OCR ADVANCED SUBSIDIARY GCE IN APPLIED ICT (H115)

OCR ADVANCED SUBSIDIARY GCE IN APPLIED ICT (DOUBLE AWARD) (H315)

OCR ADVANCED GCE IN APPLIED ICT (H515)

OCR ADVANCED GCE IN APPLIED ICT (DOUBLE AWARD) (H715)

Qualification Accreditation Numbers:

Advanced Subsidiary GCE:	100/4434/6
Advanced Subsidiary GCE (Double Award):	100/4435/8
Advanced GCE:	100/4436/X
Advanced GCE (Double Award):	100/4437/1

KEY FEATURES

- This is a new broad-based qualification in Applied ICT.
- AS content for the AS GCE award builds upon the content of the GCSE Applied ICT.
- A2 content for the GCE award provides an essential building block for progress to further development as IT users. The optional units allow candidates to develop their knowledge and practical use of different applications packages.
- Designed to provide a progression route to higher education and further training for employment.

PART A: GENERAL SPECIFICATION

FOREWORD

This booklet contains OCR Advanced Subsidiary GCE, Advanced Subsidiary GCE (Double Award), Advanced GCE and Advanced GCE (Double Award) specifications in Applied ICT for teaching from September 2005.

The Advanced Subsidiary GCEs are assessed at a standard appropriate for candidates who have completed the first year of study of the corresponding two year Advanced GCE course, i.e. between GCSE and Advanced GCE. They form the first half of the Advanced GCE courses in terms of teaching time and content. When combined with the second half of the Advanced GCE courses, known as 'A2', the AS awards form 50% of the assessment of the total Advanced GCE. However, the AS (Single and Double Awards) can be taken as 'stand-alone' qualifications. A2 is weighted at 50% of the total assessment of the Advanced GCE.

The first year of certification of the OCR Advanced Subsidiary GCE in Applied ICT is June 2006.
The first year of certification of the OCR Advanced Subsidiary GCE in Applied ICT (Double Award) is June 2006.
The first year of certification of the OCR Advanced GCE in Applied ICT is June 2007.
The first year of certification of the OCR Advanced GCE in Applied ICT (Double Award) is June 2007.

These specifications meet the requirements of the Common Criteria as set out in the Arrangements for the statutory regulation of external qualifications in England, Wales and Northern Ireland (QCA, ACCAC and CCEA, 2000), the Advanced GCE Qualification Criteria (QCA, ACCAC and CCEA, 2002) and the relevant Subject Criteria (QCA 2002).

Part A Contents

PART A: GENERAL SPECIFICATION **2**

Foreword 2

SECTION A: SPECIFICATION SUMMARY **6**

1 Scheme of Assessment 6

2 Units of Assessment 8

SECTION B: GENERAL INFORMATION **9**

1 Introduction **9**

1.1 Rationale 9

1.2 Specification Aims 9

1.3 Assessment Objectives 10

1.4 Nature of Assessment 11

2 Administration and Entry **12**

2.1 Administrative Arrangements 12

2.2 Units of Assessment 15

2.3 Making Entries for Certification 16

2.4 Availability of Units of Assessment 17

2.5 Re-Sit Rules 18

2.6 Restrictions on Candidate Entries 18

2.7 Special Arrangements 18

3 Certification and Results **19**

3.1 Issue of Results 19

3.2 Awarding and Reporting Attainment 19

3.3 Result Enquiries and Appeals 21

4 Technical Information **21**

4.1 Certification Titles 21

4.2 Level of Qualification 22

4.3 Recommended Prior Learning 22
4.4 Progression 22
4.5 Related Qualifications 22
4.6 Code of Practice Requirement 23
4.7 Status in Wales and Northern Ireland 23
4.8 Weighting of Assessment Objectives 24
4.9 Quality of Written Communication 25
4.10 Differentiation 25
4.11 Guided Learning Hours 26

5 Structure of Units 27

SECTION C: PORTFOLIOS 28

6 Delivery and Administration of Portfolios 28

6.1 Supervision and Authentication of Portfolios 28
6.2 Administering Portfolio Assessment and Moderation 29

7 Assessment of Portfolios 30

7.1 The Assessment Evidence Grids 30
7.2 Internal Standardisation 30
7.3 Submission of Marks to OCR 31
7.4 Portfolio Moderation 31

8 Instructions for Marking 32

8.1 Sources of Guidance 32
8.2 Determining a Candidate's Mark 33
8.3 Sample Assessment Evidence Grid 34

SECTION D: OPPORTUNITIES FOR TEACHING 37

9 Spiritual, Moral, Ethical, Social and Cultural Issues 37

10 Citizenship 37

11 Environmental Issues 37

12 The European Dimension 38

13 Health and Safety 38

14 Key Skills 39

15 Generic Resources 40

16 Further Information and Training for Teachers 40

17 Contacting OCR 41

Appendix A: Performance Descriptions 42

PART B: UNIT SPECIFICATIONS 1

Part B Contents 1

STRUCTURE OF UNITS 2

SECTION A: SPECIFICATION SUMMARY

1 SCHEME OF ASSESSMENT

All specifications in this booklet are based on equally-weighted units of assessment, each requiring **60** guided-learning hours (glhs) of delivery.

The Advanced Subsidiary (Single and Double Award) GCEs form 50% of the assessment weighting of the corresponding Advanced (Single and Double Award) GCE.

Advanced Subsidiary GCEs can be taken as stand-alone single or double award specifications or as the first half of an Advanced single or double award GCE course.

Assessment is by means of **three** units of assessment for Advanced Subsidiary GCE (**180** glhs), **six** units of assessment for Advanced Subsidiary GCE (Double Award) and Advanced GCE (**360** glhs), and **twelve** units of assessment for Advanced GCE (Double Award) (**720** glhs).

The Single Award Structure

Advanced GCE (Single Award)		
Advanced Subsidiary GCE (Single Award)		
AS	AS	AS
A2	A2	A2

The Double Award Structure

Advanced GCE (Double Award)					
Advanced Subsidiary GCE (Double Award)					
AS	AS	AS	AS	AS	AS
A2	A2	A2	A2	A2	A2
Advanced GCE (Single Award)					

Relative Standards of Advanced Subsidiary GCE and Advanced GCE

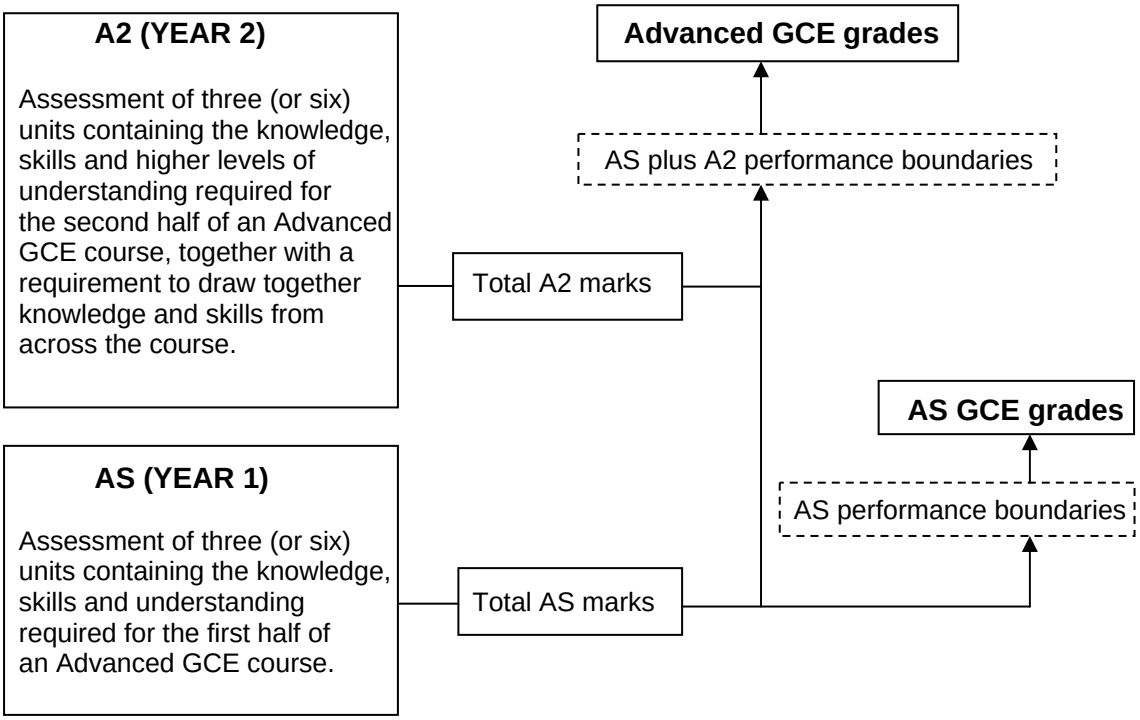
The skills, knowledge and understanding required for the first half of an Advanced GCE course are contained in the 'Advanced Subsidiary' (AS) units. The level of demand of the AS examination is that expected of candidates halfway through a full Advanced GCE course of study.

The skills, knowledge and understanding required for the second half of an Advanced GCE course are contained in the 'A2' units. The level of performance expected, therefore, reflects the more demanding Advanced GCE material, including the higher-level concepts and a requirement to draw together knowledge and skills from across the course. The precise pattern across AS and A2 reflects the nature of individual subjects.

The combination of candidates' attainments on the relatively less demanding AS units and relatively more demanding A2 units lead to an award at Advanced GCE standard.

The Advanced Subsidiary GCE units and qualification and the Advanced GCE units and qualification are graded A to E where A is the highest grade.
The Advanced Subsidiary GCE (Double Award) units and qualification and the Advanced GCE (Double Award) units and qualification are graded AA, AB, BB, BC, CC, CD, DD, DE, EE where AA is the highest grade.

The diagram below summarises how the combined marks from AS and A2 units lead to graded Advanced Subsidiary GCE and Advanced GCE qualifications.



2 UNITS OF ASSESSMENT

Unit Code	Unit Number	Level	Title of Unit	Mode of Assessment	Unit Combinations (mandatory/optional)			
					AS GCE	AS GCE (Double Award)	Advanced GCE	Advanced GCE (Double Award)
G040	1	AS	Using ICT to communicate	Portfolio	m	m	m	m
G041	2	AS	How organisations use ICT	**External***	m	m	m	m
G042	3	AS	ICT solutions for individuals and society	Portfolio	m	m	m	m
G043	4	AS	System specification and configuration	Portfolio		m		m
G044	5	AS	Problem solving using ICT	Portfolio		o^2		o^2
G045	6	AS	Software development – design	Portfolio		o^2		o^2
G046	7	AS	Communicating using computers	Portfolio		o^2		o^2
G047	8	AS	Introduction to programming	Portfolio		o^2		o^2
G048	9	A2	Working to a brief	**External***			m	m
G049	10	A2	Numerical modelling using spreadsheets	Portfolio			o^2	o^{2a}
G050	11	A2	Interactive multimedia products	Portfolio			o^2	o^{2a}
G051	12	A2	Publishing	Portfolio			o^2	o^{2a}
G052	13	A2	Artwork and imaging	Portfolio			o^2	o^{2a}
G053	14	A2	Developing and creating websites	Portfolio			o^2	o^{2a}
G054	15	A2	Software development	**External***				o^1
G055	16	A2	Networking solutions	**External***				o^1
G056	17	A2	Program design, production and testing	Portfolio				o^{2b}
G057	18	A2	Database design	Portfolio				o^{2b}
G058	19	A2	Developing and maintaining ICT systems for users	Portfolio				o^{2b}
G059	20	A2	ICT solutions for people with individual needs	Portfolio				o^{2b}

m candidates must complete those units marked m listed in the relevant column for the award being taken
o^1 candidates choose **one** option from those marked o^1 listed in the relevant column for the award being taken
o^2 candidates choose **two** options from those marked o^2 listed in the relevant column for the award being taken
o^{2a} candidates choose **two** options from those marked o^{2a} listed in the relevant column for the award being taken.
o^{2b} candidates choose **two** options from those marked o^{2b} listed in the relevant column for the award being taken
external assessments marked with an * indicate those with pre-released case-study material which will be available to centres approximately **six** weeks prior to the examination dates except for Unit 9 which will be available to centres at the start of the course.

SECTION B: GENERAL INFORMATION

1 Introduction

1.1 RATIONALE

GCEs in vocational subjects are broad-based vocational qualifications designed to widen participation in vocationally-related learning post-16. They have been designed to contribute to the quality and coherence of national provision and have a clear place in the Government's vision for secondary education.

The specifications build upon the broad educational framework supplied by the Qualification and Subject Criteria (QCA, ACCAC and CCEA, 2002) and employ an investigative and problem-solving approach to the study of the subject. In addition to providing a suitable route for progression for candidates completing OCR GCSE ICT A, ICT B, or Applied ICT, the course of study prescribed by these specifications can also reasonably be undertaken by candidates beginning their formal education in the subject at post-16 level. Progression through the Advanced Subsidiary GCE and Advanced GCE, through either a single or double award, may provide a suitable foundation for study of the subject, or related subjects, in further and higher education.

Key Skills are integral to the specifications and *the main* opportunities to provide evidence for the separate Key Skills qualification are indicated.

These specifications are supported by users and a range of professional institutes and Further and Higher Education Institutions. These include NTOs (National Training Organisations) which support training and development in many different sectors and have been consulted during the development of these specifications.

OCR has taken great care in the preparation of these specifications and assessment materials to avoid bias of any kind.

1.2 SPECIFICATION AIMS

All specifications in Applied ICT aim to encourage candidates to develop broad skills, knowledge and understanding of the ICT sector. They are to prepare candidates for further study or training.

The aims of these specifications in Applied ICT are to encourage candidates to:

- develop a broad range of ICT skills and knowledge of the uses of ICT in vocational contexts, as a basis for progression into further learning in ICT-related fields, including progression from AS to A2;
- develop knowledge and understanding of the components, functions and applications of information systems within a range of organisations;
- develop an understanding of the main principles of solving problems using ICT and develop the skills necessary to apply this understanding.

In addition, the aims of the Advanced GCE specification in Applied ICT is to encourage candidates to:

- apply their knowledge and understanding of ICT and use skills (e.g. planning, research, evaluation, problem solving) in vocational contexts;
- develop an understanding of the impact of information systems on organisations' personnel, policies and practices;
- develop project management skills and an understanding of the need to work with others.

In addition, the aims of the Advanced GCE (Double Award) specification in Applied ICT is to encourage candidates to develop their understanding of:

- software system design to meet the needs of an end user;

  and/or

- networks and communications.

1.3 ASSESSMENT OBJECTIVES

Candidates for these qualifications will be expected to demonstrate the following in a range of vocationally-related contexts:

AO1 ICT Capability

Candidates demonstrate practical capability in applying ICT;

AO2 Knowledge and understanding

Candidates demonstrate knowledge and understanding of ICT systems and their roles in organisations and society;

AO3 ICT problem solving

Candidates apply knowledge, skills and understanding to produce solutions and solve ICT problems;

AO4 Evaluation

Candidates evaluate:

- ICT solutions;
- their own performance.

The assessment objectives are weighted as follows:

	AS Units	A2 Units	GCE and GCE (Double Award)
AO1	20-30%	20-30%	20-30%
AO2	20-30%	10-20%	15-25%
AO3	20-30%	20-30%	20-30%
AO4	10-20%	30-40%	20-30%

Weighting of the assessment objectives within individual units is given in Section 4.8.

1.4 NATURE OF ASSESSMENT

1.4.1 Structure of Assessment

For the Advanced Subsidiary GCE **two** units will be assessed internally, through a teacher-assessed portfolio (see Section 7) and **one** unit will be assessed externally with the assessment set and marked by OCR. These **three** units will be equally sized and equally weighted.

For the Advanced Subsidiary GCE (Double Award) **five** units will be assessed internally, through a teacher-assessed portfolio (see Section 7) and **one** unit will be assessed externally with the assessment set and marked by OCR. These **six** units will be equally sized and equally weighted.

For the Advanced GCE **four** units will be assessed internally, through a teacher-assessed portfolio (see Section 7), **one** unit will be assessed externally with the assessment set and marked by OCR and **one** unit will be assessed externally with the assessment set by OCR, marked by the teacher and moderated by OCR. These **six** units will be equally sized and equally weighted.

For the Advanced GCE (Double Award) **nine** units will be assessed internally, through a teacher-assessed portfolio (see Section 7), **two** units will be assessed externally with the assessment set and marked by OCR and **one** unit will be assessed externally with the assessment set by OCR, marked by the teacher and moderated by OCR. These **twelve** units will be equally sized and equally weighted.

The assessment will be conducted in accordance with the GCE Code of Practice.

1.4.2 External Assessment

Advanced Subsidiary GCE:	Candidates take **one** unit of external assessment.
Advanced Subsidiary GCE (Double Award):	Candidates take **one** unit of external assessment.
Advanced GCE:	Candidates take **two** units of external assessment.
Advanced GCE (Double Award):	Candidates take **three** units of external assessment.

External assessments are 90 minutes and have pre-released case-study material which will be available to centres (once they have made their *provisional* candidate entries) approximately **six** weeks prior to the examination dates, except for Unit 9: *Working to a brief* which will be available to centres at the start of the course.

OCR has designed external assessments which allow candidates to apply the knowledge and understanding they have gained from teacher-designed activities and assignments based on the *What You Need To Learn* section of the units.

The externally assessed units will be marked by OCR. The maximum raw score will be stated on the front cover of the question paper.

1.4.3 Portfolio Assessment

Internally assessed units take the form of a portfolio of work designed to enable the candidate to demonstrate understanding of the content of the unit. Each internal assessment is set by the centre to OCR guidelines, is internally marked and externally moderated by OCR.

2 Administration and Entry

2.1 ADMINISTRATIVE ARRANGEMENTS

2.1.1 The Role of the Examinations Officer

All administrative arrangements regarding entries, submission of marks, moderation, receipt of results documentation etc. are to be made **through the centre's Examinations Officer**. It is important that subject staff liaise with the Examinations Officer and are aware of key dates for examination entry and submission of marks. These dates are supplied to Examinations Officers well before the start of the teaching year.

2.1.2 Provisional Entries

OCR does not require *individual* candidates to be registered at the start of their course, but nevertheless, needs certain information in order to plan effectively.

Provisional entries are *your best guess* of the number of candidates you will be entering for particular units in that session. They are important because they form the basis for the despatch of early assessment materials to you and allow OCR to ensure sufficient examiners/moderators are recruited for a session.

Centres make provisional entries by mid September (for January) and early November (for June). There is no fee for provisional entries.

If your centre does not make provisional entries you will *not* receive despatches of early examination materials, for example, instructions for practical examinations and pre-release materials.

2.1.3 Unit and Certification Entries

Final entries for units (including internally assessed units) are made in October for January units and in March for June units. It is important that entries are received by the deadline date – late entries cause major problems for OCR and attract a substantial penalty fee to reflect this.

To enter for certification, candidates must have a valid combination of unencashed units for that qualification (see Section 2.3).

Note that entry for units will *not* generate a final certificate – a separate certification entry for the qualification code must be made as follows:

Qualification	Entry Code
Advanced Subsidiary GCE	H115
Advanced Subsidiary GCE (Double Award)	H315
Advanced GCE	H515
Advanced GCE (Double Award)	H715

Certification entry is usually made at the same time as the final unit entries. If made at this time, it does not attract a fee.

A candidate who has completed all the units required for a qualification may enter for certification at a later examination series. Again this does not attract a fee.

A candidate who has completed all the required units but who has not entered for certification may do so in the same examination series within a specified period after the publication of results. There is a fee for this late certification service.

2.1.4 Special Requirements

OCR can make special arrangements for candidates in examinations, provided OCR is given sufficient notice. These arrangements should be made through Examinations Officers.

Special arrangements applications must be made by:

30 September (for January sessions);
15 January (for special question papers required for June session);
21 February (for other special arrangements for June session).

If you have candidates who come into this category, you should inform your Examinations Officer well in advance of these dates.

2.1.5 Arrangements for the Assessment and Moderation of Portfolios

Portfolio entries may be made for both the January and June sessions.

Detailed arrangements for the assessment of portfolios are explained in Section 7. Examination Officers will be sent the appropriate forms for completion in November for the January session and in January for the June session, assuming that provisional entries have been received.

Centres wishing to receive earlier feedback or advice on portfolio assessment may arrange with OCR to contact a Portfolio Consultant.

Centres must submit unit marks to OCR and to the moderator by the published OCR submission date. Failure to submit these marks on time can create serious problems for OCR and may jeopardise the issue of results on the published date.

2.2 UNITS OF ASSESSMENT

Unit Code	Unit Number	Level	Title of Unit	Mode of Assessment	Unit Combinations (mandatory/optional)			
					AS GCE	AS GCE (Double Award)	Advanced GCE	Advanced GCE (Double Award)
G040	1	AS	Using ICT to communicate	Portfolio	m	m	m	m
G041	2	AS	How organisations use ICT	**External***	m	m	m	m
G042	3	AS	ICT solutions for individuals and society	Portfolio	m	m	m	m
G043	4	AS	System specification and configuration	Portfolio		m		m
G044	5	AS	Problem solving using ICT	Portfolio		o^2		o^2
G045	6	AS	Software development – design	Portfolio		o^2		o^2
G046	7	AS	Communicating using computers	Portfolio		o^2		o^2
G047	8	AS	Introduction to programming	Portfolio		o^2		o^2
G048	9	A2	Working to a brief	**External***			m	m
G049	10	A2	Numerical modelling using spreadsheets	Portfolio			o^2	o^{2a}
G050	11	A2	Interactive multimedia products	Portfolio			o^2	o^{2a}
G051	12	A2	Publishing	Portfolio			o^2	o^{2a}
G052	13	A2	Artwork and imaging	Portfolio			o^2	o^{2a}
G053	14	A2	Developing and creating websites	Portfolio			o^2	o^{2a}
G054	15	A2	Software development	**External***				o^1
G055	16	A2	Networking solutions	**External***				o^1
G056	17	A2	Program design, production and testing	Portfolio				o^{2b}
G057	18	A2	Database design	Portfolio				o^{2b}
G058	19	A2	Developing and maintaining ICT systems for users	Portfolio				o^{2b}
G059	20	A2	ICT solutions for people with individual needs	Portfolio				o^{2b}

m candidates must complete those units marked m listed in the relevant column for the award being taken
o^1 candidates choose **one** option from those marked o^1 listed in the relevant column for the award being taken
o^2 candidates choose **two** options from those marked o^2 listed in the relevant column for the award being taken
o^{2a} candidates choose **two** options from those marked o^{2a} listed in the relevant column for the award being taken.
o^{2b} candidates choose **two** options from those marked o^{2b} listed in the relevant column for the award being taken
external assessments marked with an * indicate those with pre-released case-study material which will be available to centres approximately **six** weeks prior to the examination dates except for Unit 9 which will be available to centres at the start of the course.

2.3 MAKING ENTRIES FOR CERTIFICATION

Candidates following a course over a number of examination sessions have a variety of options open to them that allow them to certificate part-way through their course. All three- and six-unit qualifications are automatically 'banked' by OCR to enable the candidate to use them towards larger qualifications at a later date. Once banked, however, candidates may not re-sit any units within that qualification.

Candidates may enter for:

- Advanced Subsidiary GCE aggregation;
- Advanced Subsidiary GCE aggregation, bank the result, and complete the Advanced Subsidiary GCE (Double Award) assessment at a later date;
- Advanced Subsidiary GCE aggregation, bank the result, and complete the A2 assessment at a later date for either an Advanced GCE or an Advanced GCE (Double Award);
- Advanced Subsidiary GCE (Double Award) aggregation;
- Advanced Subsidiary GCE (Double Award) aggregation, bank the result, and complete the A2 assessment at a later date for either an Advanced GCE or an Advanced GCE (Double Award);
- Advanced GCE aggregation;
- Advanced GCE aggregation, bank the result, and complete the Advanced GCE (Double Award) assessment at a later date;
- Advanced GCE (Double Award) aggregation.

Candidates must enter the appropriate Advanced Subsidiary units to qualify for the Advanced Subsidiary GCE (Double Award).

Candidates must enter the appropriate AS and A2 units to qualify for the Advanced (Single or Double Award) GCE.

Individual unit results prior to certification of the qualification have a shelf life limited only by that of the qualification.

2.4 AVAILABILITY OF UNITS OF ASSESSMENT

First Availability of Units and Certificates (and then every January and June thereafter)	2006		2007	
	Jan	June	Jan	June
External assessment of AS units	✓	✓	✓	✓
Portfolio moderation for AS units*	✓	✓	✓	✓
External assessment of A2 units			✓	✓
Portfolio moderation for A2 units*			✓	✓
AS GCE certification (Single and Double Awards)		✓	✓	✓
GCE certification (Single and Double Awards)				✓

*Centres wishing to receive earlier feedback or advice on portfolio assessment may arrange with OCR to contact a Portfolio Consultant.

2.4.1 Sequence of Units

Units may be taken in any order, though centres are strongly advised to cover AS Units 1, 2 and 3 early in the course, since they form a core on which other units are based.

AS units are designed to be taught and assessed in the first year of a **two** year course and A2 units are designed to be studied and assessed in the second year although centres should use their own discretion to create a delivery pattern that suits their particular circumstances.

2.4.2 Synoptic Assessment

Synoptic assessment at Advanced GCE is designed to ensure that candidates have a good understanding of the subject as a whole and are able to address issues within the subject from a range of perspectives and in an integrated way. The emphasis is on strategic understanding and on the ability to draw evidence together from any relevant areas of the specifications. Assessment focuses on the breadth, depth and quality of candidates' analysis and evaluation. Synoptic assessment will be drawn from across the specifications and will involve candidates bringing together, and making connections between, the areas of knowledge, skills and understanding covered within the specifications and applying this when responding to the set requirements. Synoptic assessment will be assessed through the work completed for Unit 9: *Working to a brief*.

2.5 RE-SIT RULES

2.5.1 Re-Sits of Units

There is no restriction on the number of times a candidate may re-sit each unit before entering for certification for an Advanced Subsidiary (Single or Double Award) GCE or Advanced (Single or Double Award) GCE.

2.5.2 Retaking a Qualification

There is no restriction on the number of times a candidate may retake the whole qualification.

2.6 RESTRICTIONS ON CANDIDATE ENTRIES

There are no restrictions on candidates who enter for these GCE specifications.

Every specification is assigned to a national classification code indicating the subject area to which it belongs.

Centres should be aware that candidates who enter for more than one GCE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the School and College Performance Tables.

The classification code for these specifications is 0010.

2.7 SPECIAL ARRANGEMENTS

Candidates with special requirements must cover the assessment objectives. There may be more suitable ways of doing this than those used by the centre with other candidates. Any centre wishing to start candidates with special requirements on the course who might not be able to meet the requirements of the assessment must consult the Special Requirements Unit before doing so (telephone 01223 552505). For these candidates, or those whose performance may be adversely affected through no fault of their own, teachers should consult the *Inter-Board Regulations and Guidance Booklet for Special Arrangements and Special Consideration*.

3 Certification and Results

3.1 ISSUE OF RESULTS

Individual unit Statements of Results will be issued in March for January entries and in August for June entries for all units (both portfolio units and external units). Statements of Results will include, for each unit, the unit title, the unit UMS mark, the grade and the date the unit was taken.

Certification is **not** an automatic process, since OCR is unable to determine at which point a candidate wishes to complete their course. Candidates **must** be entered for the appropriate certification code (see Section 2.1.3) to claim their overall grade.

Entry for units will *not* generate a final certificate – a separate certification entry must be made at the appropriate time. If it is not, there will be a delay in issuing the candidate's final grade.

3.2 AWARDING AND REPORTING ATTAINMENT

3.2.1 General Principles

The qualifications will comply with the grading, awarding and certification requirements of the GCE section of the Code of Practice.

The Advanced Subsidiary GCE and the Advanced GCE qualifications are graded A to E where A is the highest grade.

The Advanced Subsidiary GCE (Double Award) and the Advanced GCE (Double Award) qualifications are graded AA, AB, BB, BC, CC, CD, DD, DE, EE where AA is the highest grade.

All GCE units are graded a to e where a is the highest grade.

The OCR awarding committee will consider both externally assessed and portfolio based units and will determine the grade thresholds for each unit.

3.2.2 Uniform Marks

In order that candidates' performance can be compared across units and across sessions, a Uniform Mark Scale (UMS) will be used to aggregate the results of individual assessment units to generate qualification grades.

Once the raw mark and raw mark boundaries for each unit have been established, the raw marks are converted to the UMS by OCR and reported to candidates as a *uniform mark* out of 100.

Uniform marks correspond to *unit* grades as follows:

Unit Grade	a	b	c	d	e
UMS (max 100)	80-100	70-79	60-69	50-59	40-49

Candidates who fail to achieve the standard for a grade e will be awarded a Uniform Mark in the range 0-39 and will be recorded as u (unclassified).

3.2.3 Overall Grade

The uniform marks awarded for each unit will be aggregated and compared to pre-set boundaries.

Uniform marks correspond to overall grades as follows.

Advanced Subsidiary GCE:

Overall Grade	A	B	C	D	E
UMS (max 300)	240-300	210-239	180-209	150-179	120-149

Advanced GCE:

Overall Grade	A	B	C	D	E
UMS (max 600)	480-600	420-479	360-419	300-359	240-299

Results for these qualifications will be awarded on a scale of A to E and will be recorded on the certificate as such.
Candidates who fail to achieve the standard for a grade E will be awarded a Uniform Mark in the range 0-119 for the Advanced Subsidiary GCE and 0-239 for the Advanced GCE and will be recorded as U (unclassified). This does not lead to a certificate.

Advanced Subsidiary GCE (Double Award):

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 600)	480-600	450-479	420-449	390-419	360-389	330-359	300-329	270-299	240-269

Advanced GCE (Double Award):

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 1200)	960-1200	900-959	840-899	780-839	720-779	660-719	600-659	540-599	480-539

Results for these qualifications will be awarded on a scale of AA to EE and will be recorded on the certificate as such.

Candidates who fail to achieve the standard for a grade EE will be awarded a Uniform Mark in the range 0-239 for the Advanced Subsidiary GCE (Double Award) and 0-479 for the Advanced GCE (Double Award) and will be recorded as U (unclassified). This does not lead to a certificate.

3.3 RESULT ENQUIRIES AND APPEALS

Under certain circumstances, a centre may wish to query the grade available to one or more candidates or to submit an appeal against the outcome of such an enquiry. Enquiries about unit results must be made immediately following the series in which the relevant unit was taken.

For procedures relating to enquiries on results and appeals, centres should consult the *Handbook for Centres* and the document *Enquiries about Results and Appeals – Information and Guidance for Centres* produced by the Joint Council. Further copies of the most recent edition of this paper can be obtained from OCR or they can be accessed from the Joint Council website www.jcgq.org.uk.

4 Technical Information

4.1 CERTIFICATION TITLES

These specifications will be shown on a certificate as:

OCR Advanced Subsidiary GCE in Applied ICT.
OCR Advanced Subsidiary GCE in Applied ICT (Double Award).
OCR Advanced GCE in Applied ICT.
OCR Advanced GCE in Applied ICT (Double Award).

4.2 LEVEL OF QUALIFICATION

These qualifications are approved by QCA at Level 3 of the National Qualifications Framework.

4.3 RECOMMENDED PRIOR LEARNING

Candidates entering this course should have achieved a general educational level equivalent to Level 2 in the National Qualifications Framework, or Levels 7/8 of the National Curriculum. Skills in Numeracy/Mathematics, Literacy/English and Information and Communication Technology will be particularly relevant.

However, there is no prior knowledge required for this specification. Prior study of the GCSE in ICT or Applied ICT may be of benefit to some candidates, but is not mandatory.

Prior study of the Foundation and / or Intermediate GNVQ in Information and Communication Technology may be of some benefit to some students but it is not mandatory.

4.4 PROGRESSION

4.4.1 Progression into Employment

These specifications are designed to give a broad introduction to this sector and aim to prepare candidates for further study in higher education or further training which might be whilst in employment. However, these qualifications are not designed for candidates' direct entry into employment.

4.4.2 Progression to Further Qualifications

Candidates who achieve these qualifications may be prepared to enter a variety of HND or degree level courses in ICT or computing related subjects.

4.5 RELATED QUALIFICATIONS

4.5.1 Relationship to other GCEs

The units of these qualifications have overlap of content with the OCR GCEs in ICT and Computing, although it is expected that the teaching and assessment methods will be significantly different.

4.5.2 Relationship to NVQs

These specifications broadly introduce the candidate to skills relevant to a range of ICT NVQs, though the assessment methods are not designed to guarantee occupational competence. However, this qualification will support candidates working towards National Occupational Standards, detailed guidance for which was issued by QCA in early 2002.

4.5.3 Relationship to Key Skills Qualification

A Grade E or above in any GCE in ICT, provides full exemption for the Key Skill of *Information and Communication Technology* at Level 3 within the Key Skills Qualification.

4.6 CODE OF PRACTICE REQUIREMENT

The assessment will be conducted in accordance with the GCE Code of Practice.

4.7 STATUS IN WALES AND NORTHERN IRELAND

This specification has been approved by ACCAC for use by centres in Wales and by CCEA for use by centres in Northern Ireland.

Candidates in Wales or Northern Ireland should not be disadvantaged by terms, legislation or aspects of government that are different from those in England. Where such situations might occur, including in the external assessment, the terms used have been selected as neutral, so that candidates may apply whatever is appropriate to their own situation.

OCR will provide specifications, assessments and supporting documentation in English only and can accept candidate portfolios and examination scripts in English only. Further information concerning the provision of assessment materials in Welsh and Irish may be obtained from the Information Bureau at OCR (telephone 01223 553998)[1].

[1] The OCR Information Bureau is open to take your calls between 8.00am and 5.30pm. Please note that as part of our quality assurance programme your call may be recorded or monitored for training purposes.

4.8 WEIGHTING OF ASSESSMENT OBJECTIVES

The full set of assessment objectives and their weightings within the qualification are listed in Section 1.3. The relationship between assessment objectives and the units of assessment is shown in the grids below.

Unit of Assessment	Mandatory or Optional	Level	Percentage of AS GCE				Total
			AO1	AO2	AO3	AO4	
1	m	AS	40	26	20	14	100
2	m	AS	-	40	40	20	100
3	m	AS	50	14	20	16	100
		Total	**90**	**80**	**80**	**50**	**300**

Unit of Assessment	Mandatory or Optional	Level	Percentage of AS GCE (Double Award)				Total
			AO1	AO2	AO3	AO4	
1	m	AS	40	26	20	14	100
2	m	AS	-	40	40	20	100
3	m	AS	50	14	20	16	100
4	m	AS	30	24	30	16	100
One of 5-8	o	AS	30	26	30	14	100
One of 5-8	o	AS	30	26	30	14	100
		Total	**180**	**156**	**170**	**94**	**600**

Unit of Assessment	Mandatory or Optional	Level	Percentage of GCE				Total
			AO1	AO2	AO3	AO4	
1	m	AS	40	26	20	14	100
2	m	AS	-	40	40	20	100
3	m	AS	50	14	20	16	100
9	m	A2	15	20	25	40	100
One of 10-14	o	A2	30	16	24	30	100
One of 10-14	o	A2	30	16	24	30	100
		Total	**165**	**132**	**153**	**150**	**600**

Unit of Assessment	Mandatory or Optional	Level	Percentage of GCE (Double Award)				Total
			AO1	AO2	AO3	AO4	
1	m	AS	40	26	20	14	100
2	m	AS	-	40	40	20	100
3	m	AS	50	14	20	16	100
4	m	AS	30	24	30	16	100
One of 5-8	o	AS	30	26	30	14	100
One of 5-8	o	AS	30	26	30	14	100
9	m	A2	15	20	25	40	100
One of 10-14	o	A2	30	16	24	30	100
One of 10-14	o	A2	30	16	24	30	100
One of 15-16	o	A2	15	30	35	20	100
One of 17-20	o	A2	30	16	24	30	100
One of 17-20	o	A2	30	16	24	30	100
		Total	**330**	**270**	**326**	**274**	**1200**

4.9 QUALITY OF WRITTEN COMMUNICATION

Quality of Written Communication is assessed in all units where candidates are required to produce extended written material and credit may be restricted if communication is unclear.

Candidates will:

- select and use a form and style of writing appropriate to purpose and to complex subject matter;
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate;
- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear.

4.10 DIFFERENTIATION

In the question papers, differentiation is achieved by setting questions which are designed to assess candidates at their appropriate levels of ability and which are intended to allow all candidates to demonstrate what they know, understand and can do.

In portfolio work, differentiation is by task and by outcome. Candidates undertake assignments which enable them to display positive achievement.

4.11 GUIDED LEARNING HOURS

All units in these specifications require **60** guided learning hours (glhs) *each* of delivery time. Thus:

Advanced Subsidiary GCE awards require **180** glhs of delivery time;
Advanced Subsidiary GCE double awards require **360** glhs of delivery time;
Advanced GCE awards require **360** glhs of delivery time;
Advanced GCE double awards require **720** glhs of delivery time.

5 Structure of Units

Please see Part B for the unit specifications. Units will have some or all of the following sections:

About this unit

This includes a brief description for the candidate of the content, purpose and vocational relevance of the unit. It states whether the unit is assessed externally or through portfolio evidence.

What you need to learn

This specifies the underpinning knowledge, skills and understanding candidates need to apply in order to meet the requirements of the portfolio evidence or external assessment.

Assessment evidence

This specifies the evidence candidates need to produce in order to meet the requirements of each portfolio unit. It is divided into the following parts:

- *You need to produce* – this banner heading sets the context for providing the evidence, e.g. a report, an investigation, etc.
- *Evidence Descriptors* – these describe the qualities of the work which will achieve each mark range specified.

Guidance for teachers

This provides advice on teaching and assessment strategies.

There is advice on:

- the provision of the vocational context of the unit;
- accurate and consistent interpretation of national standards;
- the use of appropriate internal assessments, taking into account the full range of grades to be covered.

There may also be advice on:

- exploiting local opportunities (e.g. information sources, events, work experience);
- resources.

SECTION C: PORTFOLIOS

6 Delivery and Administration of Portfolios

6.1 SUPERVISION AND AUTHENTICATION OF PORTFOLIOS

6.1.1 Supervision of Candidates

OCR expects teachers to supervise and guide candidates who are producing portfolios. The degree of teacher guidance in candidates' work will vary according to the kind of work being undertaken. However, it should be remembered that candidates are required to reach their own judgements and conclusions.

When supervising candidates, teachers are expected to:

- offer candidates advice about how best to approach their tasks;
- exercise continuing supervision of work in order to monitor progress and to prevent plagiarism;
- ensure that the work is completed in accordance with the specification requirements and can be assessed in accordance with the specified marking criteria and procedures.

Work on portfolios may be undertaken outside the centre and in the course of normal curriculum time. As with all internally assessed work, the teacher must be satisfied that the work submitted for assessment is the candidate's own work. This does not prevent groups of candidates working together in the initial stages, but it is important to ensure that the individual work of a candidate is clearly identified separately from that of any group in which they work.

Throughout the course, the teacher should encourage the candidate to focus on achieving the criteria listed in the *Assessment Evidence Grids*.

Once the mark for the unit portfolio has been submitted to OCR, no further work may take place. However, the portfolio can be improved and resubmitted under the re-sit rule (Section 2.5).

6.1.2 Authentication of Candidates' Work

Teachers may comment on a candidate's unit portfolio and return it for redrafting without limit until the deadline for the submission of marks to OCR.

Teachers must record details of any assistance given and this must be taken into account when assessing candidates' work.

Teachers must complete and sign the *Centre Authentication Form* to confirm that the work submitted for moderation was produced by the candidates concerned. Once completed this form must be sent to the moderator along with candidates' work.

6.1.3 Avoiding Plagiarism

Plagiarism in coursework is the equivalent of cheating in written examinations.

Candidates should be taught how to present material taken directly from other sources and must observe the following when producing portfolios:

- any copied material must be suitably acknowledged;
- quotations must be clearly marked and a reference provided wherever possible.

6.1.4 Late Work

Teachers may set internal deadlines for candidates submitting work to them. However, should candidates fail to meet this deadline, they may only be penalised if they fail to achieve one or more of the criteria in the *Assessment Evidence Grid* for that unit. A candidate whose work is submitted so late that the teacher is unable to meet OCR's deadline for receipt of marks should be warned by the teacher that failure to submit marks by this deadline may result in OCR failing to issue grades on the agreed date.

6.2 ADMINISTERING PORTFOLIO ASSESSMENT AND MODERATION

Portfolio units are internally assessed by centres and externally moderated by OCR. There are **three** key points in the administrative cycle that require action by the teacher:

- the centre enters candidates who wish to submit portfolios (October for January examinations, March for June examinations);
- the centre sends OCR and the moderator a set of provisional marks by a set deadline (to be determined – currently 10 January and 15 May);
- the moderator contacts the centre on receipt of marks and asks for a sample of work.

Further details of submission of marks and portfolio moderation are given in Sections 7.3 and 7.4.

OCR will conduct all administration of the GCE through the Examination Officer at the centre. Teachers are strongly advised to liaise with their Examination Officer to ensure that they are aware of key dates in the administrative cycle.

Assessment-recording materials and full details of administrative arrangements for portfolio assessment, will be forwarded to Examination Officers in centres in Autumn 2005, following receipt of provisional entries. At the same time the materials will be made available within *Portfolio Assessment Packs* and on the OCR website (www.ocr.org.uk). The materials will include master copies of mandatory *Unit Recording Sheets* on which to transfer your assessments from each candidate's *Assessment Evidence Grids*. Forms may be photocopied and used as required.

7 Assessment of Portfolios

7.1 THE ASSESSMENT EVIDENCE GRIDS

Centres are required to carry out internal assessment of portfolios using the *Assessment Evidence Grids* in accordance with OCR procedures. The process of using these grids is described in Section 8.2. Candidates' marks are recorded on these grids. **One** grid should be completed for each candidate's **unit** portfolio. The information on each of these grids should eventually be transferred onto a *Unit Recording Sheet* and attached to the front of the candidate's portfolio for the unit for inspection by the Moderator when the moderation process takes place.

When candidates are given their assignments, they should also be issued with a reference copy of the appropriate *Assessment Evidence Grid*.

Candidates' portfolios should be clearly annotated to demonstrate where, and to what level, criteria have been achieved. This will help in the moderation process. If teachers do this well it will be very much in the interests of their candidates. On completion of a unit, the teacher must complete the *Assessment Evidence Grid* and award a mark out of **50** for the unit. Details of this process are described in Section 8.2.

7.2 INTERNAL STANDARDISATION

It is important that all teachers, working in the same subject area, work to common standards. Centres are required to ensure that internal standardisation of marks across assessors and teaching groups takes place using an appropriate procedure.

This can be done in a number of ways. In the first year, reference material and OCR training meetings will provide a basis for centres' own standardisation. In subsequent years, this, or centres' own archive material, may be used. Centres are advised to hold a preliminary meeting of staff involved to compare standards through cross-marking a small sample of work. After most marking has been completed, a further meeting at which work is exchanged and discussed will enable final adjustments to be made.

7.3 SUBMISSION OF MARKS TO OCR

The involvement of OCR begins on receipt of entries for a portfolio unit from a centre's Examinations Officer. Entries for units to be included in any assessment session must be made by the published entry date from OCR. Late entries attract a substantial penalty fee.

By an agreed internal deadline the teacher submits the marks for the unit to the Examinations Officer. Marks will need to be available by the portfolio mark submission dates published by OCR and internal deadlines will need to reflect this. OCR will supply centres with MS1 Internal Assessment Mark Sheets to record the marks and instructions for completion. It is essential that centres send the top copy of these completed forms to OCR, the second copy to the Moderator and keep the third copy for their own records.

7.4 PORTFOLIO MODERATION

7.4.1 Preparing for Moderation

Moderation for all units will be available in the January and June sessions and will take place by post.

After the unit portfolio is internally marked by the teacher and marking has been internally standardised, marks are submitted to OCR by a specified date, published in the Key Dates poster, after which moderation takes place in accordance with OCR procedures.

The purpose of moderation is to ensure that the standard of the award of marks for internally assessed work is the same for each centre and that each teacher has applied the standards appropriately across the range of candidates within the centre.

Shortly after receiving the marks, the moderator will contact the centre and inform them of the sample of candidates' work that will be required, as outlined in Section 7.4.2.

Work submitted for moderation must be marked with the:

- centre number;
- centre name;
- candidate number;
- candidate name;
- specification code and title;
- unit code.

For each (portfolio) unit, centres must complete the appropriate *Unit Recording Sheet* (see Section 6.2) sent out annually by OCR and downloadable from the OCR website (www.ocr.org.uk) and attach it to each piece of work for moderation.

It is essential that the rank order of marks supplied to a moderator is correct. If centre assessment is inconsistent, work will be returned to the centre for re-assessment.

The sample of work which is presented to the moderator for moderation must show how the marks have been awarded in relation to the marking criteria defined in the unit.

7.4.2 Principles of Moderation

The following principles, agreed by the Awarding Bodies and QCA, indicate, in broad terms, how portfolio units will be moderated. OCR has detailed procedures that moderators will follow to implement the moderation process:

- centres submit unit marks to OCR and to the moderator by the published OCR submission date;
- the moderator will select, from each unit, a sample of candidates' portfolios which cover a range of grades;
- if the work seen overall has been assessed accurately and consistently to agreed national standards, within agreed tolerances, all unit marks submitted by the centre are accepted with no adjustments;
- adjustments, where required, will be carried out by OCR using its normal procedure; centres are not required to amend marks except if administrative issues, errors or order of merit problems are discovered.

Whilst moderators may seek clarification from a centre, they cannot negotiate portfolio marks in any way. OCR will inform centres of the outcome of the moderation process at the time of publication of results. This will include a written report on any significant issues that arose during this process.

8 Instructions for Marking

8.1 SOURCES OF GUIDANCE

The starting point in assessing portfolios is the *Assessment Evidence Grid* within each unit. These contain levels of criteria for the skills, knowledge and understanding that the candidate is required to demonstrate. The *Guidance for Teachers* within the unit expands on these criteria and clarifies the level of achievement the assessor should be looking for when awarding marks.

Before the start of the course OCR will produce a *Teacher Guide*. At INSET sessions OCR will provide exemplar material which is work that best illustrates a particular mark band description.

OCR will hold training meetings on portfolio assessment led by senior GCE moderators. Details of these are in the OCR INSET booklets which are sent to centres in the Summer term or they may be obtained from the Training and Customer Support Division (tel. 01223 552950). They are also published on the OCR website (www.ocr.org.uk).

OCR also operates a network of Portfolio Consultants. Centres can obtain advice on assessment of portfolios from an OCR Portfolio Consultant. These are both subject specialists and senior moderators. Details may be obtained from the OCR Subject Officer.

8.2 DETERMINING A CANDIDATE'S MARK

It must be stressed that teachers determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher grades.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with grades below their potential.

Each portfolio should be marked by the teacher according to the assessment objectives and content requirements in the *Assessment Evidence Grid* within each portfolio unit (a sample of which follows).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the *grid* comprises a task in the banner showing the development of an assessment objective (there may be more than one assessment objective to any particular task).

The maximum mark for each task is shown in the far right hand column of the *grid* and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

Teachers use their professional judgement to determine which descriptor in a task best suits the candidate's work and from the range of marks available within that particular mark band, they circle the mark that best fits the work. They then record this mark in the column headed *Mark*.

Centres should use the full range of marks available to them. Centres must award full marks in any strand of work which fully meets the criteria. This is work which is the best one could expect from candidates working at AS or A2 level.

Only **one** mark per row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each task.

8.3 SAMPLE ASSESSMENT EVIDENCE GRID

Please see over.

Unit 1: Using ICT to communicate

What you need to do:

Your evidence needs to include:

a: [AO2] a report comparing **two** types of business document from **each** of **three** organisations [**7**];

b: **six** original communications for different purposes that demonstrate a range of writing and presentation styles and that would be communicated by different methods, **one** needs to be a presentation on different methods of communicating information and the technologies that support them, to include:

- **i** [AO3] information sources, plans and annotated draft copies of documents/communications to show their development to meet their purpose [**10**];
- **ii** [AO1] final versions of documents/communications that meet their purpose [**10**];
- **iii** [AO1] use of a range of software tools and techniques to achieve the desired impact [**10**];
- **iv** [AO4] an evaluation of the documents/communications produced and your performance in completing the task [**7**];
- **v** [AO2] descriptions of the technologies that support different methods of communication [**6**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You describe the layout and/or purpose of the **six** collected documents, identifying some good and some bad points about the writing and/or presentation styles of similar items; you make little comment on their suitability for purpose, use of housestyle and/or how they could be improved; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you describe the layout and purpose of the **six** collected documents, identifying good and bad points about the writing and presentation styles of similar items; you make some comment on their suitability for purpose, use of housestyle and/or how they could be improved; your report will contain few spelling, punctuation and grammar errors; **[4 5]**	you describe in detail the layout and purpose of the **six** collected documents, accurately identifying good and bad points about the writing and presentation styles of similar items; you comment on their suitability for purpose, use of housestyle and how they could be improved; your report will be consistently well structured and there will be few, if any, spelling, punctuation and grammar errors. **[6 7]**	**/7**
b(i)	**AO3**	You produce little planning for your work but show that you have checked the accuracy of the layout and content of your work and proof-read it so few obvious errors remain; you list your information sources; **[0 1 2 3]**	you produce outline plans for your work and show by presenting annotated draft copies how you placed information in appropriate positions and ensured correct and meaningful content by carefully checking the accuracy of the layout and content of your work and proof-reading it so few obvious errors remain; you list your information sources in an appropriate form; **[4 5 6 7]**	you produce detailed plans for your work and show, by presenting annotated draft copies, how you achieved a consistent style, made good use of standard formats and organised a variety of different types of information in a coherent and easy-to-read way, ensuring correct and meaningful content by carefully checking the accuracy of the layout and content of your work and proof-reading it so few obvious errors remain; you list your information sources in detailed bibliography. **[8 9 10]**	**/10**

Unit 1: Using ICT to communicate (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
b(ii)	**AO1**	You create new information that is clear, easy to understand, uses a suitable style and, where appropriate, common standards for layout, and is at a level that suits the intended recipient; **[0 1 2 3 4]**	you locate, use and adapt existing information to suit a presentation, combining it with information you have created; **[5 6 7]**	you locate, adapt and combine information to create coherent, easy to read communications of near professional standard. **[8 9 10]**	**/10**
b(iii)	**AO1**	You use text styles, page layout and paragraph formatting, and combine **two** of text, graphics (photographs, clipart, line drawings, graphs and charts), tables, borders, shading, sound and video clips to suit the purpose of each communication; **[0 1 2 3]**	you use text styles, page layout and paragraph formatting, and combine formatted text, graphics (photographs, clipart, line drawings, graphs and charts), tables, borders, shading, sound and video clips to suit the purpose of each communication and improve its impact; **[4 5 6 7]**	you use text styles, page layout and paragraph formatting, and combine formatted text, graphics (photographs, clipart, line drawings, graphs and charts), tables, borders, shading, sound and video clips, appropriately, to suit the purpose of each communication and improve its impact, showing effective skills in the appropriate use of software to automate aspects of your communications, such as creating templates for standard layouts. **[8 9 10]**	**/10**
b(iv)	**AO4**	You comment on the effectiveness of your communications and suggest improvements; you comment on your actions and roles in solving the problem; **[0 1 2]**	you clearly identify good and not so good features of your communications, suggesting ways they could be improved; you include an analysis on your experiences in order to improve your own performance; **[3 4]**	you show that you identified strengths and weaknesses in your initial drafts and how you refined them to meet the purpose more closely; you include an analysis on your experiences suggesting how you might approach a similar task in future. **[5 6 7]**	**/7**
b(v)	**AO2**	You briefly describe some methods used to communicate information and the technologies that support them; **[0 1 2]**	you describe most methods used to communicate information and the technologies that support them; **[3 4]**	you describe in detail most methods of communicating information and the technologies used to support them. **[5 6]**	**/6**
				Total mark awarded:	**/50**

SECTION D: OPPORTUNITIES FOR TEACHING

9 Spiritual, Moral, Ethical, Social and Cultural Issues

Applied ICT offers a wide range of opportunities for the exploration of spiritual, moral, ethical, social and cultural issues.

These specifications encourage candidates to explore the spiritual, moral, ethical, social and cultural aspects of the introduction of ICT solutions to problems through a study of the effects on ICT on society in Unit 1: *Using ICT to communicate*, Unit 2: *How organisations use ICT* and Unit 3: *ICT solutions for individuals and society*. These units consider such issues as changing leisure and work practices, privacy and confidentiality of data held in systems, opportunities for access to information and environmental issues.

Unit 7: *Communicating using computers* and Unit 16: *Networking solutions* also introduce a global dimension with the study of electronic communications.

Legal issues are addressed in each unit, where appropriate.

10 Citizenship

This section offers guidance on opportunities for delivering knowledge, skills and understanding of citizenship issues during the course.

To be responsible members of society, candidates must be aware of the ever growing impact of Information and Communication Technology. They will reflect critically on the role of ICT in society to consider its positive and negative effects. The study of ICT supports the development of skills and attitudes that increase candidates' abilities to address the social and ethical issues of technological advancements.

11 Environmental Issues

OCR has taken account of the 1988 Resolution of the Council of the European Community and the Report *Environmental Responsibility: An Agenda for Further and Higher Education*, 1993 in preparing this specification and associated specimen assessments.

12 The European Dimension

OCR has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen assessments. European examples should be used where appropriate in the delivery of the subject content. Relevant European legislation is identified within the specification where applicable.

Teachers are expected to take appropriate opportunities to consider issues in the European context.

13 Health and Safety

Candidates are introduced to health and safety issues in the context of this sector and should be made aware of the significance of safe working practices.

The specification includes a section on the standard ways of working. This includes information on health and safety which should pervade all teaching.

14 Key Skills

These specifications provide opportunities for the development of the Key Skills of *Communication* (C), *Application of Number* (AoN), *Information and Communication Technology* (ICT), *Working with Others* (WwO), *Improving Own Learning and Performance* (IoLP) and/or *Problem Solving* (PS) as indicated in the table below. Please note that this table includes only the *main opportunities* in those units which are portfolio assessed. Further guidance on Key Skills opportunities is given in the Teachers' Guide accompanying these specifications.

Unit	C2				C3				AoN2			AoN3			WwO2			WwO3			IoLP2			IoLP3			PS2			PS3			Unit
	.1a	.1b	.2	.3	.1a	.1b	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	
1		F	F	P		F	F	P													P	P	P										1
3			F				F		P	P	P	P	P	P																			3
4																					P	P	P										4
5																											F	F	F	F	F	F	5
7																					P	P	P	P	P	P							7
8																					P	P	P										8
9															F	F	F	F	F	F													9
10									P	P	P	P	P	P													F	F	F	F	F	F	10
11				P				P													F	F	F	F	F	F							11
12				P																	P	P	P										12
13																					P	P	P										13
16																					P	P	P										16
18																											P	P	P				18
19	F	F	F	P	F	F	F	P																									19
20																					F	F	F	F	F	F							20
Unit	.1a	.1b	.2	.3	.1a	.1b	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	Unit
	C2				C3				AoN2			AoN3			WwO2			WwO3			IoLP2			IoLP3			PS2			PS3			

F: full coverage of that criterion of the key skill possible;

P: partial coverage of that criterion of the key skill possible.

15 Generic Resources

Please see Part B of this specification for specific unit resources.

Organisations	British Computer Society
Websites	http://www.bcs.org/BCS/Information/itequipment/ComputersAndHealth/ http://wombat.doc.ic.ac.uk/foldoc/ http://www.webopedia.com/
Publications	*A Glossary of Computing Terms* 10th Edition BCS Publications ISBN 020 177 629 4

16 Further Information and Training for Teachers

To support teachers using this specification, OCR will make the following materials and services available:

- a full programme of In-Service Training (INSET) meetings arranged by its Training and Customer Support Division (tel. 01223 552950);
- a website that will include materials to assist with delivery (www.ocr.org.uk);
- teacher support material;
- exemplar candidate work;
- candidate guides;
- specimen assessments;
- past external examinations;
- a report on the examination, compiled by senior examining personnel after each examination session;
- individual feedback to each centre on the moderation of portfolios;
- a portfolio consultancy service.

The Learning and Skills Development Agency, LSDA, has a website (www.vocationallearning.org.uk) with a variety of subject-specific resources and information in their teachers' section, as well as more general material about planning/teaching vocational courses.

17 Contacting OCR

Many straightforward enquiries may be resolved by visiting the OCR website (www.ocr.org.uk). The website contains copies of the specification, example assessments, support materials and current information of relevance to centres.

General administrative enquiries should be made to the OCR Information Bureau:
tel. 01223 553998
e-mail: helpdesk@ocr.org.uk

The OCR Publications Catalogue may be obtained from OCR's publications department:
tel. 0870 870 6622
fax 0870 870 6621
e-mail: publications@ocr.org.uk

Appendix A: Performance Descriptions

The performance descriptions for GCE Applied ICT aim to describe learning outcomes and levels of attainment likely to be shown by a representative candidate performing at the A/B and E/U boundaries for the AS and A2. They illustrate the expectations at these boundaries for the AS and A2 as a whole; they have not been written at specification or unit level. Each performance description is aligned to **one** assessment objective. An alphabetical system has been used to denote each element of a performance description. There is no hierarchy of elements.

Performance descriptions are designed to assist examiners in exercising their professional judgement at awarding meetings where the grade A/B and E/U boundaries will be set by examiners using professional judgement. This judgement will reflect the quality of the candidates' work, informed by the available technical and statistical evidence. Performance descriptions will be reviewed continually and updated where necessary.

Teachers may find performance descriptions useful in understanding candidates' performance across qualifications as a whole but should use the marking criteria identified in the specification when assessing candidates' work.

	Assessment Objective 1	Assessment Objective 2	Assessment Objective 3	Assessment Objective 4	Quality of Written Communication
Assessment Objectives for both AS GCE and Advanced GCE	Candidates demonstrate practical capability in applying ICT.	Candidates demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Candidates apply knowledge skills and understanding to produce solutions to ICT problems.	Candidates evaluate: • ICT solutions; • their own performance.	
AS A/B boundary Performance Descriptions	Candidates: • demonstrate an ability to use a wide range of ICT tools and techniques in a variety of practical activities.	Candidates: • demonstrate an understanding of components and functions of a range of ICT systems; • demonstrate an understanding of how the role of ICT helps a range of organisations in different sectors meet their objectives; • demonstrate an understanding of the positive and negative effects of ICT on society and individuals.	Candidates: • demonstrate an ability to apply their knowledge and skills of ICT tools and techniques to produce efficient solutions to a variety of problems arising from familiar contexts.	Candidates: • demonstrate an ability to identify strengths and weaknesses in their initial solution and refine it in relation to the user's needs; • demonstrate an ability to reflect on their experiences in order to improve their own performance.	The candidate has expressed complex ideas clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments will be consistently well structured. There will be few, if any, errors of grammar, punctuation and spelling.
AS E/U boundary Performance Descriptions	Candidates: • demonstrate an ability to use a limited range of ICT tools and techniques in a variety of practical activities.	Candidates: • demonstrate an understanding of components and functions of given ICT systems; • demonstrate an understanding of how the role of ICT helps selected organisations meet their objectives; • demonstrate an understanding of some of the effects of ICT on society and individuals.	Candidates: • demonstrate an ability to apply their knowledge and skills of ICT tools and techniques to produce working solutions to problems arising from familiar contexts.	Candidates: • demonstrate an ability to comment on the effectiveness of their solutions to problems and suggest improvements; • demonstrate an ability to comment on their actions and role in solving problems.	The candidate has expressed simple ideas clearly, but may express complex and subtle complex ineffectively. Arguments may be obscurely presented. Errors in grammar, punctuation and spelling may be present.

	Assessment Objective 1	Assessment Objective 2	Assessment Objective 3	Assessment Objective 4	Quality of Written Communication
Assessment Objectives for both AS GCE and Advanced GCE	Candidates demonstrate practical capability in applying ICT.	Candidates demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Candidates apply knowledge skills and understanding to produce solutions to ICT problems.	Candidates evaluate: • ICT solutions; • their own performance.	
A2 A/B boundary Performance Descriptions	Candidates: • demonstrate an ability to use their initiative to develop, enhance and extend their range of ICT skills and techniques as required.	Candidates: • demonstrate a detailed knowledge of formal and informal tools and techniques for developing and managing ICT systems; • demonstrate a thorough understanding of the effects of proposed solutions on end users; • demonstrate an understanding of the implications of current relevant legislation.	Candidates: • demonstrate an ability to apply their knowledge and skills of ICT tools and techniques to produce effective solutions to complex problems arising from unfamiliar contexts; • demonstrate an ability to use methodical, analytical and critical approaches to problem solving.	Candidates: • demonstrate an ability to provide a critical analysis of their solutions to ICT problems, identifying strengths and weaknesses in order to refine the solution taking account of user feedback; • demonstrate an ability to reflect on their own performance by identifying strengths and weaknesses and use this review to improve their SKU.	The candidate has expressed complex ideas clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments will be consistently well structured. There will be few, if any, errors of grammar, punctuation and spelling.
A2 E/U boundary Performance Descriptions	Candidates: • demonstrate an ability to develop and extend their range of ICT skills and techniques as required.	Candidates: • demonstrate a knowledge of tools and techniques for developing ICT systems; • demonstrate a recognition that their solutions will have effects on end users; • demonstrate a knowledge of current relevant legislation.	Candidates: • demonstrate an ability to apply their knowledge and skills of ICT tools and techniques to solve straightforward problems arising from unfamiliar contexts.	Candidates: • demonstrate an ability to comment on the effectiveness of their solution in relation to user needs, suggesting improvements; • demonstrate an ability to comment on their actions and role in solving problems and identify areas for improvement.	The candidate has expressed simple ideas clearly, but may express complex and subtle concepts ineffectively. Arguments may be obscurely presented. Errors in grammar, punctuation and spelling may be present.

PART B: UNIT SPECIFICATIONS

Part B Contents

1	Unit 1: Using ICT to Communicate	3
2	Unit 2: How Organisations Use ICT	21
3	Unit 3: ICT Solutions for Individuals and Society	31
4	Unit 4: System Specification and Configuration	43
5	Unit 5: Problem Solving Using ICT	57
6	Unit 6: Software Development – Design	69
7	Unit 7: Communicating Using Computers	81
8	Unit 8: Introduction to Programming	95
9	Unit 9: Working to a Brief	103
10	Unit 10: Numerical Modeling Using Spreadsheets	115
11	Unit 11: Interactive Multimedia Products	129
12	Unit 12: Publishing	141
13	Unit 13: Artwork and Imaging	153
14	Unit 14: Developing and Creating Websites	165
15	Unit 15: Software Development	177
16	Unit 16: Networking Solutions	187
17	Unit 17: Program Design, Production and Testing	195
18	Unit 18: Database Design	207
19	Unit 19: Developing and Maintaining ICT Systems for Users	223
20	Unit 20: ICT Solutions for People With Individual Needs	239

STRUCTURE OF UNITS

Units will have some or all of the following sections:

About this unit

This includes a brief description of the content, purpose and vocational relevance of the unit.
It states whether the unit is assessed externally or through portfolio evidence.

What you need to learn

This specifies the underpinning knowledge, skills and understanding you need to apply in order to meet the requirements of the portfolio evidence or external assessment.

Assessment evidence

This specifies the evidence you need to produce in order to meet the requirements of each portfolio unit. It is divided into the following parts:

- *You need to produce* – this banner heading sets the context for providing the evidence, e.g. a report, an investigation, etc.
- *Evidence Descriptors* – these describe the qualities of the work which will achieve each mark range specified.

Guidance for teachers

This provides advice **to teachers** on teaching and assessment strategies.

There is advice on:

- the provision of the *vocational* context of the unit;
- accurate and consistent interpretation of the national standards;
- the use of appropriate internal assessments, taking into account the full range of grades to be covered.

There may also be advice on:

- exploiting local opportunities, e.g. information sources, events, work experience;
- resources.

1 Unit 1: Using ICT to Communicate
[AS level, mandatory, internally assessed]

1.1 ABOUT THIS UNIT

This AS level unit is mandatory and is internally assessed.

This unit helps you to:

- understand the characteristics and significance of different types of information;
- understand the different methods for communicating information and the technologies that support them;
- create original communications in styles that suit the users;
- improve the accuracy, readability and presentational quality of communications you create;
- understand some of the ways organisations present information and why they use standard layouts for documents;
- choose and apply standard layouts;
- understand the need for standard ways of working;
- develop good practice in your use of ICT.

You will use your presentation knowledge and skills to create a portfolio of different communications, including a presentation on different methods of communicating information and the technologies that support them. You will also compare a collection of standard documents used by organisations. The communications you create and compare need to have sufficient content to enable you to fully demonstrate your presentation knowledge and skills.

Throughout this unit, the terms *communication, presentation, document* and *report* should be taken to mean any appropriate method of communicating information.

This unit provides the basis for all the other units. It is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce:

- a report comparing **two** types of business document from **each** of **three** organisations;
- **six** original communications for different purposes that demonstrate a range of writing and presentation styles and that would be communicated by different methods; **one** needs to be a presentation on different methods of communicating information and the technologies that support them, to include:
  – information sources, plans and annotated draft copies of documents/ communications to show their development to meet their purpose;
  – final versions of documents/communications that meet their purpose;
  – use of a range of software tools and techniques to achieve the desired impact;
  – an evaluation of the documents/communications produced and your performance in completing the task;
  – descriptions of the technologies that support different methods of communication.

1.2 WHAT YOU NEED TO LEARN

You need to learn about:

- the information age;
- communicating information;
- accuracy and readability;
- styles of presentation;
- how organisations present information;
- standard ways of working.

1.2.1 The Information Age

We live in the information age. As individuals, we are bombarded by information in many different forms. You need to learn about the characteristics and significance of different types of information including:

- written;
- multimedia;
- graphical;
- video;
- audio;
- web-based.

You need to learn about the methods by which information is communicated such as:

- paper-based;
- screen-based;
- SMS (short message service – telephone text messaging);
- radio;
- television;
- telephone;
- e-mail;
- WWW (world wide web).

You need to also learn about the technologies that support these forms of communication including:

- personal computers;
- touch screens;
- digital broadcasting;
- DVD (digital video disc);
- mobile phones;
- the Internet;
- WAP (wireless application protocol).

You also need to learn how to communicate information, both on paper and electronically, using appropriate formats.

1.2.2 Communication of Information

You know what you want to communicate. How will you express it? There are **three** important things to remember when preparing information:

- who is to receive it (the audience);
- the purpose of your communication;
- the method that will be used to communicate the information.

You need to know your audience and use the right kind of language. Unusual words might impress the reader of a job application, but they might annoy someone wanting directions to your house. You also need to consider the purpose of your communication and think about the style of language to use. Formal purposes demand a formal style.

You need to use different writing styles to meet different needs. You need to learn how the following needs and document structures affect writing style:

- attracting attention;
- setting out facts clearly;
- writing to impress;
- summarising information;
- creating a questionnaire;
- collecting information from individuals;
- explaining technical details;
- writing a reminder;
- preparing a report;
- ordering or invoicing goods.

1.2.3 Accuracy and Readability

It is important that information is accurate. Inaccuracy of information can mislead or annoy readers. Common mistakes are incorrect spelling and missing or incorrect punctuation.

Spell-checkers help you to correct spelling and punctuation. You need to use spell-checkers to detect words spelt incorrectly and repeated words, e.g. 'and and'.

Sometimes a spell-checker will suggest that a word is incorrect when you know it is correct. This often happens with *proper names*, for example 'OCR' or 'Chris'. You need to create a special personal dictionary, additional to the main dictionary, which contains any unusual words you may wish to use.

Spell-checkers do not tell you when you use a word wrongly or when you have omitted a capital letter at the start of a sentence. It will not correct 'capitol' for 'capital' or 'there' for 'their' or 'to' for 'too'. To correct this type of error, you need to use software that can check grammar. This type of software can help you to make sure that:

- sentences end with only **one** full stop;
- there is a capital letter at the beginning of a sentence;
- sentences have a subject and a verb that agree;
- common errors are avoided like writing 'you and I' when it should be 'you and me';
- for direct effect, you write in the active voice rather than the passive;
- the readability statistics meet the needs of your readers.

ICT facilities for checking the accuracy of your documents do not guarantee that there are no errors. To check that your document makes sense, is correctly laid out and meets your purpose you also need to proof-read your documents.

1.2.4 Styles of Presentation

It is important to present information clearly – it may annoy or confuse readers if you present information poorly. Common mistakes are using inconsistent headings or layout and using widely different fonts and point sizes. You need to think about what you want to achieve with your communication and what will appeal to your audience.

There are several essential features that affect presentation style. You need to use or modify these to attain a presentation style to suit your purpose, including:

- page layout;
- graphic images;
- textual styles;
- special features;
- paragraph formats;
- position of common items.

You can create an effective page layout by using suitable:

- margins;
- headers and footers;
- page orientation;
- paper size;
- pagination;
- gutters.

You can create suitable textual styles by careful selection and use of:

- fonts;
- heading and title styles;
- bold, italic and underline;
- superscript and subscript;
- text orientation;
- text animation (on screen).

You can create a variety of presentation styles by using different paragraph formats including:

- tabs and indents;
- paragraph numbering;
- widows and orphans;
- justification;
- spacing before/after;
- use of tables;
- bullet points;
- line spacing;
- hyphenation.

You can make use of special features to develop special presentation styles, including:

- borders;
- shading;
- background colour;
- text colour;
- a contents page;
- an index;
- a bibliography;
- an appendix;
- text/picture boxes.

You can use a variety of different types of media to improve presentation style, including:

- graphs or charts;
- lines or borders;
- video clips;
- pictures;
- drawings;
- digital photographs;
- clip art;
- scanned images;
- sound.

You need to understand how to position important items on a communication, including:

- references;
- signatures;
- dates;
- logos;
- addressee names;
- headings.

You need to know how and when to use any of these techniques in a communication. You may need to create many communications before you are able to judge when to use particular techniques.

You also need to learn:

- how to create templates to standardise styles of presentation;
- when to use existing information;
- how to select and adapt existing information to the needs of your communication;
- when to create original information;
- when to blend existing and original information;
- how to maintain a consistent style throughout a communication;
- how to combine text, sound, graphics, video and number information harmoniously.

You need to evaluate the communications you produce in terms of:

- their suitability for the intended audience;
- their effectiveness in getting the message across.

You then need to consider how you could produce more effective communications in the future.

1.2.5 How Organisations Present Information

Organisations range from multinationals to corner shops. In all organisations, a group of people work together to make something or provide a service. They all need to manage information. You need to learn about:

- why, and how, organisations present information both within, and outside, the organisation;
- typical uses of illustrations, technical drawings, pictures and artwork;
- commonly-accepted standards for the layout of formal documents;
- essential information that appears on formal documents;
- methods of presenting a corporate image;
- how templates might be used to enforce corporate standards.

Organisations use many different types of document. You need to show your understanding of writing style, presentation style and common standards for layout in documents such as:

- publicity flyers;
- questionnaires;
- business letters;
- newsletters;
- visual presentations;
- brochures;
- itineraries;
- forms to collect information from people;
- business reports;

- technical specifications;
- web pages;
- multimedia presentations.

1.2.6 Standard Ways of Working

Many organisations have rules and guidelines to help people work effectively and avoid problems. These are known as 'standard ways of working'. They are very important for people working with ICT.

There are many reasons for having standard ways of working in ICT. The most important is that information in ICT systems can be easily lost or misused, for example:

- unauthorised persons may gain access to confidential information;
- people may copy original work and present it as their own;
- data files may be lost, corrupted by a virus or damaged in other ways;
- computers may be damaged so that data stored in them cannot be recovered;
- information presented professionally may be believed, even though it may be inaccurate.

Standard ways of working help you to overcome these problems. In your work with ICT, you need to ensure that you:

- manage your work effectively;
- keep information secure;
- work safely.

Managing your work

The way you manage your ICT work is important. You need to:

- plan your work to produce what is required to given deadlines;
- use spaces, tabs and indents correctly to ensure consistent layout and easy editing;
- use file names that are sensible and remind you of the contents;
- store files where you can easily find them in the directory/folder structure;
- keep a log of any ICT problems you meet and how you solve them.

Keeping information secure

Protecting information from loss or misuse is essential in ICT. You need to learn the particular importance of:

- keeping information secure, e.g. protection from theft, loss, viruses, fire;
- protecting confidentiality, e.g. preventing illegal access to medical or criminal records – people or companies may wish to keep information confidential so that others do not know about it – you need to keep this type of information secure and not pass it on to others;
- respecting copyright – a computer program, words, pictures and graphic images may belong to other people – the people who created or own this material have copyright and you must **not** use their work without their permission, if you do, you are breaking the law;
  you need to understand and respect copyright law – where you do use information created by others, it is important that you acknowledge the source, by using an appropriate reference or listing it in a bibliography;
- if work stored on an ICT system is lost, it is important that there is another file that can be used in its place – there are **two** ways to make this possible:
  – by keeping dated back-up copies of files on another disk and in another location;
  – by saving work regularly and using different filenames.

Working safely

The ICT working environment is relatively safe. However, you need to avoid:

- bad posture and physical stress;
- eye strain;
- hazards resulting from equipment or workplace layout.

You need to know that a comfortable working position is important to avoid physical stress, eye strain or safety hazards. This may include:

- comfortable seating;
- suitable desk and VDU position;
- suitable keyboard position;
- brief rest periods;
- avoiding long periods of continuous VDU work;
- a surrounding area that includes near and distant objects upon which eyes may focus;
- careful layout of cables and equipment (to avoid tripping);
- suitable and complete insulation of cables (from electrical supplies).

1.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 1: Using ICT to communicate

What you need to do:

Your evidence needs to include:

a: [AO2] a report comparing **two** types of business document from **each** of **three** organisations [**7**];

b: **six** original communications for different purposes that demonstrate a range of writing and presentation styles and that would be communicated by different methods; **one** needs to be a presentation on different methods of communicating information and the technologies that support them, to include:

- **i** [AO3] information sources, plans and annotated draft copies of documents/communications to show their development to meet their purpose [**10**];
- **ii** [AO1] final versions of documents/communications that meet their purpose [**10**];
- **iii** [AO1] use of a range of software tools and techniques to achieve the desired impact [**10**];
- **iv** [AO4] an evaluation of the documents/communications produced and your performance in completing the task [**7**];
- **v** [AO2] descriptions of the technologies that support different methods of communication [**6**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You describe the layout and/or purpose of the **six** collected documents, identifying some good and some bad points about the writing and/or presentation styles of similar items; you make little comment on their suitability for purpose, use of housestyle and/or how they could be improved; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you describe the layout and purpose of the **six** collected documents, identifying good and bad points about the writing and presentation styles of similar items; you make some comment on their suitability for purpose, use of housestyle and/or how they could be improved; your report will contain few spelling, punctuation and grammar errors; **[4 5]**	you describe in detail the layout and purpose of the **six** collected documents, accurately identifying good and bad points about the writing and presentation styles of similar items; you comment on their suitability for purpose, use of housestyle and how they could be improved; your report will be consistently well structured and there will be few, if any, spelling, punctuation and grammar errors. **[6 7]**	**/7**
b(i)	**AO3**	You produce little planning for your work but show that you have checked the accuracy of the layout and content of your work, and proof-read it so few obvious errors remain; you list your information sources; **[0 1 2 3]**	you produce outline plans for your work and show, by presenting annotated draft copies, how you placed information in appropriate positions and ensured correct and meaningful content by carefully checking the accuracy of the layout and content of your work, and proof-reading it so few obvious errors remain; you list your information sources in an appropriate form; **[4 5 6 7]**	you produce detailed plans for your work and show, by presenting annotated draft copies, how you achieved a consistent style, made good use of standard formats and organised a variety of different types of information in a coherent and easy-to-read way, ensuring correct and meaningful content by carefully checking the accuracy of the layout and content of your work, and proof-reading it so few obvious errors remain; you list your information sources in detailed bibliography. **[8 9 10]**	**/10**

Unit 1: Using ICT to communicate (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
b(ii)	**AO1**	You create new information that is clear, easy to understand, uses a suitable style and, where appropriate, common standards for layout, and is at a level that suits the intended recipient; **[0 1 2 3 4]**	you locate, use and adapt existing information to suit a presentation, combining it with information you have created; **[5 6 7]**	you locate, adapt and combine information to create coherent, easy to read communications of near-professional standard. **[8 9 10]**	**/10**
b(iii)	**AO1**	You use text styles, page layout and paragraph formatting, and combine text, graphics (photographs, clip art, line drawings, graphs and charts), tables, borders, shading, sound and video clips to suit the purpose of each communication; **[0 1 2 3]**	you use text styles, page layout and paragraph formatting, and combine formatted text, graphics (photographs, clip art, line drawings, graphs and charts), tables, borders, shading, sound and video clips to suit the purpose of each communication and improve its impact; **[4 5 6 7]**	you use text styles, page layout and paragraph formatting, and combine formatted text, graphics (photographs, clip art, line drawings, graphs and charts), tables, borders, shading, sound and video clips, appropriately, to suit the purpose of each communication and improve its impact, showing effective skills in the appropriate use of software to automate aspects of your communications, such as creating templates for standard layouts. **[8 9 10]**	**/10**
b(iv)	**AO4**	You comment on the effectiveness of your communications and suggest improvements; you comment on your actions and roles in solving the problem; **[0 1 2]**	you clearly identify good and not so good features of your communications, suggesting ways they could be improved; you include an analysis on your experiences in order to improve your own performance; **[3 4]**	you show that you identified strengths and weaknesses in your initial drafts and how you refined them to meet the purpose more closely; you include an analysis on your experiences suggesting how you might approach a similar task in future. **[5 6 7]**	**/7**
b(v)	**AO2**	You briefly describe some methods used to communicate information and the technologies that support them; **[0 1 2]**	you describe most methods used to communicate information and the technologies that support them; **[3 4]**	you describe, in detail, most methods of communicating information and the technologies used to support them. **[5 6]**	**/6**
				Total mark awarded:	**/50**

1.4 GUIDANCE FOR TEACHERS

1.4.1 Guidance on Delivery

The original documents, in particular the major document, may be produced while candidates are working on other units. The major document may be on any topic, preferably one of interest to candidates. It must have enough scope to show their skills. Candidates will need to practise their skills and produce many documents before they are ready to produce their best-quality work for their portfolios.

The importance this unit attaches to accuracy and suitability should ensure that candidates spend much time thinking about the quality of what they wish to communicate and then presenting it simply and clearly. The content of documents is the key to their importance. This unit focuses on the quality of that content but candidates also learn from experience and guidance how to improve their presentations by using techniques like white space.

Acquaintance with documents from different organisations enables candidates to examine the quality of communication for a wide range of different types of document. There are numerous real examples of business documents that are stilted, tortuous or simply ineffective. It may be useful to build a bank of business clichés extracted from business documents, for candidates to translate into plain English. Typical documents are:

- bills;
- letters advertising financial products, such as credit cards and investments;
- mail-order forms and letters;
- instructions for operating domestic equipment;
- conditions of contracts, such as for credit cards, digital TV or credit agreements;
- insurance documents, letters and conditions;
- advertisements in newspapers and magazines.

While candidates need to spend a lot of time practising techniques, they need also to discover tools that can improve their writing. They need to configure grammar checkers to use different writing styles and then use them to check a written document to see if each gives a different response.

Tasks should not become checklists for techniques. The key to success is for candidates to use a variety of suitable techniques and use them sensibly. A wide choice of documents will ensure variety, but there is no need to use *every* technique listed in Section 1.2.

Group work brings enormous benefits to candidates. They could work in a group to collect documents, with each candidate contributing several cuttings or pamphlets and a critique of what they have collected. A discussion should help to generate ideas about what constitutes good and bad style. There should be no problem about authenticity if each candidate writes individual comments on a sample of the group's collection. When linked to presentational techniques, these activities should help candidates to write and present their work clearly, succinctly and effectively.

1.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 1.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates compare **two** types of document from each of **three** organisations – the inclusion of poor as well as good examples will help candidates fully meet the requirements of this task; candidates describe the main features of documents such as font size, margins, use of bullets or numbering, use of paragraphs etc. – they also identify common elements such as sender's and recipient's address, date, reference and subject on business letters; candidates awarded the lowest mark provide only brief descriptions and identify some common features, those awarded the highest mark describe the features clearly and identify most of the common elements;
		2	candidates describe the layout of documents in detail and also the particular purpose of each document, e.g. a letter from a bank that is trying to persuade the recipient to open a new type of account – they identify good and bad points about writing style, e.g. the persuasiveness of the text; they also identify good and bad points about presentation style, such as the use of bullets to emphasise points; candidates awarded the lowest mark have compared presentation but not writing styles; candidates awarded the highest mark compare both;
		3	in addition to the evidence generated for Mark Band 2, candidates link their identification of good and bad points about writing and presentation styles to the purpose of the document so that they can comment on each document's suitability for purpose – they also use the **two** documents from each organisation to comment on the use of housestyle; candidates draw on their work to suggest suitable improvements to at least some of the documents; candidates awarded the lowest mark may suggest very limited improvements, while those awarded the highest mark suggest improvements that would demonstrably improve the documents.
b(i)	**AO3**	**1**	Candidates provide little evidence of planning their communications but use spell checking and proof-reading to correct errors of content and layout – draft copies with the errors identified provide suitable evidence for this mark band; where candidates proof-read on screen, you can provide a suitable observation record; it is not expected that work will be totally error-free – the mark awarded will depend on the accuracy of the final communications;

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b(i)	AO3	2	candidates produce plans that outline the content and layout of their communications and how they will find any information required; candidates show the development of their communications by indicating on draft copies how they moved elements to achieve the desired effect; checking involves consideration of the appropriateness of information included as well as the accuracy of spelling, grammar and layout;
		3	candidates plan in detail the content and layout of their communications and how they will find the information required; candidates show the development of their communications by indicating on draft copies how they moved elements to achieve the desired effect; checking involves consideration of the appropriateness of information included as well as the accuracy of spelling, grammar and layout; it is expected that the documents/communications will be almost error free.
b(ii)	AO1	1	Candidates produce **six** communications that include information they have created – the language needs to be of an appropriate style, e.g. formal style for a business letter, and at an appropriate level, e.g. using straightforward language when addressing a communication to a younger audience – where there are accepted standards for documents, such as business letters, these need to be followed; candidates awarded the lowest mark achieve an appropriate style and level for only some of their documents and may not fully meet common standards for layout – for the highest mark, all documents include clear and easy to understand information, expressed in a suitable style and at an appropriate level – documents that have a common standard for layout fully meet these standards;
		2	candidates achieve an appropriate style and level for all of their documents and fully meet common standards for layout; all documents will include clear and easy to understand information, expressed in a suitable style and at an appropriate level; candidates carry out research and use and adapt the information they find, combining it with their own information to create their communications – adapting information might involve editing a picture or some text, for example; candidates provide sufficient information about sources to enable someone else to find the original information; candidates at the lower end of the mark band use and combine information with a minimum of adaptation, while those at the higher end of the mark band carry out considerable adaptation;
		3	in addition to the evidence generated for Mark Band 2, candidates produce documents and other communications of near-professional quality – they locate, adapt and combine information from a number of sources to produce communications that are coherent in style and content.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b(iii)	AO1	1	Candidates produce mainly text-based communications that use a range of *text styles*, e.g. font styles and sizes, bold, italic; *page layouts*, e.g. portrait, landscape, columns; and *paragraph formatting*, e.g. alignment, indents, spacing;
		2	candidates use a range of software to produce communications that combine different types of media, including sound and video clips as well as graphics, tables, borders and shading to improve their impact – the mark awarded will depend on the range of media used and the impact achieved;
		3	candidates make good use of the facilities provided by software to automate aspects of their communications – this may involve the automation of how items appear in a presentation and how the presentation moves from **one** slide to the next; candidates may also create their own templates for standard documents and/or use heading and body-text styles along with a software-generated contents list or index – the mark awarded will depend on the level of automation achieved.
b(iv)	AO4	1	Candidates make brief comments on how effective each communication is and suggest simple improvements to some of them;
		2	candidates' evaluations consider both good and less good features of each communication; candidates provide sensible suggestions as to how each communication could be improved;
		3	candidates show evidence of evaluation through the refinement of their work as it progresses; annotation of draft copies identify their strengths and weaknesses and candidates explain how the communications were refined to meet the purpose more closely; final evaluations include consideration of how a more efficient approach might be adopted for similar tasks in future.
b(v)	AO2	1	Candidates consider about half of the methods of communication listed in Section 1.2 and the associated technologies; descriptions lack depth, being restricted to simple statements or bulleted lists;
		2	candidates produce descriptions in greater depth than for Mark Band 1 and the majority of the communication methods listed will be considered;
		3	candidates produce thorough, well-structured descriptions of the majority of the communication methods listed and the technologies that support them.

1.4.3 Resources

Organisations	Plain English Campaign PO Box 3 New Mills High Peak SK22 4QP			
Textbooks	Lawson J (ed)	*Vocational A-Level Information and Communication Technology*	Pearson Education Ltd.	058 235 709 8
	Richards RP & Heathcote PM	*AVCE Units 1-3*	Payne-Gallway	190 311 229 X
	Richards RP & Vincent JM	*Further Word 2000-2002*	Payne-Gallway	190 446 703 2
Websites	http://desktoppub.miningco.com/ http://esl.about.com/cs/onthejobenglish/a/a_basbletter.htm http://www.dti.gov.uk/bestpractice/ http://www.dti.gov.uk/bestpractice/assets/mobile.pdf http://www.fastrak-consulting.co.uk/tactix/features/commopts/comopt02.htm http://www.io.com/~hcexres/tcm1603/acchtml/genlett.html http://www.plainenglish.co.uk/ http://www.smplanet.com/webpage/webpage.html http://www.textmatters.com/tm/guides/dbd.html			

2 Unit 2: How Organisations Use ICT
[AS level, mandatory, externally assessed]

2.1 ABOUT THIS UNIT

This AS level unit is mandatory and is externally assessed.

This unit helps you to:

- understand how organisations are structured;
- understand how organisations use and exchange information;
- evaluate how well ICT can and does help organisations;
- consider how ICT supports many different activities in organisations;
- see how ICT offers new opportunities.

You will study how organisations (including at least **one** large organisation) collect, disseminate and use information, how they manage the flow of information between sections or departments and the way they use ICT to access and exchange information.

The unit will be assessed through an external assessment. The mark on that assessment will be your mark for the unit.

2.2 WHAT YOU NEED TO LEARN

You need to learn about:

- types of organisation;
- functions within organisations;
- information and its use;
- ICT systems;
- the impact of ICT on working practices;
- the impact of ICT on methods of production;
- legislation.

2.2.1 Types of Organisation

In all types of organisations, a group of people work together to make something or provide a service. The range includes multinational commercial companies, utilities (transport, water, electricity and gas), public-service organisations (hospitals, schools, colleges), shops, banks and a range of enterprises employing small numbers of people that can be found in every town.

Before you can understand how ICT can help organisations and support their activities, you need to learn about how organisations are structured, their information needs and how information moves within an organisation and outside it.

2.2.2 Functions within Organisations

Most organisations have staff who have particular responsibilities, such as those dealing with sales, creating products or services, or undertaking research and development. These tasks are often known as *job functions*.

You need to learn about the many different job functions that can appear in organisations, including:

- accounts or finance;
- sales;
- distribution;
- marketing;
- research and development;
- human resources;
- design;
- production (or service provision);
- ICT services;
- administration.

You need to learn that organisations are often structured into departments for these functions and that there will be a manager for each department.

You need to learn what these departments do and with whom they need to communicate.

2.2.3 Information and its Use

Information is vital to any organisation. Some organisations exist solely to gather and disseminate information.

You need to:

- identify the types of information needed by the organisations you study and the significance of this information;
- learn how organisations collect the information they need;
- learn with whom organisations communicate and what information they exchange;
- learn about the types of information that may be exchanged between or about the following:
  – customers and clients;
  – wholesalers and retailers;
  – distributors;
  – suppliers (of services or goods);
  – manufacturers;
  – managers and employees;
  – products;
  – briefs;
  – services;
  – goods.

Organisations need to communicate to people within the organisation as well as those outside, such as suppliers and customers. You need to find out who needs information, who sends it, who receives it and how it is processed.

Most large organisations use very similar key information. You need to understand how organisations use this information. You also need to identify typical features of such information.

You need to learn about the following functions and key systems used by many large organisations:

- personnel:
  – information about employees, such as name, address, employee number and position;
  – often links with training and payroll;
- training:
  – training records are an extension of the personnel system;
  – large organisations will probably record training plans for employees;
  – records may also note special skills of staff so they can be found quickly when particular skills are required;

- payroll:
  – another extension of personnel records – tax codes and rates of pay will link to the employee number;
  – often there is a computerised mailing system that prints letters with details of wage payments;
  – payroll is one area in an organisation that deals with many changes, e.g. staff turnover, changes to personal details and changes to pay rates;
  – it is also one in which confidentiality of information is particularly important;
  – an important external link is with the Inland Revenue;
  – reports on payroll information must be available to accounts managers to contribute to statements of profits and losses;
- design and development:
  – records of changes to product design or to new products;
  – produce specifications for all products;
  – may include production drawings;
- purchasing:
  – links with stock control, accounts, production and most other departments;
  – generates purchase orders and contracts for goods and services;
- sales:
  – keeps records of all customer orders;
  – initiates the internal requests for provision of services or goods which may be sent to a despatch or delivery department;
- research:
  – keeps records of new products on trial or being investigated;
  – may be able to forecast how long existing products will remain saleable;
  – may define new areas of productivity for the organisation;
- accounts and finance:
  – tracks money paid and money owed;
  – prepares a general ledger summarising accounts;
  – preparation of balance sheets and income statements;
  – keeps track of cash receipts and payments used to forecast cash-flow;
- stock control or inventory systems:
  – tracks items held in stock by serial number;
  – records the number, cost and location of items held in stock;
  – often an automatic re-ordering process;
  – sometimes links with robotic systems in warehouses;
  – can automate much of the re-stocking necessary;
- e-mail:
  – used extensively to communicate information within the organisation and with external contacts;
  – useful for organising meetings as staff can post their availability on the system;
  – problems can arise if too little care is taken to decide who receives what information;

- Internet and intranet:
  – offer completely new opportunities that you need to consider;
  – some external, in that they open websites for outsiders to explore;
  – some internal, providing closed network facilities;
  – an important aspect is e-commerce, which is used to buy and sell goods and services on-line.

You need to draw diagrams that help you describe the movement of information in these organisations, including information flowing into and out of the organisation and between departments. This involves finding who needs or uses what information and then showing the connections.

The type of information needs to be clearly identified in the diagrams. The following types might appear:

- customer orders;
- purchase orders to suppliers;
- design and production drawings;
- wages and tax-paid details;
- records of staff training;
- names and addresses of employees;
- stock details;
- invoices paid;
- monthly income;
- monthly outgoing;
- web publicity pages;
- monthly profit or loss.

Your diagrams need to show the methods used for communicating information, including:

- face-to-face;
- documents via internal or external post;
- EDI (electronic data interchange) or e-commerce;
- LAN (local area network) or Internet e-mail;
- telephone;
- facsimile;
- centralised database systems;
- mobile devices.

You need to find out which methods are effective and efficient for different organisations. You also need to find out which methods are particularly effective for different types of information.

2.2.4 ICT Systems

You have learnt about how organisations are structured, their information needs and with whom they communicate. All organisations use ICT systems to some extent to store, process, present and communicate information. Large organisations could not function without the many ICT systems that support their operations.

You need to learn about the ICT systems that organisations use for different purposes, how these are used to process and communicate information, how they support the functions within the organisation and how these systems interact.

2.2.5 The Impact of ICT on Working Practices

You need to learn about the technological developments that have taken place and the changes in working styles and employment opportunities that have resulted from these developments. In particular, you need to learn how ICT has had an impact on:

- location and pattern:
  – employer premises or at home;
  – allowing a 24-hour operation;
  – allowing personal flexibility;
  – being static in an office or mobile;
- work skills:
  – keyboard;
  – technical;
  – design;
  – analysis;
- re-training.

These changes made by ICT on working practices have also had a knock-on effect on employees. You need to identify changes to:

- social aspects:
  – changes in motivation for those no longer supervised directly;
  – risk of job loss, due to changes in work skills required and number of staff needed;
  – security of work, due to changing contractual arrangements between employers and employees;
  – reduced social interaction at work, but increased interaction with family and neighbours;
- the balance of responsibilities:
  – who is put under stress;
  – who takes the blame when things go wrong;
- the amount and timing of leisure time;
- the fast-changing pace of ICT developments.

Some employees experience stress as a result of these changes. You need to identify how changes in supervision and increased automation, for example, may result in stress.

2.2.6 The Impact of ICT on Methods of Production

To see how ICT has affected methods of production, you need to understand how introducing robotics and other linked ICT systems has improved the processes of:

- production control;
- process control.

In particular, you need to know how ICT has aided the:

- speed of the process;
- cost of the process;
- safety of the workers involved;
- quality of the final product.

You then need to recognise how this development in ICT has had, and may in the future have, an impact on society, including issues such as:

- health and safety;
- employment levels;
- working practices.

2.2.7 Legislation

The increased use of ICT to store, process and communicate information has led to the need for different types of legislation. This includes:

- Data Protection Act (1998);
- Copyright, Designs and Patents Act (1980);
- Computer Misuse Act (1990);
- Health and Safety at Work Act (1974);
- EU Health and Safety Directives;
- Electronic Communications Act (2000).

Some of this legislation is designed to protect individuals; some is designed to protect the organisation and its information. You need to learn the purpose of each piece of legislation, how organisations are affected by it and what, if anything, they need to do to comply with the legislation. You need to know of any updates to the legislation identified above.

2.3 GUIDANCE FOR TEACHERS

2.3.1 Guidance on Delivery

The work carried out by candidates needs to cover a range of different types of ICT activities and organisations. This work could be carried out through visits to local organisations. Case studies of a variety of different organisations could be created and used. Candidates may need to be taught strategies for interpreting case study material. At least **one** large organisation needs to be covered. It will be necessary for you to provide a wide range of example documents and information about the organisation for each case study.

These need to include items such as:

- definitions of the purpose and objectives of the organisation;
- documents that show how information flows, for example:
  – letters;
  – memos;
  – orders;
  – invoices;
- charts that show the organisational structure;
- details of products manufactured, goods sold or services provided;
- details of the ICT facilities available in each job role;
- details of the departments and their role.

Typical organisations that could provide good potential for study are:

- large retailers, for example:
  – clothes shops;
  – grocery shops;
  – computer-product shops;
- manufacturers of goods, for example:
  – cars;
  – electrical goods;
  – steel products;
- providers of services, for example:
  – railways;
  – bus companies;
  – solicitors;
  – councils;
  – police;
- schools, colleges and libraries.

To produce comprehensive diagrams of information flows, candidates need to identify different systems. Candidates need to identify

- between whom the information flows;
- what the information is;
- how the information is passed between people.

In order for candidates to see how ICT has impacted upon businesses and society, they need to learn about the technological developments that have taken place and the changes in working styles and employment opportunities that have resulted from these developments.

2.3.2 Guidance on Assessment

This unit is assessed externally.

2.3.3 Resources

Organisations	Health and Safety Executive			
Textbooks	Lawson J (ed)	*Vocational A-Level Information and Communication Technology*	Pearson Education Ltd.	058 235 709 8
	Richards RP & Heathcote PM	*AVCE Units 1-3*	Payne-Gallway	190 311 229 X
Websites	http://europe.osha.eu.int/legislation/directives/ http://resources.ukonlineforbusiness.gov.uk/index.asp http://www.fast.org.uk/ http://www.hmso.gov.uk/acts.htm#acts http://www.hmso.gov.uk/acts/acts1988/Ukpga_19880048_en_1.htm http://www.hmso.gov.uk/acts/acts1990/Ukpga_19900018_en_1.htm http://www.hmso.gov.uk/acts/acts1998/19980029.htm http://www.hmso.gov.uk/acts/acts2000/20000007.htm http://www.hse.gov.uk/office/index.htm http://www.hse.gov.uk/pubns/index.htm http://www.informationcommissioner.gov.uk/			

3 Unit 3: ICT Solutions for Individuals and Society
[AS level, mandatory, internally assessed]

3.1 ABOUT THIS UNIT

This AS level unit is mandatory and is internally assessed.

The World Wide Web allows individuals to access information on almost any topic imaginable. This access to information has had a fundamental effect on society and the way individuals live their lives.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a presentation of the results of an investigation, including the use of a spreadsheet to analyse numeric data, along with a report on the sources and methods used to find information, to include:

- the selection and efficient use of research engines to find information required;
- an explanation of the impact of the availability of electronic information on individuals and society;
- information accessed from large websites;
- the use of databases to find required information;
- the use of spreadsheet software to analyse numeric data and present results;
- different types of data combined to present the results of the investigation;
- an evaluation of the methods used to find information and present the results.

3.2 WHAT YOU NEED TO LEARN

You need to learn about:

- public-service websites;
- search engines;
- databases;
- use of spreadsheet facilities;
- development of spreadsheets to present results of data analysis;
- presentation of the results of an investigation.

3.2.1 Public-Service Websites

Virtually all public-service organisations have a presence on the World Wide Web. You need to find out about and access websites relating to:

- government, both national and local, including census material;
- information services, e.g. museums, libraries, directory enquiries;
- emergency services, e.g. fire station, RNLI;
- the National Health Service;
- education;
- transport;
- broadcasting.

Many of these websites are very large. You need to navigate such large websites to access specific information using the facilities provided, such as navigation bars, textual hotspots, directories and internal search engines. You also need to download the information you require.

You need to identify the range of information each site offers and consider the impact on individuals and society of this increased availability of information. You also need to consider the impact on methods of communication between organisations, individuals and society, and the effect this has on people who do not have access to ICT.

3.2.2 Search Engines

The power of the World Wide Web as a resource is due to the ability of the user to search for specific information. You need to learn:

- what a search engine is;
- the range of search engines available and the differences between them;
- that entering the same search in different search engines may generate different results;
- which search engine is best for a particular purpose.

You need to use search engines to find and download the information you need for a task.

It is possible to enter search criteria that may generate thousands of responses. You need to use facilities available to add precision to your searches, including the use of:

- logical operators (AND, OR, NOT);
- advanced-search options.

3.2.3 Databases

A database is a collection of data stored in a computer system in some organised fashion so that desired items can be retrieved quickly according to various criteria. Databases may be large or small, on-line or stored locally.

You need to search databases to find the information you require, including the use of:

- searches using a single criterion;
- searches using relational operators such as =, >, <, <>, is the same as, comes before, comes after;
- complex searches using logical operators (AND, OR, NOT).

You need to present the results of searches as a report.

3.2.4 Use of Spreadsheet Facilities

When using spreadsheet facilities, there are a number of activities that you will do regularly. You need to carry out these activities without help, including:

- selecting and setting cell formats to match the data format;
- selecting and using suitable cell-presentation formats;
- using and manipulating spreadsheet data;
- using cell-referencing facilities appropriately;
- applying and using operators and formulae correctly;
- using built-in spreadsheet functions appropriately;
- using wizards.

You need to learn how to:

- set cell formats to match the data format, including:
  – decimal number;
  – integer number;
  – percentage;
  – date;
  – fraction;
  – text or character;
  – currency;
  – scientific;
  – custom or special;
- set cell-presentation formats, including:
  – horizontal alignment;
  – colour;
  – vertical alignment;
  – shading;
  – fonts;
  – borders;

- use and manipulate your spreadsheet to:
  – find data;
  – go to a specified cell;
  – search and replace data;
  – cut, copy, paste, move;
  – clear cell formats/contents;
  – use paste special;
- make appropriate use of cell-referencing facilities, including:
  – relative referencing;
  – cell ranges;
  – absolute cell referencing;
  – 3D referencing;
  – mixed cell referencing;
  – R1C1 referencing;
- apply and use the following operators in formulae correctly:
  – arithmetic operators, such as +, -, *, /, %, ^;
  – relational operators, such as =, <, >, >=, <=, <>;
  – the logical value FALSE, TRUE;
  – text concatenation & or +;
  – the use of parentheses ( );
- use common built-in spreadsheet functions, including:
  – SUM;
  – INT;
  – COUNT;
  – MAX;
  – AVERAGE;
  – RAND;
  – MODE;
  – MIN;
  – SQUARE;
  – IF;
  – MEDIAN;
  – DATE.

3.2.5 Development of Spreadsheets to Present Results of Data Analysis

You need to use spreadsheet facilities to analyse numerical data, e.g. census data for your region or viewing figures for particular types of television programme.

You then need to present results in appropriate ways, including good use of:

- cell formatting, such as colour and borders;
- drawing tools and graphic images;
- charts and line graphs.

You need to make good use of macros to simplify the use of the spreadsheet, including macros that:

- replace multiple key depressions for a required action;
- enable or simplify data input;
- produce printed or screen reports.

You need to ensure the accuracy of your results by testing the formulae in your spreadsheet to ensure they generate the expected results.

3.2.6 Presentation of the Results of an Investigation

You need to combine different types of information from different sources into a coherent presentation, including:

- text both created by you and from existing sources;
- graphics from websites and other sources;
- numerical data from spreadsheets;
- graphs and charts;
- results of database searches;
- hyperlinks to other information sources.

You need to understand the importance of checking the accuracy and currency of the information and of acknowledging the sources used.

3.3 ASSESSMENT EVIDENCE GRID

Please see over

Unit 3: ICT solutions for individuals and society

What you need to do:

You need to produce: a presentation of the results of an investigation, including the use of a spreadsheet to analyse numeric data, along with a report on the sources and methods used to find information,

Your evidence needs to include:

a: [AO3] the selection and efficient use of search engines to find information required [**10**];

b: [AO2] an explanation of the impact of the availability of electronic information on individuals and society [**7**];

c: [AO1] information accessed from large websites [**5**];

d: [AO1] the use of databases to find required information [**5**];

e: [AO1] the use of spreadsheet software to analyse numeric data and present results [**10**];

f: [AO1] different types of data combined to present the results of the investigation [**5**];

g: [AO4] an evaluation of the methods used to find information and present the results [**8**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO3**	You identify the information required, select a search engine and use its search facilities to locate the information; **[0 1 2 3]**	you identify the information required and use the advanced search facilities of more than **one** search engine to locate the information, comparing the results obtained; **[4 5 6 7]**	you identify the information required, select the most appropriate search engine and use efficient methods, including the use of logical operators to locate the information. **[8 9 10]**	**/10**
b	**AO2**	You make straightforward comments on how the availability of information affects people and situations you are familiar with, such as you and your family; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you explain clearly how the availability of information affects society in general and individuals within it, including people and situations outside your normal experience; your report will contain few spelling, punctuation and grammar errors; **[4 5]**	you explain in detail how organisations now communicate with individuals and society and the effect on those who do not have (or want) access to ICT; your report will be consistently well-structured and there will be few, if any, spelling, punctuation and grammar errors. **[6 7]**	**/7**
c	**AO1**	You access the required information with some help; **[0 1 2]**	you access required information independently, using menus, navigation bars etc.; **[3 4]**	you access required information independently, using an internal search engine. **[5]**	**/5**
d	**AO1**	You use search criteria involving relational operators to obtain information from at least **one** local or on-line database and evidence your searches; **[0 1]**	you use complex search criteria including relational and logical operators to obtain information from local and on-line databases and present results; **[2 3]**	you use complex search criteria including relational and logical operators to obtain information from local and on-line databases and present results as reports. **[4 5]**	**/5**

Unit 3: ICT solutions for individuals and society (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
e	**AO1**	You create a suitable spreadsheet layout to carry out simple analysis of numeric data and provide suitable printed or screen output that makes appropriate use of cell formats, charts or graphs, page or screen layout and graphic images; **[0 1 2 3]**	you show a good understanding of spreadsheet functions and formulae by using them to carry out complex analysis of numeric data, using macros to speed up the input of data and the production of results; **[4 5 6]**	you create a well-designed spreadsheet to carry out complex analysis of numeric data, testing the spreadsheet thoroughly to ensure the accuracy of the results obtained. **[7 8 9 10]**	**/10**
f	**AO1**	You produce a presentation that combines at least **two** different types of data from a at least **two** sources, listing the sources used; **[0 1 2]**	you produce a presentation that combines at least **four** types of data from at least **four** different sources, listing your information sources in an appropriate form; **[3 4]**	you produce a well thought out presentation that uses at least **six** types of data effectively to present the investigation results from at least **six** different sources coherently; you list your information sources in a detailed bibliography. **[5]**	**/5**
g	**AO4**	You comment on the effectiveness of the methods you used to find information and present results; **[0 1 2]**	you clearly identify good and not so good features of the methods you used to find information and present results; **[3 4 5]**	you show that you identified strengths and weaknesses in both your initial searches and your presentation of results; you will show how you refined them to meet the purpose more closely, suggesting how you might approach a similar task in future. **[6 7 8]**	**/8**
				Total mark awarded:	**/50**

3.4 GUIDANCE FOR TEACHERS

3.4.1 Guidance on Delivery

Candidates need to be familiar with:

- using search engines efficiently to obtain information from large websites;
- using databases to find required information;
- using spreadsheet software to analyse numeric data and present results;
- combining different types of data to present the results of an investigation.

Candidates need to experience a variety of public service websites to be familiar with the type of information that they hold.

Candidates need to be confident with each of these skills before they are ready to undertake a major task.

The order of teaching different topics is unimportant. What does matter is that candidates see that the presentation of the investigation is as important a part of the process as the researching of the data.

Candidates need to choose appropriate techniques for finding information, such as database queries and effective use of search engines, and then use the relevant results of their searches to present their findings.

A variety of techniques for analysing and presenting data using spreadsheets need to be taught so that candidates are able to select and use the most appropriate for their purpose.

The importance this unit attaches to accuracy and suitability should ensure that candidates spend much time thinking about the quality of what they wish to communicate and then presenting it simply and clearly.

3.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 3.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO3**	**1**	Having identified the information they require, candidates use the standard search facilities of a single search engine to locate it; candidates awarded the lowest mark require some assistance to select the most appropriate sites from the search results; candidates awarded the highest mark select the most appropriate sites independently and begin to recognise the limitations of this method – screen prints and witness testimony provide suitable evidence of what the candidate has done;
		2	candidates search for identified information using at least **two** different search engines – they use the advanced search facilities provided to narrow down the search results – suitable screen prints evidence the searches carried out; candidates compare the results obtained from the different search engines; the mark awarded depends on the number of different search engines used, the selection of appropriate advanced search facilities and the quality of the comparisons;
		3	candidates use their comparison of different search engines to select the one that is most appropriate to find the identified information; candidates then use a range of methods, including the use of logical operators, to locate the information as efficiently as possible – screen prints and witness testimony provide suitable evidence of the search methods used.
b	**AO2**	**1**	Candidates explain the effects of the availability of information in personal terms, such as their ability to access information on this qualification by accessing the OCR website, or the ability of their parents to find train or flight information and book tickets on-line;
		2	candidates broaden the scope of their explanations to include individuals and society in general;
		3	candidates include in their explanations the increased use by organisations of e-mail, websites and other ICT to communicate with their customers individually, and with society in general, through ICT-based advertising; they consider the effects on those who do not have (or want) access to ICT.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO1	1	Candidates access large public-service websites but need some help to locate and download the information required – screen prints and witness testimony provide suitable evidence of what the candidate has done;
		2	candidates independently use the facilities provided by large public-service websites, such as menus and navigation bars, to access and download the information they require – screen prints and witness testimony provide suitable evidence of what the candidate has done;
		3	candidates use internal search engines provided by large public-service websites to locate and download the information they require – screen prints and witness testimony provide suitable evidence of what the candidate has done.
d	AO1	1	Candidates obtain information from databases available on local drives, including network drives and CD-ROM, and large on-line databases by carrying out simple searches involving relational operators; evidence of searches may be through annotated screen shots;
		2	candidates use logical operators (AND, OR, NOT) to obtain the information they require from local and on-line databases; evidence of searches may be through annotated screen shots;
		3	candidates use logical operators (AND, OR, NOT) to obtain the information they require from local and on-line databases – they use the report facilities provided by the DBMS to present their findings.
e	AO1	1	Candidates carry out straightforward analysis of numeric data, such as finding the maximum, minimum and average values and comparing these graphically for different data sets – they use appropriate cell and presentation formats and produce page or screen layouts for results that are clear and easy to read;
		2	candidates use spreadsheet facilities to carry out more complex analysis of numerical data (e.g. calculating the annual percentage change in viewing figures for different television channels for the last **ten** years); they use macros to automate, for example, the copying of data from **one** place to another or the display of a particular area of the spreadsheet that shows a chart;
		3	candidates create spreadsheets layouts that clearly separate the results from the input data, either using different areas of the same sheet or using different sheets in a workbook with macro buttons to move to the relevant area; candidates also use colours and borders to improve the visual impact of the spreadsheet; candidates test all formulae and functions used by entering simple values and comparing the results obtained with those obtained manually or by using a calculator.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
f	AO1	1	Candidates combine **two** or **three** types of data, such as text, tables and charts, from **two** or **three** sources, such as **one** or **two** websites and their spreadsheet, in their presentations – information about sources is limited to the URL of the sites visited;
		2	candidates combine **four** or more types of data from **four** or **five** sources in their presentations; different types of sources will be used – information about sources is grouped according to type, e.g. websites are listed under **one** sub-heading and publications under another;
		3	candidates use at least **six** different information sources in the presentation of their investigation results; candidates consider carefully how the information needs to be combined so that it is presented in a logical order to make the final presentation coherent, including a suitable conclusion – information about sources is precise, e.g. including the complete URL for the web page containing the information and additional information such as author and date where available.
g	AO4	1	Candidates make brief comments on how effective each method used to find information and present results is and suggest simple improvements to some of them;
		2	candidates' evaluations consider both good and not so good features of each method used to find information and present results; candidates provide sensible suggestions as to how each method could be improved;
		3	candidates show evidence of evaluation through the refinement of their work as it progresses; candidates identify the strengths and weaknesses in their initial search strategies and explain how these were refined to meet the purpose more closely; final evaluations include consideration of how a more efficient approach might be adopted for similar tasks in future.

3.4.3 Resources

Textbooks	Heathcote RSU *Further Excel* Payne-Gallway 2000-2002 190 446 704 0 Kent P *The Complete Idiot's Guide to the Internet*
Websites	http://uk.weather.com/ http://www.baa.com/ http://www.bbc.co.uk/ http://www.learnthenet.com/english/index.html http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/FindInfo.html http://www.nationalrail.co.uk/ http://www.nhsdirect.nhs.uk/ http://www.statistics.gov.uk/ http://www.ukonline.gov.uk/Home/Homepage/fs/en http://www.visitbritain.com/

4 Unit 4: System Specification and Configuration
[AS level, double award, mandatory, internally assessed]

4.1 ABOUT THIS UNIT

This AS level unit is a mandatory part of the double award only and is internally assessed

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a specification for an ICT system to meet the needs of a given user, together with a working system on which you have installed and configured software to meet a user's needs, and recommendations for ensuring safety and security, and an explanation of the basics of software development, to include:

- a statement of the user's needs and how these might be met;
- a specification for an ICT system;
- evidence of software installation, configuration, testing and implementation of security procedures;
- evidence that the software has been configured by installing toolbars and setting up macros and templates to meet a user's needs;
- recommendations for safety and security;
- an explanation of the basics of software development;
- an evaluation of the specification you produced and the methods used for installation, configuration and testing.

4.2 WHAT YOU NEED TO LEARN

You need to learn about:

- hardware;
- software;
- basics of software development;
- safety and security.

4.2.1 Hardware

This involves understanding the purpose of significant pieces of computer equipment and their links with other components.

You need to understand the purpose of and specify, using reference materials, any of the following components to create an ICT system to meet specified user requirements:

- main processing unit;
- keyboard;
- mouse;
- VDU (visual display unit);
- processor (CPU – central processing unit);
- connectors;
- video card;
- sound card;
- network card;
- disk drives;
- optical drive;
- printer;
- scanner;
- serial port;
- parallel port;
- USB (universal serial bus) port;
- microphone;
- speaker;
- SCSI (small computer system interface) controller.

You need to learn how different systems meet different purposes and the importance of particular components. You also need to learn to judge the effectiveness of systems designed for similar purposes, e.g. how different types of RAM are more efficient and how different sound cards and speakers affect the quality of sound coming from a multimedia system.

Technical terms

Technical terms are used extensively in ICT. Following are lists of terms. You do **not** need to acquire extensive theoretical knowledge about these terms, but you do need to understand how they are used in system specifications and how the items listed affect the selection and installation of a system.

You need to know the terms relating to:

- memory, for example:
  – bit;
  – byte;
  – Kb, Mb, Gb, Tb;
  – RAM;
  – address;
  – buffer;
  – ROM;
  – volatility;
  – cache;
- the main processing unit, for example:
  – tower;
  – desk unit;
  – motherboard;
  – processor (CPU);
  – co-processor;
  – ISA (integrated systems architecture);
  – PCI (peripheral component interconnect);
  – AGP (accelerated graphics port);
  – controller;
  – card;
  – bus (address, data);
  – clock;
  – serial port;
  – parallel port;
  – expansion slot;
- disk-drive storage systems, for example:
  – floppy disk;
  – hard disk;
  – optical disk;
  – write protect;
  – data compression;
  – rotation speed;
  – access time;
  – capacity;
  – IDE (integrated drive electronics);
  – SCSI (small computer system interface);
  – SATA (serial advanced technology attachment);
- optical disks, for example:
  – CD-ROM;
  – DVD-ROM/RAM;
  – CD-RW;

- printers, plotters and VDUs, for example:
  – resolution;
  – flatbed;
  – ink jet;
  – laser;
  – buffer;
  – colour mode (bits);
  – scan frequency;
  – interlace;
  – refresh rate;
- connector plugs and sockets, for example:
  – centronics/parallel;
  – serial;
  – SCSI;
  – RJ (registered jack) series;
  – DB series;
  – DIP, DIL switches;
  – USB;
  – Firewire.

You need to configure and test complete systems and individual components of a system, including:

- main processing unit;
- keyboard;
- mouse;
- VDU;
- speaker and microphone;
- scanner;
- disk or optical drive;
- printer;
- application software;
- connecting cables;
- expansion cards (video, sound or network).

4.2.2 Software

Some software operates the computer system as soon as it is switched on. You need to know about the minimum software needed in a computer to enable a user to communicate with it.

You need to change (configure) various settings, such as setting the right time and date, and more important settings, like setting a password that users need to enter for the system to work, calling up a device driver or selecting between alternative operating systems.

Some incorrect configurations are easily corrected. Others could delete all the existing data and make the system unusable. You have to learn to configure systems safely.

There is a range of different types of software. You need to know what types of software are available and understand the purpose of each type, including:

- BIOS (basic input output system) start-up software;
- operating systems;
- GUI (graphic user interfaces);
- applications software.

The BIOS is used when the hardware first powers up. Access to these has to be initiated on starting the system. You need to understand what this start-up software controls and set or define parameters to meet requirements, such as:

- select start-up (boot) disk drive;
- define a new disk drive;
- set system password;
- configure a new card, e.g. video.

Operating systems control the computer and the way it handles all the attached peripheral devices. They also provide the user with a way of communicating with the computer system to configure the way that hardware operates.

There are many different types of operating system (OS). One of the most common provides a graphic user interface (GUI). This OS presents the user with a visually pleasing, simple interface. Other systems only provide a textual (command) interface. To use this type, the user has to understand how to enter commands. You need to select, install and configure operating systems that may have either a command interface or a graphic user interface.

ICT systems can be configured to start up and operate in different ways. The ICT system manager controls many of these. Others can be configured to suit the needs of users. You need to set up different system-boot or start-up configurations so that a system can be made to start up according to specified requirements. You also need to set up the system to suit user requirements. You need to use the operating system for settings such as:

- time and date;
- password properties;
- scheduled tasks;
- virus-protection configuration;
- directory (folder) structure and settings;
- multimedia configuration;
- printer, mouse and keyboard configuration;
- GUI desktop and display set-up;
- application-software icons;
- checking and setting system properties.

There is a wide variety of applications software to meet user needs. You need to know which type of software suits a particular processing activity. You need to select, install and configure software most suited to a specified need, including:

- document (word) processing;
- desktop publishing;
- multimedia reference;
- programming languages;
- web browsers;
- e-mail software;
- database (record structure);
- spreadsheet (numeric structure);
- vector graphics, e.g. geometric objects;
- bit-map graphics, e.g. photo images.

To enable users to make immediate and effective use of the system, you also need to configure the application software in different ways, including preparing or setting items such as:

- preferences (or configuration files);
- macros;
- toolbars and the buttons available;
- directory structures and defaults;
- data templates;
- saving and back-up security;
- menu layout and contents;
- borders, rules and scroll bars.

4.2.3 Basics of Software Development

You need to understand that software consists of a set of instructions which are in a specific sequence to obtain the desired outcome. Software can be developed using different languages, each of which has its own set of rules or syntax.

You need to learn that, when developing software, there are a number of aspects that need to be considered, including:

- the data that will be input and the output required;
- how the data will be stored;
- how the processing of data will be controlled;
- the efficiency of the program which relates to the precision in framing instructions.

You also need to know how to organise information into a form suitable for processing.

4.2.4 Safety and Security

When specifying ICT systems, to ensure the user can work safely, it is important to consider the ergonomics of:

- hardware;
- software;
- workstation layout;
- furniture.

You also need to implement or recommend proper management and security procedures, including those that ensure:

- data and software back-up is maintained;
- confidential information is protected;
- passwords are used;
- virus checking is undertaken;
- copyright is protected;
- theft is avoided (data, software, equipment);
- users are assigned appropriate rights and file permissions.

4.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 4: System specification and configuration

What you need to do:

You need to produce: a specification for an ICT system to meet the needs of a given user, together with a working system on which you have installed and configured software to meet a user's needs, and recommendations for ensuring safety and security, and an explanation of the basics of software development.

Your evidence needs to include:

a [AO3] a statement of the user's needs and how these might be met [**5**];

b [AO3] a specification for an ICT system [**10**];

c [AO1] evidence of software installation, configuration, testing and implementation of security procedures [**9**];

d [AO1] evidence that the software has been configured by installing toolbars and setting up macros and templates to meet a user's needs [**6**];

e [AO2] recommendations for safety and security [**8**];

f [AO2] an explanation of the basics of software development [**4**];

g [AO4] an evaluation of the specification you produced and the methods used for installation, configuration and testing [**8**];

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO3**	You identify user requirements by identifying the main tasks that the user wants the system to perform; **[0 1 2]**	you clearly define the user requirements by stating specific tasks that the user wants the system to perform, including the types of input and the output required; **[3 4]**	you clearly define the user requirements by detailing specific tasks that the user wants the system to perform, identifying all the types of input and the output required. **[5]**	**/5**
b	**AO3**	You produce specifications for the ICT system, including details of hardware, operating system, applications software and configuration; **[0 1 2 3]**	you show a systematic approach to clearly specifying an ICT system, including full details of hardware, operating system applications software and configuration; **[4 5 6]**	you show a systematic approach to clearly specifying an ICT system, including full details of hardware, operating system, applications software and configuration and clear detail of the design of any toolbar layouts, menus, templates and macros that would improve the efficiency and effectiveness of the user. **[7 8 9 10]**	**/10**
c	**AO1**	You select and install suitable software; you will configure the software and operating system to meet the needs of the user; you make little or no attempt to implement test procedures to check each task undertaken; you implement suitable security procedures; **[0 1 2 3]**	you select and install suitable software; you will configure the software and operating system to meet the needs of the user; you will clearly define and implement test procedures to check each task undertaken; you implement suitable security procedures; **[4 5 6]**	you select and install suitable software; you will configure the software and operating system to meet the needs of the user, including setting ROM-BIOS parameters and carrying out more complex configuration activities such as virus protection and scheduling tasks; you clearly define and implement test procedures to check each task undertaken and show how you overcame problems found as a result of using the test procedures; you implement suitable security procedures. **[7 8 9]**	**/9**

Unit 4: System specification and configuration (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
d	**AO1**	You install, without testing, a suitable toolbar layout, menu, template and macro to meet the user requirements; **[0 1 2]**	you install and test a suitable toolbar layout, menu, template and macro to meet the user requirements; **[3 4]**	you install and test toolbar layouts, menus, templates and macros that you have designed that provide the user with facilities to improve their efficiency. **[5 6]**	**/6**
e	**AO2**	You provide limited recommendations for safety and security, including the ergonomics of furniture and the workstation layout; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you provide recommendations for safety and security that include a full consideration of ergonomics and some consideration of management issues; your report will contain few spelling, punctuation and grammar errors; **[4 5 6]**	you provide detailed recommendations for safety and security that include a full consideration of ergonomics and of management issues; your report will be consistently well structured and there will be few, if any, spelling, punctuation and grammar errors. **[7 8]**	**/8**
f	**AO2**	You outline at least **two** of the basic concepts of software development; **[0 1]**	you outline at least **three** of the basic concepts of software development; **[2 3]**	you explain at least **three** of the basic concepts of software development. **[4]**	**/4**
g	**AO4**	You comment on the quality of your specification and the effectiveness of the methods you used for installation, configuration and testing; **[0 1 2 3]**	you clearly identify good and not so good features of your specification and the methods you used for installation, configuration and testing; **[4 5]**	you show that you identified strengths and weaknesses in your initial specification and practical activities and how you refined them to meet the user's needs more closely, suggesting how you might approach a similar task in future. **[6 7 8]**	**/8**
				Total mark awarded:	**/50**

4.4 GUIDANCE FOR TEACHERS

4.4.1 Guidance on Delivery

The focus of this unit is to acquire a good understanding of the hardware and software that form computer systems and the extensive software configuration tasks that are necessary to meet given specifications.

It is important that you treat the software and hardware items listed as an *indication* rather than a *prescription*. It is difficult to keep pace with the advances in ICT and, as technology changes, some of the items listed may become more or less important and your course delivery needs to reflect this.

Candidates are expected to acquire sound knowledge of different hardware and software items. They also need to gain experience in configuring a variety of software.

Candidates need to make extensive use of screen prints (dumps) to show how they have set or modified software configurations. They need to gain experience of incorporating these, together with their own annotations, into logbooks or reports that describe their activities.

Software

Candidates need to note all new files created when they add new software, try de-installing the software and then check to see if any of the new files remain. Such activity reinforces the value of standard uninstalling software to purge a system of files added by a particular application.

Software problems need to include configuring the system by setting new values in the start-up ROM-BIOS, often non-volatile RAM (NVRAM), modifying OS system files such as config.sys, autoexec.bat, win.ini, sys.ini or the registry files, and customising the appearance of a GUI system interface. There is a wide range of configuration activities that can be undertaken and candidates need to learn to undertake many of these simple configuration tasks. Sensible installation of software needs to include setting up suitable folder or directory structures.

Within applications software, candidates need to customise the software to meet a user need. Typical requirements are the layout of toolbars and buttons, the operation of multiple key depressions, the operation of macros, the use of standard templates to assist the user to achieve the formats they need, selecting the correct printer or printer driver, or ensuring the default path is suited to user needs.

Candidates need to match the characteristics of the different components to the requirements of the user. They might, for example, select a 21-inch ‘high-resolution’ monitor, a high-speed processor and a colour plotter for a user who will use the system to produce detailed manufacturing drawings.

Consideration of drivers for printers and other hardware might concentrate most on why such drivers are needed and how they may need to be configured rather than how they work.

This unit requires the provision of a computer that can be configured. Using a stand-alone computer will provide good opportunities for candidates to gain experience in installing and configuring software.

4.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 4.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO3**	**1**	Candidates use information provided to identify only the main tasks the user wants the system to perform, such as producing letters and other documents, producing multimedia presentations or editing video clips;
		2	candidates define user requirements clearly by stating the specific tasks the user wants the system to perform, including the types of input and output required, e.g. candidates might identify that the user wants to input names and addresses of customers to produce a personalised standard letter;
		3	candidates define user requirements clearly by describing in detail the specific tasks the user wants the system to perform, including the types of input and output required – all the input and output devices needed are identified.
b	**AO3**	**1**	Candidates gaining maximum marks include details of hardware, such as type, size and speed, as appropriate, of both operating system and applications software, such as type, title and version; and how the system needs to be configured to meet the user requirements, such as the software icons required on the desktop, the directory (folder) structure and settings and the macros, templates, toolbar layouts and menus required – as a minimum, candidates identify all the hardware, software and configuration requirements but their specification lacks detail;
		2	candidates recognise the interdependence of hardware and software components when specifying systems and approach the specification systematically by considering the specific user requirements and the software or hardware essential to meet these as a starting point;
		3	candidates have included detail of the macros, templates, toolbar layouts and menus required; at this level, they have considered the efficiency and effectiveness of the user and produce clear designs that would demonstrably improve these aspects.
c	**AO1**	**1**	Candidates select and install software to meet specific requirements; they configure the software, e.g. by setting preferences; they configure the operating system by, for example, setting password properties, setting up directory (folder structures), configuring printer, mouse and keyboard, and configuring GUI desktop and display setup including application software icons; candidates also implement security procedures such as setting and using passwords;

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO1	2	additionally, candidates create test procedures to check each task undertaken that include details of the test to be carried out and the expected result; they carry out the tests and compare the actual result obtained with that expected; where problems are found, candidates keep records of the steps they take to resolve these problems;
		3	candidates test the facilities created to ensure they work as expected; candidates further carry out configuration activities that require them to set ROM-BIOS parameters and schedule tasks such as virus checking.
d	AO1	1	Candidates set up and install a toolbar layout, menu, template and macro to meet specific user requirements – these may be examples provided by the software that have been modified by candidates;
		2	candidates set up and install a toolbar layout, menu, template and macro to meet specific user requirements; candidates create test procedures to check each task undertaken that include details of the test to be carried out and the expected result; they carry out the tests and compare the actual result obtained with that expected; where problems are found, candidates keep records of the steps they take to resolve these problems;
		3	additionally, at this level, candidates use their own designs to create and install toolbar layouts, menus, templates and macros that demonstrably improve the efficiency of the user, e.g. by creating a template that includes macros to input specific data.
e	AO2	1	Candidates provide limited recommendations for safety and security – these may include the use of passwords to prevent theft and protect confidential information and the importance of virus checking; consideration of ergonomics is limited to furniture and work station layout;
		2	candidates include the ergonomics of hardware and software in their recommendations; they also consider management issues such as maintaining data and software back-up;
		3	candidates provide detailed recommendations for all the safety and security issues identified in Sub-section 4.2.4.
f	AO2	1	Candidates provide brief notes that identify at least **two** of the basic concepts of software development;
		2	candidates provide brief notes that identify at least **three** of the basic concepts of software development;
		3	candidates explain at least **three** of the basic concepts of software development with reference to specific examples.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
g	AO4	1	Candidates make brief comments on the quality of their specification and how effective each method used was for installation, configuration and testing, and suggest simple improvements to some of them;
		2	candidates' evaluations consider both good and not so good features of each method used for installation, configuration and testing – they provide sensible suggestions as to how each method could be improved;
		3	candidates show evidence of evaluation through the refinement of their work as it progresses; candidates identify the strengths and weaknesses in their initial specification and practical activities and explain how these were refined to meet the users' needs more closely; final evaluations include consideration of how a more efficient approach might be adopted for similar tasks in future.

4.4.3 Resources

Organisations	Health and Safety Executive			
Publications	Computer magazines such as *What PC* that include articles on hardware and software components.			
Textbooks	British Computer Society	*A Glossary of Computing Terms* Tenth Edition	Pearson Education Ltd.	020 177 629 4
	Gookin D & Rathbone A	*PCs for Dummies* Ninth Edition	John Wiley & Sons Inc	076 454 074 2
	Lawson J (ed)	*Vocational A-Level Information and Communication Technology*	Pearson Education Ltd.	058 235 709 8
	Meyers M	*Michael Meyers' A+ Certification Lab Manual:* Student Edition	Osborne McGraw-Hill	007 213 348 1
	Rathbone A	*Windows XP for Dummies* Second Edition	John Wiley & Sons	076 454 074 2
	Richards RP & Heathcote PM	*AVCE Units 4-6*	Payne-Gallway	190 311 248 6
Websites	http://www.hse.gov.uk/pubns/index.htm http://www.pcindex.co.uk/			

5 Unit 5: Problem Solving Using ICT
[AS level, double award, optional, internally assessed]

5.1 ABOUT THIS UNIT

This AS level unit is an optional part of the double award only and is internally assessed

In this unit you need to understand the difference between *data, information* and *knowledge*.

The data and information which are used by an organisation can come from a variety of sources. Some of these will be external to the organisation and others will be internal. In today's world, much of the information used by an organisation may come from the Internet. In order to solve the problems of an organisation through the use of ICT, you need to identify where the information used by the organisation comes from and how it is used within the organisation.

You need to:

- define the term *data*, clearly identifying that data itself has no meaning;
- describe what is meant by the term *information*;
- describe what is meant by the term *knowledge*;
- understand the importance of information and data within an organisation and how the use of information and data will affect the solution to a problem;
- investigate and understand the differing types of software which may be used to solve problems within an organisation;
- understand how a solution to a problem may have an impact on other parts of the organisation;
- appreciate the need for planning, decision making and control when solving problems in organisations.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce, for a familiar context:

- the identification and explanation of the problem to be solved with the benefits of the solution to the organisation;
- a proposed solution to the problem;
- a description of the information which will be used by the proposed solution to include the levels at which the information will be used;
- an identification, providing examples, of the differing types of software which are used in an organisation and the levels at which they are used;
- an identification and explanation of the quality procedures which need to be used to include the aims, goals and objectives of the proposed solution;
- an identification and explanation, to include diagrams, of the system boundaries and environments which will be affected by the proposed solution;
- an evaluation of the proposed solution and your performance in solving the problem.

5.2 WHAT YOU NEED TO LEARN

You need to learn about:

- information;
- software;
- quality procedures;
- systems;
- evaluating the solution.

5.2.1 Information

Information has a range of definitions which you need to know about. These include:

- the meaning of information extracted by people;
- semantic and syntactic aspects of information;
- different methods of representing information to convey meaning, e.g. symbols.

Different information used within an organisation will be used at different levels within the organisation. There are **three** main levels found within any organisation. These are:

- operational information;
- tactical information;
- strategic information.

Operational Information lies at the bottom of the information-gathering process. Typical information used at this level will be the number of units sold of any item in a shop or the overtime hours worked by staff in a given department.

Tactical Information is used in the day-to-day running of an organisation and the decisions which have to be made by middle management. These decisions will be based upon information which comes up through an organisation, as well as information which comes into the organisation from outside sources.

Strategic Information is used by top-level management in making decisions which will affect the whole organisation and its future. These decisions tend to be long-term and involve high levels of expenditure. The decisions may include issues like investment, foreign trade and expansion of the organisation. Strategic information is very closely linked with strategic planning.

Information can also be classified in relation to the time-frame in which it will be used. Information may be categorised into historical, current or future usage. When solving problems, it is important that past information is considered as well as how the information is currently used. If a problem is to be solved with a long-term success, then the way in which information is to be used in the future also needs to be considered to ensure that the solution to the problem is to be long-term.

The quality of information may also be affected by many factors. You need to learn about the following factors and how they affect the quality of information:

- accuracy;
- relevance;
- age;
- completeness;
- presentation;
- level of detail.

There are many other characteristics of information which you need to know about when developing a solution to a problem. Different organisations will use information in different ways.

You need to identify the different characteristics of information and how you will use the different characteristics of information to solve the problem. You have already seen that information can be used at different levels within an organisation and how the time-frame of the information is important. The other characteristics you need to identify are:

- source:
  – internal;
  – external;
  – secondary;
  – primary;
- nature:
  – qualitative;
  – quantitative;
  – formal;
  – informal;

- frequency:
  – real-time;
  – scheduled;
  – ad-hoc;
- use:
  – planning;
  – control;
  – decision;
- form:
  – written;
  – visual;
  – formal;
- type:
  – disaggregated;
  – aggregated;
  – sampled.

5.2.2 Software

You need to know about the different types of software that an organisation could use, including:

- general-office software;
- MIS (management-information system);
- expert systems;
- KBS (knowledge-based system);
- profiling systems;
- EIS (executive-information system);
- DSS (decision-support system).

Each level of information will be processed using differing types of software. Before any problem within an organisation is solved, it is important that the level at which the information is to be used, and the software which is used at that level, is determined.

At *operational* level, the software which is most likely to be used will be standard office software such as word-processing, databases and spreadsheets. At *tactical* level, the software most likely to be used will be management-information systems (MIS), expert systems, knowledge-based systems (KBS) and profiling systems. At *strategic* level, software used will include decision-support systems (DSS) and executive-information systems (EIS).

You need to identify and explain the purpose of the type of software which needs to be used to solve any problem based on the level at which the problem occurs. You also need to know that the raw data for processing is the information produced by the lower level.

5.2.3 Quality Procedures

When developing a solution to a problem, it is very important that the aims, goals and objectives of the problem and solution are detailed. If the aims, goals and objectives are defined at the beginning of the problem-solving process, then they can be referred back to at any point during the process. By doing this, it is possible to ensure that the solution stays 'on track' and, at completion, solves the organisation's problem. When the aims, goals and objectives are being developed, it is an opportunity for the organisation to be consulted to ensure that the problem has been defined correctly and that the proposed solution is acceptable.

There are many tools which can be used during problem-solving to ensure that the quality of the solution is acceptable. Total quality management (TQM) is the most popular tool used. You need to investigate TQM and explain how it can be used during the problem-solving process, paying particular attention to the aims, goals and objectives.

5.2.4 Systems

A problem within an organisation may only affect **one** system or sub-system within the organisation. You need to identify and establish the boundaries of the system in order to solve fully the organisation's problem. It is sometimes difficult to identify clearly the boundaries between systems within the organisation, especially when the same information is used by more than **one** system or sub-system. If the organisation has a very closely integrated system then it may be very difficult to identify clearly where the solution to the problem will have the most impact. However, a clearly-defined boundary will help to determine the functional area in which the solution will fully solve the problem. Diagrams may be used to demonstrate the system boundaries and to show interaction with other systems within the organisation.

There are many systems' environments which need to be taken into account when solving a problem. You need to investigate the environments and properties to enable the appropriate selection when developing a solution.

You need to understand:

- systems;
- subsystems.

You need to:

- draw system-boundary diagrams;
- identify the environment affected by the system.

5.2.5 Evaluation of the Solution

It is very important that the effectiveness of a solution is clearly analysed once it has been developed. The solution needs to fully solve the organisation's problem and satisfy all the information requirements of the system or subsystem within the organisation. At this point the aims, goals and objectives which were developed at the beginning of the problem-solving process need to be referred to so as to ensure these are fully met.

5.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 5: Problem solving using ICT

What you need to do:

You need to produce, for a familiar context:

a [AO2] the identification and explanation of the problem to be solved with the benefits of the solution to the organisation [**3**];
b [AO3] a proposed solution to the problem [**8**];
c [AO3] a description of the information which will be used by the proposed solution to include the levels at which the information will be used [**7**];
d [AO1] an identification, providing examples, of the differing types of software which are used in an organisation and the levels at which they are used [**6**];
e [AO2] an identification and explanation of the quality procedures which need to be used to include the aims, goals and objectives of the proposed solution [**5**];
f [AO1/2] an identification and explanation, to include diagrams, of the system boundaries and environments which will be affected by the proposed solution [**14**];
g [AO4] an evaluation of the proposed solution and your performance in solving the problem [**7**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You identify the problem to be solved; **[0 1]**	you give a simple explanation of the problem with some of the benefits to the organisation explained; **[2]**	you give a detailed explanation with the benefits of the solution to the organisation fully explained. **[3]**	**/3**
b	**AO3**	You produce a simple solution which does not fully solve the problem; **[0 1 2]**	you produce a limited solution to the problem which is appropriate to the organisation; **[3 4 5]**	you produce a detailed solution which fully solves the problem and is appropriate to the organisation. **[6 7 8]**	**/8**
c	**AO3**	You give an incomplete description of the information which is used by the proposed solution; **[0 1 2]**	you give a simple description of the information which is used by the proposed solution, including identification of the levels at which the information is used; **[3 4]**	you give a detailed description of the information which is used by the proposed solution, including a detailed explanation of the use of the information at each level. **[5 6 7]**	**/7**
d	**AO1**	You identify the differing types of software which are used at the different levels within an organisation; **[0 1 2]**	you identify, giving a limited range of examples, the differing types of software which are used at the different levels within an organisation; **[3 4]**	you identify, giving a wide range of examples, the differing types of software which are used at the different levels within an organisation. **[5 6]**	**/6**
e	**AO2**	You identify the quality procedures which could be used when developing the proposed solution; **[0 1]**	you give a simple explanation of the quality procedures which could be used when developing the proposed solution; **[2 3]**	you give a detailed explanation of the quality procedures which could be used when developing the proposed solution. **[4 5]**	**/5**
f	**AO1**	You produce incomplete system boundary diagrams; **[0 1 2 3]**	you produce complete system diagrams showing either the inputs or outputs of the system; **[4 5 6]**	you produce detailed system diagrams showing the inputs and outputs of the system. **[7 8 9]**	**/14**
	AO2	You identify the system boundaries and environment which are affected by the proposed solution; **[0 1]**	you give a simple explanation of the system boundaries and environment which are affected by the proposed solution; **[2 3]**	you give a detailed explanation of the system boundaries and environment which are affected by the proposed solution. **[4 5]**	
g	**AO4**	You produce a simple evaluation of the proposed solution, including a comment on your actions and role in proposing a solution; **[0 1 2]**	you produce an evaluation of the proposed solution discussing the aims, objectives or goals, including comments on your own actions and roles in proposing a solution; **[3 4 5]**	you produce a detailed evaluation of the proposed solution discussing the aims, objectives and goals, including reflection of your experiences to improve your own performance, suggesting how you might approach a similar task in the future. **[6 7]**	**/7**
				Total mark awarded:	**/50**

5.4 GUIDANCE FOR TEACHERS

5.4.1 Guidance on Delivery

This unit looks in more detail at the type of information and systems used within organisations.

Candidates need to be taught the importance of information and data within an organisation and how the use of information and data will affect the solution to a problem. This could be done through real-life examples looking at documentation and methods of communication within a number of large organisations. Candidates need to look at the flow of information up through the hierarchy of an organisation. They need to see how the information is used.

In this unit, candidates need to be made familiar with the different types of computer systems and software that can be used by organisations. Again, the use of real life examples needs to be used to make the theory more meaningful. Candidates need to know how the impact of changes within **one** section of an organisation can affect other departments.

An appreciation of the need for planning, decision-making and control when solving problems in organisations needs to be made. Candidates need to realise that solutions to problems don't just happen and that there is a lot of work involved to ensure that a solution can be implemented.

5.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 5.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates provide a simple identification of the problem to be solved;
		2	candidates provide a simple explanation of the problem to be solved; they are able to identify and explain some of the benefits of a solution to the organisation;
		3	candidates provide a detailed explanation of the problem to be solved; they are able to identify and explain all the benefits that this solution will bring to the organisation.
b	**AO3**	**1**	Candidates provide a simple solution which does not fully solve the defined problem;
		2	candidates provide a limited solution to the defined problem; the solution does solve the defined problem and is appropriate for the organisation;
		3	candidates provide a detailed solution to the defined problem which fully solves the problem and is appropriate for the organisation.
c	**AO3**	**1**	Candidates provide an incomplete description of the information which will be used by the proposed solution; there is no consideration of the inputs/outputs of the system and no identification of the levels, within the organisation, at which the information will be used;
		2	candidates provide simple description of the information which will be used by the proposed solution; there is limited consideration of the inputs/outputs of the system and some identification of the levels, within the organisation, at which the information will be used;
		3	candidates provide detailed description of the information which will be used by the proposed solution; there is full consideration of the inputs/outputs of the system and a detailed explanation of the levels, within the organisation, at which the information will be used.
d	**AO1**	**1**	Candidates provide an identification of the differing types of software which are used at different levels within an organisation;
		2	candidates provide an identification of the differing types of software which are used at different levels within an organisation; a limited range of examples of the different types of software identified is provided;
		3	candidates provide an identification of the differing types of software which are used at different levels within an organisation; a wide range of examples of the different types of software identified is provided.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
e	AO2	1	Candidates provide an identification of the quality procedures which could be used when developing the proposed solution;
		2	candidates provide a simple explanation of the quality procedures which could be used when developing the proposed solution; candidates will provide either the advantages or the disadvantages of each quality procedure;
		3	candidates provide a detailed explanation of the quality procedures which could be used when developing the proposed solution; candidates will provide the advantages and disadvantages of each quality procedure.
f	AO1	1	Candidates provide incomplete system boundary diagrams which do not conform to any industry standard conventions;
		2	candidates provide system boundary diagrams showing either the inputs or outputs from, and the interaction with, any existing systems within the organisation; the system boundary diagram follows industry standards and conventions;
		3	candidates provide detailed boundary diagrams showing both the inputs and outputs from and the interaction with any existing systems within the organisation; the system boundary diagram follows industry standards and conventions.
	AO2	1	Candidates provide an identification of the system boundaries and environment which will be affected by the proposed solution; there is no consideration of how the proposed solution will affect other systems within the organisation;
		2	candidates provide a simple explanation of the system boundaries and environment which will be affected by the proposed solution; there is some consideration of how the proposed solution will affect the other systems within the organisation; there is some attempt to solve any conflict which the candidate may have identified between the proposed solution and other existing systems within the organisation;
		3	candidates provide a detailed explanation of the system boundaries and environment which will be affected by the proposed solution; there is detailed consideration of how the proposed solution will affect the other systems within the organisation; there are proposals to solve any conflict which the candidate may have identified between the proposed solution and other existing systems within the organisation.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
g	AO4	1	Candidates provide an incomplete evaluation leading to a simple conclusion for the proposed solution; the impact of the new system is not fully discussed;
		2	candidates provide an evaluation leading to a conclusion; the benefits or disadvantages of the new system are considered; the impact of the new system is not fully discussed;
		3	candidates provide a detailed evaluation leading to a justified conclusion; the benefits and disadvantages of the new system are fully discussed; the impact of the proposed solution is fully discussed.

5.4.3 Resources

Textbooks	Dayton D	*Computer Solutions for Business*	Microsoft Publishing International
	Hollander A (ed)	*Accounting, IT & Business Solutions*	Irwin
	Ray R	*Technical Solutions for Growing Businesses*	Amacon
Websites	http://www.bcs.org.uk – The home page for the British Computer Society http://www.computer.org – The home page for the IEEE Computer Society		

6 Unit 6: Software Development – Design
[AS level, double award, optional, internally assessed]

6.1 ABOUT THIS UNIT

This AS level unit is an optional part of the double award only and is internally assessed.

This unit helps you to:

- understand and apply strategies to investigate computer solutions;
- analyse a system prior to designing a solution;
- design a solution.

Before a computer solution can be designed, it is important to understand why, how and where the solution will be used and by whom. In order for a computerised solution to fully meet the needs of the end-user, it is important to follow a plan and to investigate the current system fully.

The main strategy used when investigating, analysing and designing computer solutions is systems analysis. It is important to understand the system life-cycle which is followed when developing a complete solution to a problem.

The system life-cycle has various stages which need to be completed in order. The stages which make up the system's life-cycle are:

- feasibility;
- investigation;
- analysis;
- design;
- implementation;
- maintenance.

This unit will help you to have an understanding of the tools and techniques which are used in the first **four** stages, to understand why they are used and the benefits of each one.

This unit has links with Unit 15: *Software development.* In order to make a judgement or a solution, candidates should have completed Unit 3: *ICT solutions for individuals and society* and Unit 4: *System specification and configuration*.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a design for a solution to a given problem, in a familiar context, which includes:

- the identification and explanation of the tools and techniques used in the analysis stage;
- the identification and explanation of the tools and techniques used in the design stage;
- the investigation methods used when designing solutions;
- a report documenting feasibility and design;
- data-flow modelling and associated documentation;
- entity-relationship diagrams and associated documentation;
- a conclusion and evaluation of the proposed solution and your performance in solving the problem.

6.2 WHAT YOU NEED TO LEARN

You need to learn about:

- feasibility studies;
- the investigation stage;
- structured analysis;
- design of forms and layouts;
- producing a conclusion.

6.2.1 Feasibility Studies

The initial stages of investigation, analysis and design are very important, as it is at these stages that the needs and requirements of the end-user are identified. If the requirements and needs of the end-user are not identified correctly, then a solution may be designed which does not fulfill their needs and requirements. If this is the case then the solution may not be used.

Before a system can be analysed and designed, a feasibility stage needs to be undertaken. The feasibility stage determines if the required solution is possible. The main questions which need to be answered at this stage are:

- Will the solution fulfill all the needs and requirements of the end-users?
- Will the solution have a positive impact on the end-users?
- Can the solution be designed and implemented within the time-scale allocated and within the budget?

If the system life-cycle is to progress to the next stage then all the answers to these questions need to be ‘yes’.

6.2.2 Investigation Stage

The investigation stage is very important as this is where all the initial information required to design the solution is gathered. The investigation needs to be collected and recorded and the information also needs to be saved as you may need to refer to it at a later stage.

There are various techniques which can be used when investigating the requirements of a solution. These techniques include:

- interviews;
- questionnaires;
- meetings;
- observations;
- document analysis.

You need to research these techniques and identify when it would be appropriate to use each one. There are benefits and disadvantages to each method used for investigation and you need to explain these.

6.2.3 Structured Analysis

The next stage is to analyse the current system and to suggest a number of options for the solution. There are a number of tools and techniques which could be used when analysing a system. These include data-flow modelling and ERDs (entity-relationship diagrams).

Data-flow modelling includes techniques and tools such as:

- simple data-flow diagrams (DFDs);
- informal diagrams such as 'rich picture'.

You need to develop **two** levels of DFDs for the system for which you are designing a solution.

A Level 0 DFD (context diagram) shows the general overview of the system and its relationship with external entities which are outside the system boundary. The context diagram will show the flows of data between the system for which you are designing a solution and the external entities with which it needs to interact.

A Level 1 DFD then shows an overview of what is happening within the system for which you are designing a solution. This includes:

- the type of information being passed within the system;
- the documents used;
- how the information is stored;
- the processes which occur within the system.

Standard symbols are used for data-flow diagrams. There are many different sets of symbols which can be used and you need to research, identify and select a set of symbols to use. Once you have selected the set of symbols which you are going to use then they need to be used *consistently*.

You also need to develop the documentation which accompanies the diagrams. Documentation which could be used in data-flow modelling includes:

- external-entity descriptions;
- input/output descriptions.

This documentation is used to clarify the diagrams you have produced and to stop any confusion occurring. Each process you have used in your Level 1 DFD needs to have an associated process description to identify the activities or operations which take place within that process.

Input/output descriptions provide textual descriptions of the data flows which connect the internal processes and entities to the external entities of the system.

You need to learn about, and create, entity-relationship diagrams (ERDs). You need to understand and identify different types of relationships, including:

- one-to-one;
- many-to-one;
- one-to-many;
- many-to-many.

ERDs provide a detailed graphical representation of the information used within the system and identify the relationships that exist between data items. As with data-flow modelling, there is a set of tools and techniques which you need to use.

You also need to develop the documentation which accompanies the diagrams. Documentation includes:

- entity descriptions;
- attribute lists.

Every entity which you have used needs to have an entity description which details the:

- name of the entity and a description;
- the entity attributes;
- the relationships and links.

You also need to learn about, and develop for your solution:

- decision tables;
- flowcharts;
- structured English/pseudo-code.

Decision tables provide a very simple way of showing actions which take place under certain rules. The advantage of a decision table is that all combinations of the rules have to be considered and it is easy to see if all the rules have been identified. There is a standard layout for decision tables which means that all the information included in the table can be understood by the end-users.

Flowcharts are a method of representing the processes of a system in a pictorial form using different shaped boxes to represent different types of actions. Flowcharts help break down a complex process into small steps and are easy to understand. However, flowcharts do not convert into program code very easily and can, in some cases, become very complex, making them hard to follow. Flowcharts are, therefore, best used to give an overview of the functions of a process with decision tables or structured English used to describe the detail.

Structured English is the mid-step between program code and normal English. It is used to describe the steps in a process without being concerned about the programming syntax. Structured English is also known as pseudo-code. When using structured English to define a process you need to use constructs such as:

- IF…THEN…ELSE;
- WHILE…DO;
- SELECT CASE…END CASE;
- REPEAT…UNTIL.

6.2.4 Design of Forms and Layouts

The next stage is to design:

- the data-input forms;
- screen layouts;
- screen-report layouts;
- printed-report layouts.

For each screen or printed report required for the new system, it is necessary to produce the following information:

- type:
  – screen display;
  – printing;
  – screen display with an option to print displayed data;
- purpose:
  – for whom;
  – for what it is to be used;
- data required:
  – the attributes to be shown;
  – any calculated data items to be displayed;
  – any processes required, e.g. sorting or grouping of data (and which attributes need to be used for these processes).

6.2.5 Production of a Conclusion

In producing a conclusion, you need to have an understanding of the resources needed for the new system and the impact the new system will have. This needs to include a discussion of:

- alternative solutions available in terms of hardware and software;
- the benefits of developing a new system.

6.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 6: Software development – design

What you need to do:

You need to produce a design for a solution to a given problem, in a familiar context.

Your evidence needs to include:

a [AO2] the identification and explanation of the tools and techniques used in the analysis stage [**4**];
b [AO2] the identification and explanation of the tools and techniques used in the design stage [**4**];
c [AO2] the investigation methods used when designing solutions [**4**];
d [AO1] a report documenting feasibility and design [**15**];
e [AO3] data-flow modelling and associated documentation [**8**];
f [AO3] entity-relationship diagrams and associated documentation [**8**];
g [AO4] a conclusion and evaluation of the proposed solution and your performance in solving the problem [**7**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You identify the tools and techniques which are used during the analysis stage; **[0 1 2]**	you give a simple explanation of the tools and techniques which are used during the analysis stage; **[3]**	you give a detailed explanation of the tools and techniques which are used during the analysis stage. **[4]**	**/4**
b	**AO2**	You identify the tools and techniques which are used during the design stage; **[0 1 2]**	you give a simple explanation of the tools and techniques which are used during the design stage; **[3]**	you give a detailed explanation of the tools and techniques which are used during the design stage. **[4]**	**/4**
c	**AO2**	You identify investigation methods; **[0 1 2]**	you give a simple explanation of investigation methods; **[3]**	you give a detailed explanation of investigation methods. **[4]**	**/4**
d	**AO1**	You produce a simple report showing a single solution to the given problem; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3 4 5]**	you produce a detailed report showing alternate solutions to the given problem; your report contains few spelling, punctuation and grammar errors; **[6 7 8 9 10]**	you produce a detailed report showing alternate solutions to the given problem, justifying the chosen solution; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors. **[11 12 13 14 15]**	**/15**
e	**AO3**	You produce an incomplete data-flow model for the current solution with incomplete documentation; **[0 1 2]**	you produce a data-flow model of the current solution using simple graphical representation with complete documentation; **[3 4 5]**	you produce a complete data-flow model of the current solution, making effective use of formal graphical representation with complete and detailed documentation. **[6 7 8]**	**/8**
f	**AO3**	You produce an incomplete ERD for the proposed solution with incomplete documentation; **[0 1 2]**	you produce a simple ERD of the solution, with complete documentation; **[3 4 5]**	you produce a complete ERD of the solution, with complete and detailed documentation; **[6 7 8]**	**/8**
g	**AO4**	You produce a simple evaluation of the system; you comment on your actions and role in solving the problem; **[0 1 2]**	you evaluate the solution discussing either benefits or disadvantages of the solution; you include an analysis on your experiences in order to improve your own performance; **[3 4]**	you evaluate the solution discussing both benefits and disadvantages of the solution; you include an analysis on your experiences, suggesting how you might approach a similar task in the future. **[5 6 7]**	**/7**
				Total mark awarded:	**/50**

6.4 GUIDANCE FOR TEACHERS

6.4.1 Guidance on Delivery

This unit has links with Unit 15: *Software development*, but to ensure that each unit is meaningful in its own right there is a small overlap in content. The overlap is appropriate because the approach in each case is different. This unit introduces analysis methods that are used to investigate existing or potentially-new systems.

Candidates need to learn about the system's life-cycle and need to understand each stage and how it impacts on the next stage. They need to identify the tools and techniques that are used in the first **three** stages in particular. Each of these stages needs to be identified and the techniques and methods used at each point need to be covered. Candidates need to learn a variety of techniques so that they are able to select the appropriate ones to use for their coursework.

You need to cover analysis tools and methods such as:

- formal data-flow diagrams (DFDs) at **two** levels;
- informal diagrams such as 'rich picture';
- entity-relationship diagrams (ERDs);
- decision tables;
- flowcharts;
- structured English/pseudo-code.

Design of the system also needs to be covered. The importance of layout, both on screen and printed reports needs to be stressed as well as the ease of data input.

6.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 6.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the *grid* comprises a *strand* in the banner, which may be a task or sub-task, showing the development of an assessment objective.

The maximum mark for each strand is shown in the far right-hand column of the *grid* and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates provide an identification of the tools and techniques which could be used during the analysis stage; the tools and techniques identified will be limited;
		2	candidates identify and provide a simple explanation of the tools and techniques which could be used during the analysis stage; there is a range of tools and techniques identified and explained; candidates provide either the advantages or limitations of each tool and technique identified;
		3	candidates identify and provide a detailed explanation of the tools and techniques which could be used during the analysis stage; there is a wide range of tools and techniques explained; candidates provide the advantages and limitations of each tool and technique identified with appropriate situations of use.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b	AO2	1	Candidates provide an identification of the tools and techniques which could be used during the design stage; the tools and techniques identified will be limited;
		2	candidates identify and provide a simple explanation of the tools and techniques which could be used during the design stage; there is a range of tools and techniques identified and explained; candidates provide either the advantages or limitations of each tool and technique identified;
		3	candidates identify and provide a detailed explanation of the tools and techniques which could be used during the design stage; there is a wide range of tools and techniques explained; candidates provide the advantages and limitations of each tool and technique identified, with appropriate situations of use.
c	AO2	1	Candidates identify investigation methods which could be used; the range of investigation methods identified will be limited;
		2	candidates identify and provide a simple explanation of the investigation methods which could be used; candidates provide either the advantages or limitations of each investigation method they have identified;
		3	candidates identify and provide a simple explanation of the investigation methods which could be used; candidates provide the advantages and limitations of each investigation method they have identified, with appropriate situations of use.
d	AO1	1	Candidates provide a simple report including the feasibility of the proposed system, a proposed solution to the given problem and simple or incomplete design of input/output requirements; candidates only provide **one** proposed solution with no alternate solutions indicated; the proposed solution is incomplete or does not meet the needs of the end-user;
		2	candidates provide a detailed report including the feasibility of the proposed system, solutions to the given problem and design of data input/output requirements; candidates provide alternate solutions to the problem; proposed solutions and designs meet the needs of the end-user;
		3	candidates provide a detailed report including the feasibility of the proposed system, solutions to the given problem and design of data input/output requirements and calculations needed; candidates provide alternate solutions to the problem; candidates provide a preferred solution for the end-user and are able to justify the choice; the proposed solutions and designs meet the needs of the end-user.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
e	AO3	1	Candidates produce an incomplete data flow model with incomplete documentation;
		2	candidates produce a data flow model using a simple graphical representation method; the documentation is complete, appropriate and relates to the data flow model;
		3	candidates produce a full and complete data flow model using a formal modelling technique; the detailed documentation is complete, to an appropriate level of detail, and relates to the data flow model produced.
f	AO3	1	Candidates produce an incomplete ERD with incomplete documentation;
		2	candidates produce an ERD with complete documentation that is, appropriate and relates to the ERD;
		3	candidates produce a full and complete ERD with detailed documentation that is complete, to an appropriate level of detail, and relates to the ERD produced.
g	AO4	1	Candidates provide a simple conclusion for the proposed solution; candidates make brief comments on how they tackled and solved the problem and suggest simple improvements;
		2	candidates provide an evaluation leading to a conclusion; the benefits or disadvantages of the new system are considered; an alternative solution is identified; candidates' evaluations consider both good and not so good features of the way they tackled and solved the problem; candidates provide sensible suggestions as to how each method could be improved;
		3	candidates provide an evaluation leading to a justified conclusion; the benefits and disadvantages of the new system are fully discussed; alternative solutions are identified; candidates show evidence of evaluation through the refinement of their work as it progresses; candidates identify the strengths and weaknesses in their strategies to solve the problem and explain how these were refined to meet the purpose more closely; final evaluations include consideration of how a more efficient approach might be adopted for a similar task in future.

6.4.3 Resources

Textbooks	Avison DE & Shah H	*The Information Systems Development Life-Cycle: A first course in information systems*	McGraw-Hill 1997
	Curtis G & Cobnam D	*Business Information Systems – Analysis, Design and Practice* (4th Edition)	Prentice Hall 2002
	Deeks D & Lejk M	*Introduction to Systems Analysis Techniques*	Prentice Hall
	Kendall JE & Kendall KE	*Systems Analysis and Design*	Irwin
	Pressman RS	*Software Engineering: A practitioners approach (European adaptation)*	McGraw-Hill
	Robertson J & Robertson S	*Complete Systems Analysis: The work book, the text book and the answers*	Dorset House
	Shelly GB, Cashman TJ & Rosenblatt HJ	*Systems Analysis and Design*	Course Technolgy
	Skidmore S	*Introducing Systems Analysis*	Macmillan
	Sommerville I	*Software Engineering* (6th Edition)	Addison Wesley 2001
	Whitten & Bentley	*Systems Analysis and Design Methods*	McGraw-Hill
Websites	http://www.bcs.org.uk – The home page for the British Computer Society http://www.computer.org – The home page for the IEEE Computer Society		

7 Unit 7: Communicating using Computers
[AS level, double award, optional, internally assessed]

7.1 ABOUT THIS UNIT

This AS level unit is an optional part of the double award only and is internally assessed.

The use of the Internet and intranets has expanded rapidly over the last few years. Recently, there has been an increase in the need for people with the skills for setting up and managing websites. This unit will help you to develop these valuable skills.

This unit will help you to:

- develop an understanding of how Internets and intranets are used by organisations;
- know how the Internet is organised and about standards and protocols;
- explain the different bandwidths that exist and different connection methods and equipment required;
- understand the different services that can be provided by the Internet and intranets;
- understand the software and hardware requirements for a web server that can support a website;
- know about a range of Internet tools and understand the purpose of the tools and select the appropriate tool for a specific task;
- know and understand the different costs involved in connecting to and accessing the Internet;
- understand the technical terms relating to the Internet and communication services and know about data compression and communication logs;
- set up and configure an e-mail system for a single computer;
- understand the principles of working safely and record keeping of faults found and repaired.

This unit has links with Unit 16: *Networking solutions*.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce:

- a report on an organisation detailing how they make use of the intranet and Internet;
- a report on an existing website;
- a report on setting up a planned website,
- a web page and host it online;
- evidence of configuring a single computer for Internet and e-mail access.

7.2 WHAT YOU NEED TO LEARN

You need to learn about:

- acronyms and technical terms used in communicating using computers;
- the Internet and intranets;
- the Internet and communications systems;
- web server requirements;
- Internet tools;
- Internet websites;
- setting up a computer system for use on the Internet.

7.2.1 Acronyms and Technical Terms used in Communicating using Computers

You need to understand the meaning of acronyms and technical terms used in communicating using computers, including:

- Internet access provider (IAP);
- Internet service provider (ISP);
- point of presence (POP);
- World Wide Web (WWW);
- universal resource locator (URL);
- domain-naming system (DNS) and registration;
- sub-domain naming;
- URL and e-mail redirection services;
- search engine;
- hypertext mark-up language (HTML);
- dynamic HTML;
- hypertext transport protocol (http);
- file transfer protocol (ftp);
- public domain software and shareware;
- inter-relay chat (IRC);
- personal digital assistant (PDA);
- advanced digital subscriber line (ADSL);
- integrated services digital network (ISDN);
- transfer control protocol/Internet protocol (TCP/IP);
- hard disk drive (HDD);
- random access memory (RAM);
- file transfer protocol (FTP).

7.2.2 The Internet and Intranets

In an organisation, information sources are identified as being either external or internal. You need to understand how the Internet, intranets and extranets are used by organisations by:

- identifying current usage;
- describing the advantages and disadvantages of the current usage;
- describing areas where the use of the Internet and intranet could be improved.

There are many services available through the Internet. You need to learn about a range of services and their purposes, including:

- e-mail;
- WWW;
- IRC, conferencing;
- newsgroups, Newsnet, bulletin boards;
- file transfer;
- Telnet.

You need to know about the organisation of the Internet, including:

- domains and DNS;
- mode of access to the Internet, IAP, ISP, POP and Internet services;
- international standards and protocols.

You need to explain the effects of different bandwidths and baud rates on the time taken to download web pages.

You need to know about different methods of connection to the Internet, including:

- data-connecting equipment (modem) and data-terminating equipment (computer), connectors and cables;
- wireless connections including those from mobile phones and PDAs;
- analogue telephone lines, digital telephone lines, cable and leased lines;
- satellite, ADSL, ISDN.

7.2.3 The Internet and Communications Systems

The Internet offers access to a wide range of information and communications services. You need to access and use the Internet. Use of the Internet allows you to find information using search and retrieval techniques.

You need to understand the costs involved in connecting to the Internet:

- ISP subscriptions;
- domain name registration fees;
- telephone charges.

7.2.4 Web Server Requirements

You need to understand the hardware and software requirements for setting up a website on a server, including:

- the operating system;
- web server software;
- protocols, e.g. TCP/IP;
- Internet naming (DNS) and addressing systems;
- security (firewalls, gateways);
- proxy servers;
- network card;
- router;
- components of a server:
  – number, type and speed of processor;
  – number, type and capacity of HDD;
  – number and type of RAM;
  – speed and type of network card.

You also need to identify the costs involved in setting up a website.

7.2.5 Internet Tools

You need to understand the purpose of Internet tools so that you can select appropriate tools to carry out a specific task. The tools you need to use are:

- browser software, bookmarks and search engines for accessing and searching the Internet;
- FTP tools for uploading and downloading files;
- web-editing software for creating and editing web pages.

You need to:

- access and search the Internet to view existing websites to obtain ideas on layout;
- download graphics and information;
- set TCP/IP address, domain name, address of the start-up home page and e-mail address for own use;
- identify the technical requirements for a website;
- create and test a website;
- access your own website.

7.2.6 Internet Websites

You need to understand the different technologies used to create a website and the reasons for the use of those technologies, such as:

- PHP (Hyper-Text Pre-Processor);
- ASP (Active Server Pages);
- CGI (Common Gateway Interface);
- Java;
- DHTML (Dynamic HTML).

You need to analyse a website, determine its purpose and produce a diagrammatic structure of the website.

You need to identify and explain basic script commands.

7.2.7 Setting up a Computer System for Use on the Internet

You need to:

- install and configure modem or network connection;
- install required software – browser, ftp, e-mail, virus checker, compression software.

E-mail is an important method of communication. You need to use both a LAN and the Internet to:

- send, receive and reply to e-mail messages;
- send and receive attachments;
- maintain an e-mail address book;
- file e-mail appropriately;
- virus check e-mail and attachments as necessary.

The web browser allows the user to view pages. You need to:

- add pages to favourites/bookmarks;
- configure the home page;
- alter settings such as display and security.

7.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 7: Communicating using computers

What you need to do:

Your evidence needs to include:

a [AO2] a report on an organisation detailing how they make use of the intranet and Internet [**6**];
b [AO2/3] a report on an existing website [**12**];
c [AO3] a report on setting up a planned website [**9**];
d [AO1/4] a web page and host it online [**11**]**;**
e [AO1] evidence of configuring a single computer for Internet and e-mail access [**12**].

How you will be assessed

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You identify how the Internet and intranet are currently used and how they help the organisation meet its objectives; you make little or no attempt to describe any improvements the organisation could make to how it uses the Internet and intranet; **[0 1 2]**	you describe how the Internet and intranet are currently used, the advantages and disadvantages of the current use, and how they help the organisation meet its objectives; you identify **one** improvement the organisation could make to how it uses the Internet and intranet; **[3 4]**	you describe how the Internet and intranet are currently used, the advantages and disadvantages of the current use, and how they help the organisation meet its objectives; you describe improvements the organisation could make to how it uses the Internet and intranet. **[5 6]**	**/6**
b	**AO2**	You identify the purpose of the nominated website and you describe **two** different services provided by the website; you identify the use of at least **one** Internet technology; **[0 1 2]**	you identify the purpose of the nominated website and you describe a range of different services provided by the website; you identify the use of at least **two** Internet technologies; **[3 4]**	you identify the purpose of the nominated website and you describe a range of different services provided by the website; you identify and explain the use of at least **two** Internet technologies. **[5 6]**	**/12**
	AO3	You produce a diagrammatic structure of the website identifying titles of pages and hyperlinks; you show little or no evidence of understanding of code used in web pages; **[0 1 2]**	you produce a diagrammatic structure of the website identifying titles of pages and hyperlinks; you annotate the code used in at least **three** web pages; **[3 4]**	you produce a diagrammatic structure of the website identifying titles of pages and hyperlinks; you annotate and explain the code used in at least **three** web pages. **[5 6]**	

Unit 7: Communicating using computers (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO3**	You identify some of the costs, connection methods and hardware/software that need to be considered to create and host your planned website; you do not consider ISPs to host your website; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you describe a range of costs, valid connection methods and hardware/software, including bandwidth requirements, that need to be considered to create and host your planned website; you identify a suitable ISP for hosting your website; your report contains few spelling, punctuation and grammar errors; **[4 5 6]**	you describe a range of costs, valid connection methods and hardware/software, including bandwidth requirements, that need to be considered to create and host your planned website; you identify a suitable ISP and give reasons for its suitability for hosting your website in relation to its technical requirements; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors. **[7 8 9]**	**/9**
d	**AO1**	You create **one** web page from your planned website with no identification of Internet technologies used; **[0 1]**	you create **one** web page from your planned website and identify the use of at least **one** Internet technology used; **[2]**	you create **one** web page from your planned website and identify the use of at least **one** Internet technology used; you will host the web page online. **[3]**	**/11**
	AO4	You comment on your actions and role in creating and getting a web page hosted online; **[0 1 2 3]**	you include an analysis on your experiences in order to improve your own performance; **[4 5]**	you include an analysis on your experiences suggesting how you might approach a similar task in the future. **[6 7 8]**	
e	**AO1**	You identify some of the hardware/ software and information required to set up a computer for Internet and e-mail access; you do not install any communication software; you make changes to **two** different browser configuration settings; you show evidence of setting up an appropriate filing structure for e-mails; you identify part of the installation process for the communication software; **[0 1 2 3 4]**	you identify the hardware/software and information required to set up a computer for Internet and e-mail access; you install **one** piece of communication software; you describe and produce evidence of **two** different configuration changes made to a browser; you produce evidence on sending and receiving e-mails and filing received e-mails; you identify the steps that you went through for the installation process for the communication software; **[5 6 7 8]**	you identify a range of hardware/software and information that could be used to set up a computer for Internet and e-mail access; you install **three** pieces of communication software; you describe and produce evidence of **two** different configuration changes made to a browser, and produce evidence on sending and receiving e-mails and filing received e-mails; you produce an installation guide for the communication software identifying all settings required. **[9 10 11 12]**	**/12**
				Total mark awarded:	**/50**

7.4 GUIDANCE FOR TEACHERS

7.4.1 Guidance on Delivery

This unit allows candidates to investigate how communication and network systems are used by organisations. It covers identification of services provided by the Internet and intranets and how organisations make use of those services.

Candidates will be expected to research a website and analyse it to determine the technologies used, purpose and site map. Some pre-investigated sites would be useful to ensure that the site chosen has enough scope within it to allow candidates to achieve full marks.

As far as possible, the theoretical knowledge required needs to be gained from practical experience. This may be acquired by using different types of e-mail systems and investigating websites that use different technologies.

Candidates need practice in designing and specifying websites for specific purposes and in producing diagrams to indicate clearly their layout. They also need to be encouraged to learn, use and understand the technical terms associated with communications and networks.

7.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 7.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates investigate how an organisation makes use of the intranet and Internet;
		2	once candidates have established the current use of the Internet and intranet, they describe the advantages and disadvantages of the use; they describe **one** improvement to the organisation's use of the intranet and Internet;
		3	candidates describe improvements to the organisation to enable it to make better use of the intranet and Internet.
b	**AO2**	**1**	Candidates *analyse* a website which uses **two** different web technologies and has at least **three** pages; candidates report on the *purpose* of the website – who the audience is, what the company expects the website to do, why it is there;
		2	candidates report on the *purpose* of the website – who the audience is, what the company expects the website to do, why it is there; candidates identify the services provided and the technologies used by the website;
		3	candidates describe the services provided and the technologies used by the website – they cannot just identify the technologies, rather they describe how the website is making use of those technologies.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b	AO3	1	Candidates produce a diagrammatic site map of the website, showing links – titles of pages only are required, detailed diagrams of pages are **not** required;
		2	candidates produce a diagrammatic site map of the website, showing links – titles of pages are required, a print-out of the html code is included; candidates provide some annotation of the code that demonstrates they have some understanding of html – annotation of code covers formatting of the page, code to realise the text attributes and page colours for example;
		3	candidates produce a diagrammatic site map of the website, showing links – titles of pages are required, a print out of the html code is included; candidates provide annotation of the code that demonstrates they have understanding of html – annotation of code covers formatting of the page, e.g. code to realise the text attributes, page colours and page layout features (frames, tables, navigation bars etc.).
c	AO3	1	Candidates are looking at setting up a website – they are not actually setting up a site – the site they report on is the one they set up in **Task d**; candidates look at the costs involved, different methods of connection, bandwidth requirements and the hardware and software requirements;
		2	candidates are looking at setting up a website – they are not actually setting up a site – the site they report on is the one they set up in **Task d**; candidates look at the costs involved, different methods of connection, bandwidth requirements and the hardware and software requirements; candidates identify different ISPs and identify **one** that is suitable for their planned website;
		3	candidates are looking at setting up Internet sites – they are not actually setting up a site – the site they report on is the one they set up in **Task d**; candidates look at the costs involved, different methods of connection, bandwidth requirements and the hardware and software requirements; the connection methods are different and valid for the organisation; the bandwidth requirements cannot just be given – there is some analysis showing how they have been reached; the hardware and software requirements are logical and complete; candidates identify different ISPs and identify and explain the reasons for the one that is most suitable for their planned website.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	AO1	1	Candidates create a single web page – they do not need to identify the requirements for their site or the information that would be required to host their site on the Internet;
		2	candidates create a web page that makes use of **one** Internet technology – they identify the Internet technology used;
		3	candidates create a web page that makes use of at least **one** identified Internet technology; candidates actually host the site on the Internet.
	AO4	1	Candidates comment on the steps that they went through to create a web page and host it online;
		2	candidates explain the steps that they went through to create a web page and host it online;
		3	candidates explain the steps that they went through to create a web page and host it online; additionally, they identify from experience how they would improve their technique to solve the problem if they were to repeat the process.
e	AO1	1	Candidates identify and list hardware and software for both Internet and e-mail access; they state what each piece of software is used for; candidates provide an explanation of the changes they made to the browser settings to demonstrate understanding; they are able to send and receive e-mails; e-mails received are filed appropriately; candidates identify some of the process that they carried out to install the communications software; the steps may be just a bulleted list;
		2	additionally, candidates install **one** piece of communication software; candidates provide documentation on the installation so it could be repeated – this forms part of the technical documentation for the system; candidates explain why an e-mail server is required and provide an evaluation against these requirements at the end of the task; candidates identify the process that they carried out to install the communications software;
		3	additionally, candidates install **three** pieces of communication software; candidates configure the browser software in **two** different ways; they describe the changes although they do not explain the changes; they also consider the file structure needed for sending and receiving e-mails and set up the file structure; this is the most complicated part of all the tasks – it requires each candidate to set up an e-mail server and an e-mail client; they set up at least **two** users and send and receive e-mail between the **two** users; candidates explain why an e-mail server is required and provide an evaluation against these requirements at the end of the task; candidates provide documentation on the installation so it could be repeated – this forms part of the technical documentation for the system.

7.4.3 Resources

Textbooks	Dean T	*Network+ Guide to Networks*	
	Hunt C & Thompson RB	*Windows NT TCP/IP Network Administration*	
	Lowe D	*Networking All-in-one Desk Reference for Dummies*	
	Networking	*CCNA 1 and 2: Companion guide*	Academy Program Cisco
	Networking	*CCNA 3 and 4: Companion guide*	Academy Program Cisco
	Tanenbaum A	*Computer Networks (International edition)*	
	Wegner JD & Rockell R	*IP Addressing and Subnetting Including Ipv6*	
Websites	**General:** http://www.cisco.com/ – Cisco Systems http://www.wown.com/ – World of Windows Networking **Manufacturers:** http://www.dlink.com http://www.hp.com/ http://www.linksys.com/ http://www.netgear.com **News Sites:** http://wifinetnews.com/ http://www.comnews.com/ http://www.networkcomputing.com/ **Notes:** http://www.scit.wlv.ac.uk/~cm1950/CP3397/ – various notes on networking http://www2.rad.com/networks/netterms.htm – tutorials on networking		

8 Unit 8: Introduction to Programming
[AS level, double award, optional, internally assessed]

8.1 ABOUT THIS UNIT

This AS level unit is an optional part of the double award only and is internally assessed

This unit introduces you to a variety of programming languages. It will help you to:

- understand that there are different types of programming language, each having its own features and purposes;
- recognise the differences between programming languages and the similarities between these languages;
- understand the way in which programs are structured using different programming languages.

In this unit you will:

- develop simple programs using a programming language of your choice (these small programs could be joined together as a working solution to meet user requirements for Unit 17: *Program design, production and testing*);
- investigate the structure of programs written in a variety of languages and identify commonalities and differences between them.

This unit will be assessed on your portfolio work only. The mark on that assessment will be your mark for the unit. You will produce evidence for **two** different programming languages:

- annotated program listings for a number of small, simple working programs, *written by you*;
- an annotated program listing for a working program, given to you, and written in a different language to that used in the previous task;
- a report describing your performance in writing the working programme.

WHAT YOU NEED TO LEARN

You need to learn about:

- programming languages;
- program structure.

8.2.1 Programming Languages

You need to understand why there is a need for programming languages to be used.

You need to know about the different *levels* of languages (low level, intermediate level, imperative high level, declarative high level). You also need to know about the different *types of software* for which each level of language is appropriate (low level for operating systems and hardware specific applications, intermediate level for operating systems and network operating systems, high level for a wide variety of non-machine specific applications).

You need to know that there are different languages for different purposes:

- different low level languages for each type of processor;
- languages for embedded systems, e.g. Ada;
- general purpose intermediate level languages, e.g. C;
- languages for knowledge based systems, e.g. Prolog, Lisp;
- object-oriented languages, e.g. C++, SmallTalk, Java, VB.NET;
- languages for mathematical and scientific applications, e.g. Fortran;
- visual languages for event-driven user interfaces, e.g. Visual BASIC, Delphi, Visual C++;
- web scripting languages, e.g. HTML, and web application languages, e.g. JavaScript;
- database query languages, e.g. SQL;
- languages for writing application macros, e.g. VBA;
- languages developed for learning, e.g. Pascal, BASIC.

You need to understand the difference between *imperative* and *declarative* languages and need to know the features of each type of language, i.e. that *imperative* languages are procedural and contain data declarations, function declarations and program constructs, and that *declarative* languages are non-procedural and contain facts and rules.

You also need to know that some features are common to most programming languages, e.g. most are able to deal with constant and variable data and subroutines, and that some languages, though they may be different in structure and features, have a common purpose.

8.2.2 Program Structure

You need to know how programs written in different languages are structured. You need to identify features such as how constants and variables are identified and how subroutines are declared and called.

You need to identify and use the following program constructs:

- sequence;
- selection;
- repetition (count-controlled, test on entry, test on exit).

You need to identify and use the following to store and manipulate data:

- data types – number (integer, floating point), character, Boolean;
- data structures – string, array, record, file;
- operators – arithmetic, relational, logical;
- data manipulation processes – concatenation of strings, file handling, input, output.

You need to identify and use the following to produce a modular program:

- subroutines;
- local and global variables.

You need to develop simple programs using a chosen programming language and understand and comment on simple programs written in at least **one** other programming language.

You need to demonstrate an understanding of the need for good program design techniques to facilitate the ongoing maintenance of programs, e.g. the use of comments, meaningful data names, indentation and modularity.

8.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 8: Introduction to programming

What you need to do:

Your evidence needs to include, for **two** different programming languages:

a: [AO1/2/3] annotated program listings for a number of small, simple working programs, *written by you* [**24**];

b: [AO1/2/3] an annotated program listing for a working program, given to you, and written in a different language to that used in **Task a** [**19**];

c: [AO4] a report describing your performance in writing the working program and annotating the given program [**7**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO1**	You use ICT tools to produce simple working programs with annotated program listings; **[0 1 2 3]**	you use some techniques – at least **one** example each of program constructs, and data manipulation, meaningful data names, correct indentation; **[4 5 6]**	you use a wide range of techniques – constructs, data types, manipulation and modularity. **[7 8]**	**/24**
	AO2	You demonstrate an understanding of components and functions of programming languages by annotating your program listings to show where you have used data types and/or input/output; **[0 1 2 3]**	you demonstrate an understanding of components and functions of programming languages by annotating your program listings to show where you have used data types, input/output and data manipulation; **[4 5]**	you demonstrate an understanding of components and functions of programming languages by annotating your program listings, fully and clearly, to show where you have used data types, data manipulation and modularity. **[6 7]**	
	AO3	You apply your knowledge of ICT tools and techniques to produce a working program to meet the given task; **[0 1 2 3]**	you produce an effective solution by using appropriate program constructs, data types and data manipulation; **[4 5 6]**	you produce an efficient solution with subroutines used in the program. **[7 8 9]**	

Unit 8: Introduction to programming (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
b	**AO1**	You use ICT tools to annotate the given program listing; **[0 1 2]**	you identify some techniques – at least **one** example each of program constructs and data manipulation; **[3 4 5]**	you identify a wide range of techniques – constructs, data types, manipulation and modularity. **[6 7]**	**/19**
	AO2	You demonstrate an understanding of components and functions of programming languages by annotating the program listing to show where data types and/or input/output have been used; **[0 1 2]**	you demonstrate an understanding of components and functions of programming languages by annotating the program listing to show where data types, input/output and data manipulation have been used; **[3 4]**	you demonstrate an understanding of components and functions of programming languages by annotating the program listing, fully and clearly, to show where data types, data manipulation and modularity have been used. **[5 6]**	
	AO3	You apply your knowledge of ICT tools and techniques by correctly annotating the given program listing; **[0 1 2]**	you apply your knowledge of ICT tools and techniques by identifying and annotating program constructs, data types and data manipulation; **[3 4]**	you apply your knowledge of ICT tools and techniques by identifying and annotating program constructs, data types and data manipulation subroutines in the given program. **[5 6]**	
c	**AO4**	You comment on the effectiveness of solutions by describing why the languages used for both programs are suited to the given tasks; you comment on your actions and role in solving the problem; **[0 1 2]**	you identify strengths and weaknesses in the initial solution and refine it in relation to the user's needs by suggesting **one** improvement to each of the programs; you include an analysis of your experiences in order to improve your own performance; **[3 4]**	you identify strengths and weaknesses in the initial solution and refine it in relation to the user's needs by suggesting **one** improvement to each of the programs and giving a valid reason for this suggestion; you include an analysis on your experiences, suggesting how you might approach a similar task in the future. **[5 6 7]**	**/7**
				Total mark awarded:	**/50**

8.4 GUIDANCE FOR TEACHERS

8.4.1 Guidance on Delivery

This unit is intended to give candidates an overall introduction to programming using a variety of programming languages, tools and techniques. Candidates need to, at the end of the unit, write simple programs, such as calculating the average of a given set of numbers stored in a file, performing a selection of tasks chosen from a menu, carrying out a selection of basic transactions, etc.

It is recommended that candidates spend around **50** hours studying this unit, with more time devoted to language **one**, in which a program must be produced, than language **two**, which candidates need to understand but not necessarily use.

8.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 8.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO1**	**1**	Candidates produce a simple annotated program with **one** form and little use of repetition, e.g. they may use a number of variables when **one** could be used repeatedly; (up to **three** marks, depending on the quality of the program);
		2	candidates use some repetition or selection in their program;
		3	candidates make appropriate use of modules in their program.
	AO2	**1**	Candidates identify the data types used and/or the input and output;
		2	candidates annotate data manipulation, e.g. input, output, file handling, string handling;
		3	candidates annotate subroutines with an indication of what they do, and annotate data manipulation, e.g. input, output, file handling, string handling.
	AO3	**1**	Candidates show evidence that the program works as requested; (up to **three** marks depending on the quality and ease of use of the program);
		2	candidates also use selection and repetition appropriately;
		3	candidates make appropriate use of modules.
b	**AO1**	**1**	Candidates annotate the program listing with appropriate comments; (up to **three** marks depending on the quality of the annotation);
		2	candidates annotate examples of program constructs and data manipulation;
		3	candidates produce extensive annotation, including data types and modules.
	AO2	**1**	Candidates identify and annotate the data types used and the input and output used;
		2	candidates annotate data manipulation, e.g. input, output, file handling, string handling;
		3	candidates annotate subroutines with an indication of what they do, and annotate data manipulation, e.g. input, output, file handling, string handling.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b	AO3	1	candidates show, through their annotation, that they understand the functionality of the given program; (up to **two** marks, depending on the quality of the annotation);
		2	candidates identify and annotate where selection and repetition have been used;
		3	candidates annotate all subroutines to describe their functionality.
c	AO4	1	Candidates produce a brief description of why the languages used suit the program written by themselves and the **one** given to them, e.g. program is user-oriented and so a visual language is appropriate, functionality is more important than the user interface and so low-level or non-visual could be used, a more complex program with a high-level language will make it easier to program; candidates make some relevant comments on their approach to the task;
		2	candidates suggest improvements to their code and the given code, e.g. they could have used a different type of loop or a subroutine instead of code in the main program; candidates highlight their strengths and weaknesses in completing the task;
		3	candidates might submit **two** versions (*before* and *after* an improvement) but need to explain why the improvement was made; candidates analyse their strengths and weaknesses and suggest how they might approach a similar task in future; (a further mark is allocated for a high quality answer relating to either of the above).

8.4.3 Resources

Textbooks	French CS	*Computer Science*	Continuum
	Holmes A	*Learning to Use Visual Basic*	Heinemann
	Holzschlag ME	*Using HTML 4*	QUE
	Horton I	*Beginning Visual C++ 6*	WROX Press
	Lhotka R & Hollis B	*Fast Track Visual Basic.NET*	WROX Press
	Prinz P & Kinch-Prinz U	*A Complete Guide to Programming in C++*	Jones and Bartlett
	Summers P	*Visual Basic 6.0 for Windows*	WROX Press
	Wright P	*Beginning Visual Basic 6*	WROX Press
Websites	www.freenetpages.co.uk www.VBcode.com www.wtvl.net/mike/webjr/begcpp.htm		

9 Unit 9: Working to a Brief
[A2 level, mandatory, externally assessed]

9.1 ABOUT THIS UNIT

This A2 level unit is mandatory and is externally assessed by portfolio evidence set by OCR, teacher marked and moderated by OCR.

This unit helps you to improve your own performance and working relationships through the planning, implementation, management and evaluation of an ICT project. Assessment is intended to allow you to demonstrate the development of your own skills and knowledge in relevant areas of ICT, as well as in your ability to work with others. You are asked to find the solution to a brief chosen from a list. The briefs are set by OCR and may be completed by you as an individual or as part of a team. Your work is marked by your teacher and externally moderated by OCR.

This unit is assessed through an external assessment that is set at the beginning of each academic year. The mark on that assessment will be your mark for the unit. You will produce:

- a preparatory report into current working practice;
- a project plan in response to the set brief;
- a diary or log of work completed;
- support materials for use with the project;
- a summative report on the project including user feedback.

This unit has synoptic assessment which involves you bringing together, and making connections between, the areas of knowledge, skills and understanding covered within other units of the specification.

9.2 WHAT YOU NEED TO LEARN

You need to produce a body of work as evidence for this unit that demonstrates that you can work to a set task, and in doing so, develop your own skills for working with others. There will be a range of tasks from which you may choose, and these will be structured so as to be applicable to a range of different situations and learning environments. The response may be a group project, allowing you to work with others in your group to reach a common solution to a brief. Alternatively you may work as an individual with others who are clients or users of the developed system. The final written work needs to make it clear what contribution you, as an individual, made to the overall success of the project.

In order to complete your chosen task, you need to:

- understand a set brief and plan to meet the requirements of the brief;
- identify your own skills;
- work with others;
- plan, develop and deliver a project;
- continually evaluate your work;
- produce a summative project.

9.2.1 Understanding of a Set Brief and a Plan to Meet the Requirements of the Brief

A brief will usually include a description of what is to be included and why. Briefs may also include a clear explanation of the needs of the target audience and, where applicable, the client.

When working to a brief, there are a number of considerations. You need to ensure that your work:

- meets the technical and resource constraints;
- is fit for purpose;
- allows you to satisfy the requirements of the unit by working with others within the confines of your course and centre.

Whilst this unit focuses on working with others, it is a reality of the course that you may not be able to carry out the project as part of a team. Where you choose to address the brief as part of a team, the focus for working with others needs to be the team members. However, when you are working through the unit on your own, the focus for working with others needs to be the users or clients of the project.

9.2.2 Identification of your own Skills

When working from a set brief, you need to demonstrate that you have identified strengths in your own work and areas in which you have been successful. These areas may include:

- skills and techniques;
- use of new software;
- skills for working with others;
- the degree to which your work meets professional standards.

9.2.3 Working with Others

You need to know about the skills needed when working with others, either as a member of a team delivering a common project or with clients of the service you provide.

The skills needed when working with others will depend on the role of the person/ people that you are working with. These could include:

- experts;
- users;
- team members;
- project supervisors.

The skills needed to work with others may be broken into **four** groups. These groups are:

- interpersonal skills – e.g. co-operation, exchange of information, clarification of responsibility/working relationship, leadership, enthusiasm and adaptability;
- technical skills – e.g. knowledge of specific software or hardware, ICT skills in general, giving/taking advice or support;
- effort skills – e.g. your volume of work, the quality of your work, your ability to meet deadlines;
- economic skills – e.g. identification of physical resources/time needed, efficient use of physical resources/time.

You need to apply these skills to the project you develop. As your project progresses, you need to be aware that your skills in this area will also increase. You need to keep a record of the development of your skills as part of the continual evaluation of your work.

9.2.4 Planning, Development and Delivery of a Project

In order to successfully meet the demands of the brief, you need to use project management tools to plan and develop your project. These tools include:

- Gantt charts;
- PERT charts;
- timelines;
- critical path analysis;
- CASE tools.

As well as these formal planning tools, you need to carry out further research to ensure that your project is successful. Further tasks you may wish to consider include:

- reviewing current practice;
- assessing your own ICT skills, leading to the identification of skills areas that need further development;
- the drafting of initial ideas, to include a timescale for implementation or setting up of the project;
- negotiating with others to decide upon a final structure for your project;
- allowing time for a review of the effectiveness of the plan upon completion of the project.

Once you have completed the planning process, you need to carry out the project in line with both the initial brief and your subsequent negotiations. As part of your project, you will be expected to keep a log of work you have completed. This log will allow you to assess the development of your own skills and needs to include:

- a full list of all tasks undertaken as part of the delivery of the project;
- an assessment of your contribution to the success of the task;
- the skills used in meeting the requirement of the task;
- an assessment of how your skills needed to extend to meet the needs of the task – your discussion of your skills needs to include your use of working with others as well as ICT skills.

9.2.5 Continual Evaluation of your Work

The process of self-evaluation is an important aspect of this unit. As part of this process, you need to ask the following questions:

- How has the work of others influenced the development of my work?
- How have I supported the work of others?
- How were important decisions made and how were others informed of those decisions?
- How did I deal with differences of opinion?
- How effective are the processes and techniques I developed in order for me to meet the demands of the brief?
- How well did my project meet the demands of the brief?
- In what ways would I alter my project if I did it again?

Your ability to answer these questions will allow you to discuss your work with your teachers and your peer group and thereby come to a meaningful conclusion about the effectiveness of both the project itself, and your ability to work with others.

9.2.6 Production of a Summative Project

In response to the external assessment, you need to provide a body of work as evidence for this unit. Your work needs to include:

- an initial discussion of the requirements of the brief and an analysis of the current level of both your ICT skills and your project management skills;
- preparatory research and investigation into current working practices leading to a clear analysis of the specific requirements of the brief within the particular learning environment;
- full evidence of support materials produced in response to the brief, with clear indication of authorship;
- continual evaluation of your response to the brief, project management, skills level and the quality of the final outcome and your contribution to that outcome.

9.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 9: Working to a brief

What you need to do:

Your evidence needs to include:

a: [AO2] a preparatory report into current working practice [**6**];
b: [AO2/3] a project plan in response to the set brief [**18**];
c: [AO1/2/3] a diary or log of work completed [**31**];
d: [AO1] support materials for use with the project [**5**];
e: [AO4] an evaluation of your performance in relation to planning the project [**12**];
f: [AO4] an evaluation of your performance in implementing the project [**13**];
g: [AO4] an evaluation of your ICT solution to the given brief [**15**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You describe the current working practices; there will be no consideration of what needs to be taken into account; **[0 1 2]**	you describe the current working practices and highlight some issues which need to be taken account of when implementing the project; **[3 4]**	you produce a report which fully evaluates the current working practices and discusses all issues to be taken account of when implementing the project. **[5 6]**	**/6**
b	**AO2**	You use simple techniques in planning your project; **[0 1 2]**	you use formal project-management techniques in planning your project with a reasonable level of accuracy and skill; **[3 4 5]**	you use at least **two** formal project-management techniques with a high level of skill and accuracy in planning your project. **[6 7 8]**	**/18**
	AO3	You produce a simple plan in any format; **[0 1 2 3]**	you produce a project plan that covers some aspects of the necessary planning; **[4 5 6]**	you produce a project plan that covers fully all aspects of the project. **[7 8 9 10]**	
c	**AO1**	You produce a diary or log that shows that you have developed and extended your range of ICT skills and techniques; **[0 1 2 3]**	you produce a diary or log that shows that you have developed and extended your range of ICT skills and techniques; **[4 5 6]**	you produce a diary or log that shows that you have used your initiative to develop and extend your range of ICT skills and techniques. **[7 8 9 10]**	
	AO2	You produce a diary or log that shows that you have knowledge of tools and techniques for developing ICT systems with a display of some skills acquired in this unit, and other units, in this specification; you also show that you have some awareness that the quality of your work will affect end-users and/or other members of the team; **[0 1 2]**	you produce a diary or log that shows that you have a fair amount of knowledge of both formal and informal techniques for developing and managing ICT systems, demonstrating the skills acquired in this unit, and other units, in this specification; you also show that you have awareness that the quality of your work will affect end users and/or other members of the team; **[3 4]**	you produce a diary or log that shows that you have a detailed knowledge of both formal and informal techniques for developing and managing ICT systems, demonstrating the skills acquired in this unit, and other units, in this specification; you also show that you have a thorough awareness that the quality of your work will affect end users and/or other members of the team. **[5 6]**	

Unit 9: Working to a brief (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO3**	You produce a diary or log that shows that you have dealt with straightforward day-to-day issues arising from running the project; you do not consider longer-term issues; **[0 1 2 3 4 5]**	you produce a diary or log that shows you have been methodical in dealing with more complex day-to-day issues arising from running the project; you do not consider longer-term issues; **[6 7 8 9 10]**	you produce a diary or log that shows you have been methodical in dealing with the more complex aspects of both the day-to-day and longer-term issues arising. **[11 12 13 14 15]**	**/31**
d	**AO1**	You develop support materials for use with the project; **[0 1]**	you develop support materials for use with the project and, in doing so, you develop your range of ICT skills; **[2 3]**	you develop support materials for use with the project and, in doing so, you use your initiative to develop and extend your range of ICT skills as required by the solution. **[4 5]**	**/5**
e	**AO4**	You comment on your actions and role in planning your project and identify areas for improvement; **[0 1 2 3 4]**	you include an analysis on your own performance by identifying strengths and weaknesses in your planning , with some suggestions for improvement to the overall process; **[5 6 7 8]**	you include an analysis on your own performance by identifying strengths and weaknesses in your planning, and use this analysis to show how you will address these issues to be more effective in the future. **[9 10 11 12]**	**/12**
f	**AO4**	You comment on your actions and role in implementing your ICT solution for the user and identify areas for improvement; **[0 1 2 3 4 5]**	you include an analysis on your own performance in implementing your ICT solution by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; **[6 7 8 9]**	you include an analysis on your own performance in implementing your ICT solution by identifying strengths and weaknesses and use this analysis to show how you will address these issues to be more effective in the future. **[10 11 12 13]**	**/13**
g	**AO4**	You comment on the effectiveness of your solution in relation to user needs, suggesting improvements; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3 4 5]**	you provide a critical analysis of your solution in relation to user needs, identifying strengths and weaknesses; your report contains few spelling, punctuation and grammar errors; **[6 7 8 9 10]**	you provide a critical analysis of your solution, identifying strengths and weaknesses in order to refine the solution, taking account of user feedback; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors. **[11 12 13 14 15]**	**/15**
				Total mark awarded:	**/100**

9.4 GUIDANCE FOR TEACHERS

9.4.1 Guidance on Delivery

The emphasis for this unit is for candidates to produce a working response to an externally-set brief. This brief will be chosen from a varied list set by OCR at the start of each academic year and will allow candidates to explore and develop the issues surrounding the concept of *working to a brief*. The focus of this unit is on the processes that a person goes through when they work on a project. The project brief itself, whilst giving focus to a candidate, is not the end product that will be assessed. Candidates need to produce evidence of project planning, evaluation and development of ICT skills and skills required for working with other people. In this context, the 'others' could be either members of a team or could be the client of the set brief.

All briefs will include a scenario that may be applied to an individual candidate's experience at school, or in the wider school community, and will allow candidates to develop both their ICT skills and their ability to work with others. As part of the response to the brief, candidates need to produce supporting documentation and so need to know about the range of support materials currently available, including on-line, paper-based, and other sources. Candidates will be expected to show how they, individually, contributed either to the team's response to the brief or, when working alone, to the learning of others. Candidates will need some guidance as to which brief to follow and need to know that the choice of briefs may be restricted by the nature of the educational establishment they attend or by the numbers available to follow the unit.

Candidates need to have carried out some practical research into the role of individual teams and may benefit from some case study work in preparation for the unit. The ability to reflect on the dynamics of real life teams and the role that individuals play within those teams would be a further advantage. Candidates also need to reflect on their own ability to work with others and will need to develop the ability to criticise their own work as part of the preparation for the OCR set task.

A major part of the assessment of this unit will be based upon a diary or log that candidates will be expected to keep as they work through the project. This needs to provide evidence of how candidates deal with a range of issues throughout the life of the project and how their skills develop as they do so. The range of issues dealt with needs to include both structural issues and more practical issues surrounding day-to-day implementation of the project. The range of skills highlighted needs to cover both ICT skills and those involved in working with others.

Assessment of the unit will be carried out internally, with OCR carrying out moderation of your marking.

9.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 9.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **100** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates produce a report that describes the current working practices that apply to the project in the organisation with which they are working;
		2	candidates produce a report which highlights a range of issues that need to be taken account of when planning and implementing the project; the report needs to give some clear indication of the issues involved and needs to be useful in preparing a project plan, but will not cover all of the issues that a more thorough piece of research would have highlighted;
		3	candidates produce a report which is fully researched and presented; any reader is able to get a clear grasp of all the issues that need to be addressed when planning and implementing the project.
b	**AO2**	**1**	Candidates use any form of organised approach to planning the project;
		2	candidates use any recognised management planning tool to plan the project;
		3	candidates use at least **two** different formal management techniques to plan the project.
	AO3	**1**	Candidates produce a simple project plan that is be extremely vague and only covers the most basic issues;
		2	candidates produce a project plan that covers some of the necessary issues in reasonable depth *or* a few issues in great depth;
		3	candidates produce a full project plan – at the highest level, the degree of planning covers all aspects of the project and it is clear from the plan that the candidate has considered all possible aspects of the project in great depth.
c	**AO1**	**1**	Candidates produce a diary which shows development of skills from a level identified at the beginning of the project;
		2	candidates produce a diary which shows the development and enhancement of skills and techniques from a level identified at the beginning of the project;
		3	candidates produce a diary which shows the use of initiative to develop and extend skills and techniques from a level identified at the beginning of the project.
	AO2	**1**	The differentiation in this section is based on the extent to which candidates have shown an awareness of the different tools and techniques that may be used to complete the project – including team skills – and the effect that their actions may have upon others; in this case, the tools and techniques, as well as the 'others' will depend on the scenario chosen – the weaker candidate will have shown some awareness of the tools and techniques available, as well as an awareness that their action will affect others, but with little commentary on either area; the stronger candidate will have displayed a full knowledge of the tools and techniques available and will have shown full empathy towards others.
		2	
		3	

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO3	1	Candidates produce a diary which shows that they have dealt with straightforward issues in a simple manner;
		2	candidates produce a diary which shows that they have dealt with more complex issues; the techniques used to do this show some ability to be methodical in their responses;
		3	candidates produce a diary which shows that they have dealt with a full range of issues in a methodical manner and have developed a system that allows experience of dealing with **one** issue to influence the response to another.
d	AO1	1	Candidates produce simple support materials in any format for the project;
		2	candidates produce support materials for the project and develop their range of ICT skills;
		3	candidates produce support materials for the project; candidates use their initiative to develop and extend their range of ICT skills.
e	AO4	1	Candidates produce a report on how the project ran and suggest improvements that may be made if the project were to run again;
		2	candidates produce a report on how the project ran, identifying strengths and weaknesses of their planning of the project; candidates suggest some improvements to the planning if the project were to run again;
		3	candidates produce a report on how the project ran, identifying strengths and weaknesses of their planning of the project; this analysis is used to inform the overall assessment of the project and to suggest improvements to planning if the project were to run again; candidates explain how these improvements would help a future project.
f	AO4	1	Candidates produce a report on the project implementation; they identify the skills they used to create the solution and suggest enhancements to their skills that may be made if the project were to run again;
		2	candidates produce a report on the project implementation, identifying strengths and weaknesses in their skills, knowledge and understanding; candidates suggest some enhancements to their skills if the project were to run again;
		3	candidates produce a report on the project implementation, identifying strengths and weaknesses in their skills, knowledge and understanding; this analysis is used to inform the overall assessment of the project and to suggest enhancements to their skills if the project were to run again; candidates explain how these improvements would help a future project.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
G	AO4	1	Candidates produce a report on the final product and suggest improvements that may be made if the were project to run again;
		2	candidates produce a report on the final product, identifying how the final product meets/does not meet the user requirements; candidates suggest some improvements to the final product if the project were to run again;
		3	candidates produce a report on the final product, identifying how the final product meets/does not meet the user requirements; candidates identify all user feedback and they explain how the feedback has led them to make changes to their final product; this analysis is used to inform the overall assessment of the project and to suggest enhancements to their skills if the project were to run again; candidates explain how these improvements would help a future project.

9.4.3 Resources

Websites	http://whatis.techtarget.com/definition/0,,sid9_gci331391,00.html http://whatis.techtarget.com/definition/0,,sid9_gci331397,00.html http://www.ganttchart.com/ http://www.itteam.uk.com/gwpert.htm http://www.me.umn.edu/courses/me4054/assignments/gantt.html http://www.mindtools.com/critpath.html http://www.palgrave.com/skills4study/html/studyskills/workingwithothers.htm#team

10 Unit 10: Numerical Modelling Using Spreadsheets
[A2 level, optional, internally assessed]

10.1 ABOUT THIS UNIT

This A2 level unit is optional and is internally assessed.

This unit helps you to:

- understand and apply the principles of numerical modelling using spreadsheets;
- design spreadsheets that process numerical data and present required information;
- prepare standard spreadsheets that others can use to solve problems with new data;
- learn and apply good design and test principles.

You will create a spreadsheet to meet specified requirements. The specified requirements will require the use of some of the more specialist and complex spreadsheet facilities associated with aspects of numerical modelling.

This unit applies the knowledge and skills gained from Unit 1: *Using ICT to communicate* and Unit 3: *ICT solutions for individuals and society*.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce:

- a design specification that analyses a suitable problem and describes how you will solve it by numerical modelling;
- evidence of implementing your solution using suitable entry aids and processing facilities;
- a record of how you overcame your problems;
- a specification for testing your spreadsheet, and evidence of the results of these tests;
- technical documentation that explains how your spreadsheet works, and user documentation that explains how it is used;
- an evaluation of the effectiveness of your solution and your personal performance.

10.2 WHAT YOU NEED TO LEARN

You will be introduced to new technical terms in this unit. Some of the words may be familiar but have specialised meanings in this area of study. You need to know how to use these terms correctly.

You will learn to:

- develop a working specification;
- use spreadsheet facilities;
- design and develop spreadsheets;
- implement a spreadsheet solution;
- present spreadsheet information;
- test spreadsheets;
- document the development;
- evaluate the effectiveness of your solution and your performance.

10.2.1 Development of a Working Specification

You need to create spreadsheets that meet specified requirements. The user of your spreadsheet will want to enter data, and the spreadsheet needs to process the data to produce the required output. Output will be in the form of numerical values or charts.

You need to learn how to analyse user requirements to determine:

- what output information they want;
- how they currently obtain that information (if at all);
- where the data to be input is to come from;
- what numerical processing needs to be done to get the required output;
- what aids can be provided to assist with data input or processing;
- how the output information needs to be presented.

You need to use the answers to these questions to produce a detailed design specification for the spreadsheet. You will find it helpful to discuss with others the user's requirements and how they may be met. A good design specification states the user's needs in such a way that there is no doubt about the scope of the task and the work that has to be done.

You and the user need to agree the design specification before you begin work on the spreadsheet design.

10.2.2 Use of Spreadsheet Facilities

When using spreadsheet facilities, there are a number of activities that you will do regularly. You need to learn to carry out these activities without help, including:

- selecting and setting cell formats to match the data format;
- selecting and using suitable cell-presentation formats;
- using and processing numerical spreadsheet data;
- using cell-referencing facilities appropriately;
- correctly applying and using operators and formulae;
- using built-in spreadsheet functions appropriately.

You need to learn how to:

- set appropriate cell formats to match the data format, including:
  – decimal number;
  – integer number;
  – percentage;
  – date;
  – fraction;
  – text or character;
  – currency;
  – scientific;
  – custom or special;
- set appropriate cell-presentation formats, including:
  – horizontal alignment;
  – colour;
  – vertical alignment;
  – shading;
  – fonts;
  – borders;
- use and manipulate your spreadsheet to:
  – find data;
  – go to a specified cell;
  – search and replace data;
  – cut, copy, paste, move;
  – clear cell formats/contents;
  – use paste special;
- make appropriate use of cell-referencing facilities, including:
  – relative referencing;
  – cell ranges;
  – absolute cell referencing;
  – multi-sheet referencing;
  – mixed cell referencing;
- effectively apply the following common operators in formulae:
  – arithmetic operators, such as +, -, *, /, %, ^;
  – relational operators, such as =, <, >, >=, <=, <>;
  – the logical value FALSE, TRUE;
  – the use of parentheses ( );

- effectively apply common built-in spreadsheet functions, including:
  – SUM;
  – RAND;
  – DATE;
  – AVERAGE;
  – IF;
  – MAX;
  – INT;
  – COUNT;
  – MIN;
- selectively apply specialised built-in spreadsheet functions, taken from **one or more** of the following, (or from functions with similar degrees of complexity):
  – iterative problem-solving or rounding features and functions, such as:
    goal seek,
    floor,
    solver,
    ceiling,
  – financial functions, such as:
    interest rates,
    future value,
    loan payments,
    rates of return,
    net present value,
    asset depreciation,
  – mathematic and trigonometric functions, such as:
    cosine,
    floor,
    ceiling,
    power,
    combinations,
    product,
  – statistical functions, such as:
    count if,
    forecast,
    rank correlation coefficient,
    frequency,
    confidence intervals,
    standard deviation,
    rank,
    binomial distribution probability,
    variance,
  – lookup and referencing functions, such as:
    vlookup,
    row,
    hlookup,
    transpose,
    match,
    offset,
  – date and time functions such as:
    time,
    date,
    day,
    hour,
    minute,
    year.

10.2.3 Design and Development of Spreadsheets

The design of the spreadsheet needs to make it easy to use. In creating a spreadsheet for users, you need to provide simple but effective ways of entering data, including:

- creating sheets that have the appearance of a form;
- using data entry forms.

You need to provide users with helpful prompts, including:

- providing data entry messages;
- using data validation and associated messages.

You need to present results in appropriate ways, which may include good use of:

- cell formatting, such as colour and borders;
- drawing tools and graphic images;
- charts and line graphs.

You need to make good use of macros to simplify the use of the spreadsheet, including macros that:

- replace multiple key depressions for a required action;
- enable or simplify data input;
- produce printed or screen reports.

You need to use some of the more complex spreadsheet facilities, including:

- lists and tables – sorting, lookup tables, subtotals and totals;
- list boxes and drop-down boxes to select data for entry;
- styles to create a customised cell format;
- named cells and ranges for use in formulae;
- auto-fill lists, for lists of dates or days of the week;
- validation – restricting data input to acceptable data values;
- templates – creating standard spreadsheet layouts for repeated use;
- protecting cells by hiding and locking cells;
- control buttons, to initiate macros;
- multiple sheets with links between them;
- multiple views or windows.

10.2.4 Implementation of a Spreadsheet Solution

You need to show that you can plan and follow a strategy to implement your spreadsheet solution. You need to learn to describe this strategy. You are very likely to meet difficulties and problems as you create the solution. Some of these problems may require you to consult your end-user before you can solve them successfully. Again, these problems need to be documented in your development records. This process is known as following a *System Life Cycle*.

10.2.5 Presentation of Spreadsheet Information

The presentation of information in your spreadsheet is very important and you need to consider this from the start. You need to apply the principles of presenting information that you learnt in Unit 1: *Using ICT to communicate* to your spreadsheet. To present results in appropriate ways, on VDU screens and on printed pages, you need to make suitable use of cell formats, page layout, charts and line graphs.

You need to create an appropriate page layout, including:

- margins;
- headers;
- footers;
- page size;
- page orientation.

You need to present charts and line graphs appropriately, including using:

- chart or graph title;
- axis labels;
- background;
- legend data series labels;
- data labels;
- category labels;
- axes formats;
- axis values;
- gridlines.

10.2.6 Testing of Spreadsheets

You need to learn to test your spreadsheets thoroughly. You can do this by asking yourself questions such as:

- whether the solution meets the agreed specification;
- whether results agree with manual methods of doing the same problem;
- whether the spreadsheet can cope with normal, extreme and abnormal data;
- whether other people can use the solution;
- whether the spreadsheet is robust or can be made to fail.

You need to create a test specification that defines tests for:

- acceptable data input values (maximum, minimum and boundary data);
- unacceptable data values that need to be automatically rejected;
- checking, independently, that all functions and formulae work correctly;
- checking that the system meets user requirements.

10.2.7 Documentation

You need to learn to document the development of your customised spreadsheet and create instructions for users.

Technical documentation is for specialists. It records the design and development of the spreadsheet and could include:

- a copy of the agreed design specification;
- details of the hardware, software and other resources required;
- instructions for opening and configuring the spreadsheet;
- details of all numerical processing, including calculations, formulae and functions used;
- details of validation and verification procedures;
- details of all input and output screens and printed designs.

User documentation helps others to use your custom spreadsheet. You need to learn to write user instructions that are simple to understand. Your instructions could include:

- how to start the spreadsheet program;
- routes through the spreadsheet menus;
- examples of screens and data entry forms;
- instructions about data entry;
- advice on how to respond to common error messages;
- examples of data output screens and printed copy.

10.2.8 Evaluation of the Effectiveness of your Solution and your Performance

You need to learn how to evaluate your ICT solution and your own performance in arriving at a solution. These evaluations need to:

- provide a critical analysis of the effectiveness of your solution;
- identify strengths and weaknesses of your solution;
- suggest improvements to your solution;
- enable you to refine your solution;
- take account of user feedback;
- reflect on your own actions and performance;
- review your own strengths and weaknesses in solving an ICT problem from start to finish;
- identify areas of personal performance that could be improved upon.

10.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 10: Numerical modelling using spreadsheets

What you need to do:

Your evidence needs to include:

a: [AO3] a design specification that analyses a suitable problem and describes how you will solve it by numerical modelling [**7**];

b: [AO1] evidence of implementing your solution using suitable entry aids and processing facilities [**15**];

c: [AO3] a record of how you overcame your problems [**5**];

d: [AO4] a specification for testing your spreadsheet, and evidence of the results of these tests [**7**];

e: [AO2] technical documentation that explains how your spreadsheet works, and user documentation that explains how it is used [**8**];

f: [AO4] an evaluation of the effectiveness of your solution and your personal performance [**8**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO3**	You produce a design specification that takes account of user requirements; **[0 1 2]**	you produce a design specification that is complete and details sources of data, numerical processing required, user aids and how output is to be presented; **[3 4 5]**	you produce a design specification that provides a clear, precise and complete description of a numerical modelling solution to a problem. **[6 7]**	**/7**
b	**AO1**	You produce a numerical modelling spreadsheet solution which can be implemented and includes data entry, numerical processing and output; **[0 1 2 3 4 5]**	you produce a solution that effectively includes specialist numerical processing functions and complex spreadsheet facilities; **[6 7 8 9 10]**	you implement a complete solution to a complex problem that consistently shows effective use of complex spreadsheet facilities for data entry, numerical processing and presentation of output. **[11 12 13 14 15]**	**/15**
c	**AO3**	You produce a record of the strategy used to implement the spreadsheet solution, including methods used to overcome problems; **[0 1 2]**	you show that the solutions used to overcome problems show an understanding of both the user's needs and the effective use of spreadsheet facilities; **[3 4]**	you use methodical, analytical and critical approaches to overcome problems during implementation; your methods will fully address the user's needs and make effective use of spreadsheet facilities. **[5]**	**/5**
d	**AO4**	You test the spreadsheet to check that it meets the requirements of the design specification; **[0 1 2]**	you provide evidence that a testing specification is followed that adequately tests the functionality of the spreadsheet solution; **[3 4]**	you provide a detailed test specification which tests all aspects of the solution with a full range of acceptable and unacceptable input, expected output, and any associated error messages. **[5 6 7]**	**/7**

Unit 10: Numerical modelling using spreadsheets (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
e	**AO2**	You produce clear technical and user documentation that identifies numerical processing methods used, includes copies of menus and screens used and provides expected outputs; **[0 1 2 3]**	you produce technical and user documentation which makes good use of graphic images, together with explanations of technical aspects of the solution, examples of menus and data input screens, types of output available and possible error messages; **[4 5]**	you produce complete technical and user documentation which makes effective use of graphic images, together with explanations of all technical aspects of the solution, examples of menus and data input screens, types of output available and possible error messages. **[6 7 8]**	**/8**
f	**AO4**	You comment on the effectiveness of the final solution, with some overall indication of how the work may be improved in the future; you evaluate aspects of your personal performance that affected the solution; your report may contain errors in spelling, punctuation and grammar; **[0 1 2]**	you provide an analysis of your final solution, identifying the strengths and weaknesses in order to identify how the work may be improved in the future; you evaluate aspects of your personal performance by identifying your strengths and weaknesses that affected the solution, with some suggestions for improvement to the overall process; your report contains few spelling, punctuation and grammar errors; **[3 4 5]**	you provide a full critical analysis of your final solution identifying how well it meets the initial brief, taking into account user feedback in order to identify how the work may be improved in the future; you evaluate aspects of your personal performance by identifying your strengths and weaknesses and how you may address these issues to be more effective in the future; your report is consistently well-structured and there will be few, if any, spelling, punctuation and grammar errors. **[6 7 8]**	**/8**
				Total mark awarded:	**/50**

10.4 GUIDANCE FOR TEACHERS

10.4.1 Guidance on Delivery

This unit is designed to be practical, with opportunities to link theoretical aspects of problem solving with exposure to more complex spreadsheet facilities. Spreadsheets are an excellent application for solving real problems of a wide degree of complexity, and have the flexibility to allow adjustments and enhancements to be made without seriously affecting the functionality of the solution.

The delivery strategy suggested below is based on the following important principles:

- the unit develops further ideas met in Unit 1: *Using ICT to communicate*;
- as the unit is about solving real problems, it is important to deliver the theory of the *project life cycle* and the involvement of the user at the various stages of this cycle;
- the unit is essentially about numerical modelling; it is essential that the problems met by candidates as either exemplar material or for problem contexts need to involve elements of numerical modelling; using a spreadsheet to simply store and present information, e.g. database solutions that involve no data processing are **not** suitable for this unit; this unit needs to be seen as the opportunity to focus wholly on numerical modelling;
- the specialist numerical modelling functions given in Section 10.2 suggest some areas of problem solving that are suitable for this unit; these functions are not exclusive; centres are encouraged to specialise in different problem areas, as long as the area contains suitable numerical modelling problems of appropriate complexity for A2 level;
- candidates need to be taken through all aspects of a spreadsheet project, including exposition to advanced and complex spreadsheet techniques and sections of write-up that are required to provide the assessment evidence; this could be done in parallel with, or in advance of, candidates working on their own projects.

10.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 10.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO3**	**1**	Candidates produce a simple design specification – account is taken of user requirements, although these may not be complete; description of data sources, processing, and output is attempted;
		2	candidates produce a specification which considers all user requirements, sources of data, processing and output – sketches of screen layouts and a description of the planned use of numerical modelling are included;
		3	candidates produce a specification which will be precise and detailed enough to enable a competent third party (for instance, another Applied ICT candidate) to implement it independently – this includes sketches of the spreadsheet layouts and a description of all functions and facilities to be used; there is clarity on how the use of numerical modelling will facilitate the solution; the complexity of the proposed system, plus the quality and completeness of the specification, will determine the mark awarded.
b	**AO1**	**1**	Candidates produce a spreadsheet solution which may not be fully complete, or be of only a small degree of complexity; some data entry facilities, suitable numerical modelling and presentable output are all included in a solution to a fairly simple problem or a good attempt at a more complex problem;
		2	candidates produce a very good solution to a simple problem, or a good solution to a more complex problem – the use of numerical modelling techniques beyond the basic level; a good range of spreadsheet facilities are included to aid the user to input information and to view output;
		3	candidates produce a very good solution to a complex problem, which includes very good use of numerical modelling – an appropriate variety of spreadsheet facilities are included that make the model easy to use, and produce output of a good quality; there are no obvious areas of weakness in the solution – the complexity, quality and completeness of the finished system will determine the mark awarded.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO3	1	Candidates produce some record of how the spreadsheet was implemented – this could be chronological (a diary) or an explanation of the facilities used in a sensible order; a brief reference is made to problems encountered, and how they were overcome;
		2	candidates produce a more detailed description of problems encountered– this will include considerations of alternative strategies to solve the problems and may make reference to the *system life cycle* approach to problem solving;
		3	candidates produce a complete and detailed description of problems encountered– this will include considerations of alternative strategies to solve the problems, and may make reference to the *system life cycle* approach to problem solving.
d	AO4	1	Candidates undertake some testing which is loosely linked to user requirements – evidence of this testing is documented;
		2	candidates produce evidence of a strategic approach to testing – a test strategy is detailed before testing begins, which takes into account initial user requirements; a suitable range of tests are undertaken which test the majority of the spreadsheet solution; test data is chosen which represents normal and some abnormal data – results of the tests are well documented;
		3	candidates produce evidence of testing which is well planned and strategic – it relates very closely to the initial user requirements; it comprehensively tests all aspects of the solution's functionality, with normal, abnormal and boundary data; the test schedule may be revised in the light of results from earlier tests – results of the tests, and corrective action needed, are well documented.
e	AO2	1	Candidates produce documentation both for a user and as a technical reference; the user documentation includes copies of menus, screens and examples of output – it enables the user to understand the purpose of the solution, and how to begin using it; the technical documentation explains how the spreadsheet is installed, and how the spreadsheet works – some of this explanation may be linked to evidence for **Task c** – there is no need for candidates to repeat a detailed explanation of the solution if this already exists;
		2	candidates produce documentation which is complete; good use of graphic images make the user documentation more understandable; some technical aspects of the solution are explained, perhaps with printouts of formulae and functions used;
		3	candidates produce documentation which is complete and detailed; good use of graphic images make the user documentation more understandable; all technical aspects of the solution are explained, with printouts of formulae and functions used.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
f	AO4	1	Candidates produce an evaluation which identifies the strengths and weaknesses of the solution – it makes reference to the initial user requirements; sensible improvements to the solution are suggested, and some evaluation of the candidate's own performance at producing the solution is made;
		2	candidates produce an evaluation which considers both positive and negative aspects, and takes into account feedback from the user(s) – the evaluation takes account of the design specification and initial user requirements; reference is made to the effectiveness of numerical modelling techniques; the evaluation of the candidate's own performance refers to aspects of problem-solving techniques and/or *the system life cycle*;
		3	candidates produce an evaluation which is thorough and takes into account feedback from the user(s) – the evaluation is consistently linked back to the design specification and initial user requirements; reference is made to the effectiveness of numerical modelling techniques; the evaluation of the candidate's own performance refers to aspects of problem-solving techniques and/or *the system life cycle*.

10.4.3 Resources

Organisations	Any small businesses or organisations that may use spreadsheets for numerical modelling. Examples may include small cafes, insurance agents, clubs and societies, play groups etc.			
Textbooks	Beare R	*Mathematics in Action: Modelling the real world using mathematics*		
	Heathcote PM	*Successful ICT Projects in Excel*		
	Heathcote PM & Richards RP	*AVCE ICT Units 1-3* *[both good for advanced use of spreadsheets, however do not provide focus on broader use of numerical modelling]*		
	Jackson M & Staunton M	*Advanced Modelling in Finance using Excel and VBA*		
	McLaren D	*Spreadsheets and Numerical Analysis*		
	Mott J & Rendell I	*Spreadsheet Projects in Excel for A Level* (2nd Edition 2003)	Hodder & Stoughton	034 081 202 8
	Sjostrand D	*Mathematics with Excel*		

11 Unit 11: Interactive Multimedia Products
[A2 level, optional, internally assessed]

11.1 ABOUT THIS UNIT

This A2 level unit is optional and is internally assessed.

Interactive multimedia products can play an important role in entertainment, education and in providing information.

This unit helps you to:

- be critical of commercially-produced interactive multimedia products;
- appreciate what is involved in the design and creation of interactive multimedia products.

In this unit you need to:

- research into interactive multimedia products;
- produce elements of interactive multimedia products;
- design and build an interactive multimedia product to meet a client's requirements;
- review your interactive multimedia product for its effectiveness in meeting the clients' requirements.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce:

- a review of **two** commercially-produced interactive multimedia products, showing how their design influenced the design of the interactive multimedia product that you produce;
- detailed designs, of which **one** is chosen as the design for the final product;
- a multimedia product to meet the client's requirements;
- a detailed test plan;
- a detailed user guide;
- a review of both the interactive multimedia product that you produced and your personal performance.

11.2 WHAT YOU NEED TO LEARN

You need to provide a body of work as evidence for this unit that demonstrates that you can:

- review and evaluate interactive multimedia products;
- consider design;
- design an interactive multimedia product;
- create elements of an interactive multimedia product;
- author an interactive multimedia product;
- test and document your product;
- review your final product.

11.2.1 Review and Evaluation of Interactive Multimedia Products

There are a large number of commercially-produced interactive multimedia products available, for a range of different purposes, e.g. training, entertainment, giving information. There are also web-based resources that perform the same function. You need to describe:

- what makes a *good* interactive multimedia product;
- what makes a *bad* interactive multimedia product.

You need to learn to:

- identify the intended audience of any interactive multimedia product, e.g. children, teenagers, parents;
- decide the overall impact on the audience, e.g. to inform, to shock, to amuse;
- recognise any tactics being used, e.g. in multimedia products the author may use music to create an atmosphere, the pace of animations, the colours and font style used;
- decide whether the interactive multimedia product being reviewed and evaluated is appropriate and effective in communicating its message and in encouraging the viewer to remember the message.

In deciding whether any interactive multimedia product is effective in communicating its message, you need to take into account other considerations, such as:

- the content and presentation of the material presented – if the content changes automatically, whether there is enough time to take in the message and whether the product flows;
- how easy it is for the user to interact with the system – the navigational tools used.

11.2.2 Design Considerations

You need to learn the meaning of the technical terms used in the construction of multimedia products:

- compression;
- resolution;
- frames per second;
- colour depth.

You need to know how interactive multimedia products are structured, including:

- linear;
- hierarchical;
- web or mesh.

Having investigated commercially-produced interactive multimedia products, you will apply the principles you have learnt to specifying, designing and creating your own interactive multimedia product.

11.2.3 Design of an Interactive Multimedia Product

Good interactive multimedia products of any nature need to be designed carefully. You need to learn how to:

- write a script for your product;
- produce structure diagrams;
- use design methods like storyboards or flowcharts;
- produce a task list or action plan for development;
- incorporate a structure to enable alternative paths through your product;
- design suitable screen layouts;
- incorporate appropriate navigational tools.

11.2.4 Creation of Elements of an Interactive Multimedia Product

An interactive multimedia product consists of a number of elements – video, sound, images, animation, drawings, diagrams, charts and/or text. You will be given a commission to produce material for a client. As part of that commission, you need to learn to:

- create, format and edit text;
- create drawings, diagrams and charts;
- take digital pictures, scan images and retrieve clip art;
- edit images, including clip art;
- import and convert text and graphics files;
- create animation;
- record and edit sounds;
- record and edit video clips.

When you incorporate material not created by yourself, you need to know about copyright restrictions and know how to obtain any necessary permission.

11.2.4 Authoring an Interactive Multimedia Product

Having created the elements of an interactive multimedia product, you need to learn how to build these elements into a multimedia product using an authoring package. You also need to learn how to incorporate interaction between the user and the product by:

- utilising buttons/hotspots/links/hypertext links;
- utilising transitions;
- utilising frames;
- using drag and drop features;
- allowing text/numeric input;
- creating interactive images;
- having start/stop procedures controlled by the user.

11.2.5 Testing and Documentation

It is unlikely that the interactive multimedia product that you produce will work exactly as you planned straight away. You need to carry out tests and edit your product including:

- testing all links and pathways;
- proof-reading text;
- checking layout and alignment of elements to ensure a professional quality product.

Documentation is provided to give users information about all aspects of an interactive multimedia product. You need to be able produce documentation that includes:

- the purpose of the product;
- the system requirements;
- how to install and use the product.

11.2.6 Review of your Final Product

In your investigation of commercially-produced interactive multimedia products, you learnt what makes a product good or bad. You need to apply these principles to review your own interactive multimedia product and suggest how it might be improved.

You need to ask others to use and comment on your interactive multimedia product and documentation.

11.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 11: Interactive multimedia products

What you need to do:

Your evidence needs to include:

a: [AO2] a review of **two** commercially-produced interactive multimedia products, showing how their design influenced the design of the interactive multimedia product that you produce [**5**];

b: [AO3/4] detailed designs, of which **one** is chosen as the design for the final product [**12**];

c: [AO1/3] a multimedia product to meet the client's requirements [**21**];

d: [AO4] a detailed test plan [**3**];

e: [AO2] a detailed user guide [**3**];

f: [AO4] a review of both the interactive multimedia product that you produced and your personal performance [**6**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You describe **two** multimedia products; **[0 1]**	you describe **two** multimedia products and compare like with like to draw some conclusions about the design of your final product; **[2 3]**	you produce a report which evaluates **two** commercial multimedia products, discusses the good and the bad points of each, and fully explains how each product has influenced the design of your final product. **[4 5]**	**/5**
b	**AO3**	You produce more than **one** simple design; **[0 1 2]**	you produce more than **one** design plan; **[3 4]**	you produce more than **one** clear and detailed design plan. **[5 6]**	**/12**
	AO4	You comment on the effectiveness of your designs; **[0 1 2]**	you identify the strengths and weaknesses of your designs and use these to choose which design to implement; **[3 4]**	you provide a critical analysis of your designs – you identify their strengths and weaknesses and use these to choose which design to implement. **[5 6]**	
c	**AO1**	You develop a multimedia solution that meets the client's brief; you identify some of the ICT skills that you have used; **[0 1 2 3 4 5]**	you develop a multimedia solution that meets the client's brief – in doing so, you develop your range of ICT skills; you identify the range of ICT skills that you have used; **[6 7 8 9 10]**	you develop a multimedia solution that meets the client's brief – in doing so, you use your initiative to develop and extend your range of ICT skills as required by the solution; you identify the range of ICT skills that you have used. **[11 12 13 14 15]**	**/21**
	AO3	You apply your knowledge to create a solution to the client's brief; **[0 1 2]**	you apply your knowledge and skills to create an effective solution to the client's brief, making good use of design and layout facilities; **[3 4]**	you apply your knowledge and skills to create a complete solution to a complex problem that shows effective use of design, layout and a range of interactive features. **[5 6]**	

Unit 11: Interactive multimedia products (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
d	**AO4**	You produce a test plan to check that your multimedia product meets the requirements of the design specification; **[0 1]**	you produce a detailed test plan and use it to test your multimedia product; **[2]**	you produce a detailed test plan which tests all aspects of the multimedia product, and revise the product if necessary. **[3]**	**/3**
e	**AO2**	You produce clear user documentation that includes an explanation of the purpose of your multimedia presentation, its system requirements and how to install and use it; **[0 1]**	you produce clear user documentation that includes an explanation of the purpose of your multimedia presentation, its system requirements, and how to install and use it, together with explanations of technical aspects of the solution; **[2]**	you produce clear user documentation, making good use of graphic images and detailed instructions for use; the guide includes an explanation of the purpose of your multimedia presentation, its system requirements and how to install and use it, together with explanations of technical aspects of the solution. **[3]**	**/3**
f	**AO4**	You comment on the effectiveness of your final solution, with some overall indication of how the work may be improved in the future; you comment on your actions and role in solving the problem and identify areas for improvement; your report may contain errors in spelling, punctuation and grammar; **[0 1 2]**	you include an analysis of your final solution, taking account of the user's feedback, identifying the strengths and weaknesses in order to identify how the work may be improved in the future; you include an analysis on your own performance by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; your report contains few spelling, punctuation and grammar errors; **[3 4]**	you provide a full critical analysis of your final solution, identifying how well it meets the initial brief, taking account of user feedback in order to identify how the work may be improved in the future; you include an analysis on your own performance by identifying strengths and weaknesses and use this analysis to show how you will address these issues to be more effective in the future; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors. **[5 6]**	**/6**
				Total mark awarded:	**/50**

11.4 GUIDANCE FOR TEACHERS

11.4.1 Guidance on Delivery

This unit allows candidates the opportunity to develop skills in producing an interactive multimedia product. Candidates will be required to produce an interactive multimedia product to suit a given brief for **one** organisation. The interactive multimedia product needs to combine text, graphics and where appropriate, movement and sound, as well as further features of the specific form of product involved.

There will be opportunities for candidates to obtain briefs from real clients or during work experience. Equally, it would be valid to obtain real or simulated briefs from staff within the centre.

It is important that candidates have a good understanding of the effects of different elements of an interactive multimedia product and are able to combine those elements for their multimedia product. In order to create good quality products, candidates need to study the range of specific software available for the creation of interactive multimedia. There is a range of specialised software packages available for developing multimedia products and it is expected that most candidates will use **one** of these.

Candidates need to produce an interactive multimedia product to meet the needs of a given brief. The initial brief needs to be sufficiently demanding so as to allow them to show sufficient proficiency in their major product. Having been set a brief, candidates need to create a design for their product. Candidates also need to produce a user guide for the multimedia product.

Candidates need to keep a record of the skills that they acquire in order to complete their solution. Opportunity needs to be made available for candidates to use their own initiative to discover new skills and techniques required.

Once candidates have completed the brief, they need to evaluate their role in the process of producing the interactive multimedia product and the extent to which their products meet the client's requirements.

11.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 11.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates produce a description of **two** multimedia products, with no comparison or conclusions drawn;
		2	candidates produce a description of **two** multimedia products, with comparisons drawn; there is some indication of how these comparisons will inform the design of the final product;
		3	candidates produce, at the lower end of this mark band, a written report that considers all aspects but gives a more general description of each aspect and does not fully explain the influence of each on the final design; candidates produce, at the top end of this mark band, a full report that discusses the good and bad points of each product under review and fully explains how each product has influenced the design of the final product.
b	**AO3**	**1**	Candidates produce some evidence of having planned the final product;
		2	candidates produce initial design plans of the content, with some indication of the route through the product;
		3	candidates produce full design plans, including content and the paths through the product; the chosen plan needs to be reflected in the structure of the final product.
	AO4	**1**	Candidates include some comments about how well each design fits the brief; the higher marks within this mark band will be awarded for including some indication as to why the final design was chosen;
		2	candidates produce an evaluation of their designs, with the beginnings of a reasoned argument about which design was chosen as the final structure;
		3	candidates produce a critical analysis of their designs, ranging from an overall review of all **three** with the beginnings of a reasoned argument about which design was chosen as the final structure, through to a step-by-step analysis of each design, considering good and bad points, with a clearly argued explanation of why the final design was chosen.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO1	1	Candidate produce a multimedia product to meet the brief and can identify some of the skills that have been used;
		2	candidates produce a multimedia product to meet the brief; candidates use new skills in producing the multimedia product, but the development and suggestion of which skills to use is mainly based on advice and training from others;
		3	Candidates produce a multimedia product to meet the brief; candidates show independence in choosing which software to use and how it is to be used.
	AO3	1	Candidates produce a multimedia product that meets the client's brief;
		2	candidates create an effective solution to the client's brief, making good use of design and layout facilities; the solution demonstrates good understanding of design and the end product is easy to use;
		3	candidates create a complete solution to a complex problem that shows effective use of design, layout and a range of interactive features; the solution demonstrates a good use of multimedia facilities as appropriate, e.g. sound and animation is incorporated; the product is suited to the user's needs.
d	AO4	1	Candidates plan what elements to test in the product and how each is to be tested;
		2	candidates test each element of the product in a predetermined manner and compare the actual results of each test to the expected result;
		3	candidates test each element of the product in a predetermined manner and compare the actual results of each test to the expected result and use the results of those tests to revise the product.
e	AO2	1	Candidates produce a simple text-based guide;
		2	candidates produce a guide with some images from the presentation;
		3	candidates produce a full and clear guide that explains how to use the product, with images taken from the product to clarify points made.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
f	AO4	1	Candidates give a basic comparison of their product as a whole to the requirement of the brief; candidates comment on the steps that they went through to create a multimedia product;
		2	candidates are able to use their own assessment of their product and the views of others to comment on their product as a whole and suggest some improvements; candidates explain the steps that they went through to create a multimedia product;
		3	candidates make use of feedback from users to assess each element of the product and its general structure; candidates are able to use their own assessment of their product, linking it back to the initial brief, and suggest improvements; candidates explain the steps they went through to create a web page and host it online, additionally they identify, from experience, how they would improve their technique to solve the problem if they were to repeat the process.

11.4.3 Resources

Websites	http://animation.about.com/?once=true& http://graphicssoft.about.com/library/weekly/aa000104a.htm?terms=multimedia#mma http://www.cs.cf.ac.uk/Dave/Multimedia/node26.html

12 Unit 12: Publishing
[A2 level, optional, internally assessed]

12.1 ABOUT THIS UNIT

This A2 level unit is optional and is internally assessed.

This unit helps you to:

- appreciate the uses of desktop publishing (DTP), and word processing packages and their capabilities, and apply them to a variety of tasks;
- recognise the variety of documents produced using DTP facilities and the range of hardware and software available for this purpose;
- sample the kind of work undertaken by designers, illustrators, newspaper artists and draughtspersons.

In this unit you need to:

- work alongside a client whose needs you must meet;
- research a brief, plan a response and produce a quality solution;
- produce information that communicates effectively and accurately, taking into account the needs of the audience; the document will be fit for purpose;
- extend previous DTP work;
- combine information of different types to create complex documents;
- produce draft documents for approval;
- use customising and automating tools and techniques to produce professional-looking, complex documents, e.g. newsletters, journals, complex reports.

This unit will be assessed through your portfolio work only. The mark on that assessment will be your mark for the unit. You will produce:

- notes taken during an initial, and any subsequent, meeting with a client, negotiating and amending a brief for the production of a camera ready copy (CRC) document;
- evidence of the drafting and production of a CRC of your final document to meet the brief and, in doing so, you will show that you can create and capture images, as well as import material from other packages, utilise object libraries such as clip art, and select and further develop images to meet the style and content of the final copy, as negotiated with the client;
- a CRC document, of at least **ten** pages, that combines different types of information presented to the client for approval, together with a letter which correctly describes the final production stage and external factors which may affect completion of the final published document;
- an evaluation of both the layout and content of your final copy and your performance.

12.2 WHAT YOU NEED TO LEARN

You need to learn about:

- document types and presentation styles;
- combining information;
- researching a brief, planning your response and presenting your solutions;
- the final printed output.

12.2.1 Document Types and Presentation Styles

You need to learn how publishing techniques are applied to create a variety of presentation styles for the following document types:

- billboards and posters;
- books and manuals;
- brochures/leaflets and newsletters;
- forms and mailshots;
- magazines and newspapers;
- reports;
- suites of stationery.

12.2.2 Combining Information

You need to combine information of various types using different file types, including:

- image files;
- word processed files;
- text files;
- databases;
- chart and graph files;
- compressed files.

You need to convert files to a suitable format where necessary.

You need to effectively use the appropriate editing and formatting tools and techniques in documents, including:

- headings, sub-headings;
- body text;
- footnotes, endnotes;
- bullets, lists;
- tabs;
- drawing more complex shapes using grouping, layers, filters;
- figure captions, figure numbers;
- headers, footers;
- tables.

You need to edit your document and use editing tools for:

- setting margins (top, bottom, left, right);
- formatting (setting attributes, fonts, case);
- justification (centre, left/unjustified, right, full/justified);
- tabulation, columns, gutters;
- leading, kerning;
- alignment (vertical, horizontal, indentation);
- pagination, avoiding widows/orphans;
- grammar check, spell check, hyphenation control.

You need to apply the following text attributes into documents:

- bold, underline, italics;
- superscript, subscript;
- overscore;
- case (upper, lower);
- font size and style.

You need to understand page layout techniques and apply them in your work, including:

- design of appropriate structures and styles for sections of a document;
- techniques for text boxes;
- layering;
- borders;
- shading;
- headers/footers;
- indexes, tables of contents, cross references;
- watermarks.

12.2.3 Research into a Brief, Planning of your Response and Presentation of your Solutions

The publishing industry has set procedures that are used when planning and presenting a document. You need to learn about:

- the drafts/design stage;
- the enhancement of presentation of text;
- the final production stages;
- procedures for coping with external factors.

When you are producing your own documents, you also need to follow these procedures. For the drafts/design stage, this will include:

- following house-styles;
- creating master page layouts;
- presenting page proofs for reading;
- the use of white space;
- producing artwork sketches;
- setting text orientation;
- creating style sheets.

For the enhancement of presentation of text, you need to know about and, where appropriate, use:

- watermarks;
- 'greeking' and 'latining';
- repeating elements;
- special characters, such as Greek characters used in mathematical material, en-rules used for dashes and ellipses used to indicate omissions;
- ruler grid lines;
- callouts/labels;
- automatic generation, e.g. of notes, an index and a contents list.

You need to understand and use correctly, the terms that describe the final production stages:

- colours of print, e.g. CMYK separation, and paper;
- paper weights and sizes, e.g. 80 gsm, A4;
- CRC (camera ready copy) – the final layout of a page, looking exactly as it should appear when it is published;
- binding/folding;
- proof reading;
- printing devices and services;
- proof reading symbols according to BS 5261 Part 2 (1976).

External factors may also affect the production process. You need to learn about the effect these factors have and how to cope with them, including:

- problems that may arise, such as meeting deadlines, and working within a team of freelancers;
- legislation (copyright) and how to obtain permissions for use of copyright material.

You will be given a commission to produce material for a client and you need to:

- negotiate a brief with the client;
- consider ICT tools available;
- choose a suitable solution to match the intended audience and to meet the needs of your client;
- plan your presentation of your portfolio of ideas to your client;
- get product approval from your client.

12.2.4 Final Printed Output

You need to know what range of effects can be achieved by printing on different types of printer (laser, dot-matrix, bubble-jet, colour, monochrome) and on different media (different colours and qualities of paper, fabrics, acetate).

You need to understand the effect of printer resolution on the quality of the final image.

12.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 12: Publishing

What you need to do:

Your evidence needs to include:

a: [AO2] notes taken during an initial, and any subsequent, meeting with a client, negotiating and amending a brief for the production of a camera ready copy (CRC) document [**5**];

b: [AO1/3] evidence of the drafting and production of a CRC of your final document to meet the brief and, in doing so, show that you can create and capture images, as well as import material from other packages, utilise object libraries such as clip art, and select and further develop images to meet the style and content of the final copy as negotiated with the client [**21**];

c: [AO1/2] a CRC document, of at least **ten** pages, that combines different types of information presented to the client for approval together with a letter which correctly describes the final production stage and external factors which may affect completion of the final published document [**9**];

d: [AO4] an evaluation of both the layout and content of your final copy and your performance [**15**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You produce notes taken during the negotiation of a brief with the client that evidence discussion of possible software solutions together with some discussion of alternative solutions; you do not consider deadlines; **[0 1 2]**	you produce notes taken during the negotiation and subsequent meetings with the client that evidence a full discussion of possible software solutions, together with a full discussion of alternative solutions; you agree deadlines; **[3 4]**	you produce notes taken during the negotiation and subsequent meetings with the client that fully evidence all discussions of all possible software solutions together with the implications of each of these solutions; you agree deadlines. **[5]**	**/5**
b	**AO1**	You produce different types of information to be used in the final copy; **[0 1 2 3]**	you produce different types of information for inclusion in the final copy, some of which need to show evidence of information having been manipulated to explore different styles of presentation; **[4 5 6]**	you produce, edit and use a variety of types of information for inclusion in the final copy, showing clear evidence of the use of a comprehensive range of editing and manipulation tools available within the appropriate applications package in order to explore different means of presenting the same information. **[7 8 9]**	**/21**
	AO3	You follow the design stage processes, including most of the following: sketching different initial document designs, following housestyle, creating master page layouts, presenting page proofs, producing artwork sketches, setting text orientation and creating style sheets; **[0 1 2 3 4]**	you follow and demonstrate through annotation all design stage processes, including sketching different initial document designs, following housestyle, creating master page layouts, presenting page proofs, producing artwork sketches, setting text orientation and creating style sheets; **[5 6 7 8]**	you follow and demonstrate through identification and explanation all design stage processes, including sketching different initial document designs, following housestyle, creating master page layouts, presenting page proofs, producing artwork sketches, setting text orientation and creating style sheets. **[9 10 11 12]**	

Unit 12: Publishing (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO1**	You produce a CRC of the agreed design that combines information; the document is appropriate for the audience and is free from errors; there is little evidence of the use of editing and formatting techniques; **[0 1 2]**	you produce a CRC of the agreed design that combines information used in an appropriate manner; the document shows clear evidence of using more than **four** text styles, more than **two** text attributes, and of editing a piece of imported text; **[3 4]**	you will produce a CRC of the agreed design that combines information used in an appropriate manner; the document shows clear evidence of using more than **four** text styles, more than **two** text attributes, and of editing a piece of imported text; there is clear evidence of the effective use of advanced editing and formatting techniques. **[5 6]**	
	AO2	You produce a final letter that presents the CRC to the client for their approval with little or no consideration of how the project could be broken down into a series of stages; **[0 1]**	you produce a final letter that presents the CRC document to the client for their approval, together with a full breakdown of the further stages required in the production of the final published document; **[2]**	you produce a final letter that presents the CRC document to the client for their approval, together with a full breakdown of the further stages required in the production of the final published document; the letter also explains how the final product can be altered at a later stage. **[3]**	**/9**
d	**AO4**	You comment on the effectiveness of the CRC, with some overall indication of how the work may be improved, together with a description of how the CRC document was produced, with some suggestions as to how they may be more efficient in the future; your report may contain errors in spelling, punctuation and grammar; you comment on your actions and role in solving the problem and identify areas for improvement; **[0 1 2 3 4 5]**	you provide an analysis of the CRC, identifying the strengths and weaknesses in order to refine the solution, taking account of the client's feedback together with a description of how you produced the CRC document; your report contains few spelling, punctuation and grammar errors; you include an analysis on your own performance by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; **[6 7 8 9 10]**	you provide a full critical analysis of the CRC, identifying how well it meets the initial brief and any subsequent refinements, taking account of user feedback, together with a discussion of how you produced the CRC document following the negotiation of the brief through to the submission of the document for approval; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors; you include an analysis on your own performance by identifying strengths and weaknesses and use this analysis to show how you will address these issues to be more effective in the future. **[11 12 13 14 15]**	**/15**
				Total mark awarded:	**/50**

12.4 GUIDANCE FOR TEACHERS

12.4.1 Guidance on Delivery

The emphasis of this unit is for candidates to produce a quality solution to a design brief, negotiated with a client, for a document that is to be published. Candidates will be required to produce a camera ready copy (CRC) of their final document which needs to be submitted to the client, along with further instructions explaining the remaining elements of the publishing process. The CRC will combine suitable text and images selected from a range, some of which will be produced in preparation by candidates. This will involve candidates in using both graphics and word processing software to a high level. The final CRC will benefit from being produced using desktop-publishing software. The document should be of sufficient length and complexity to allow a candidate to use a variety of information and editing techniques.

There will be opportunities for candidates to obtain briefs from real clients or during work experience. Equally, it would be valid to obtain real or simulated briefs from staff within the centre.

Candidates would benefit from access to a variety of graphic design, spreadsheet, database, word processing and DTP software. Candidates will further benefit from having access to microprocessor systems that have sufficiently fast processing, large RAM and sufficient storage space. In order to allow candidates the opportunity to cover the full range of tasks required for this unit, centres are advised, where possible, to make use of scanning equipment, digital cameras and video recorders. In order to fully evidence the quality and range of work produced during the unit, candidates will also need access to both black and white and colour printers.

Candidates need to involve the client throughout the drafting and production of the finished product and comments made by the client need to be reflected in the production of the finished product.

12.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 12.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates produce basic notes of the initial discussion with the client – it is clear from these notes that candidates have been able to suggest some software solutions in general terms, but have been unable to suggest alternative approaches to the solution of the problem; these notes include details of the material to be included in the final document, examples of previously published materials to be used as a guide to house-style, and a schedule for completion of the work;
		2	candidates produce notes of the initial discussion with the client – it is clear from these notes that candidates have been able to suggest some possible alternative solutions to the problem but this has been limited to discussion of the software only and not to the implications of using the software; deadlines are agreed with the client and they are kept; the notes include details of the material to be included in the final document, examples of previously published materials to be used as a guide to house-style and a schedule for completion of the work;
		3	candidates produce notes of the initial discussion with the client – it is clear from these notes that candidates have been able to both suggest alternative solutions to the problem and explain to the client the full advantages and disadvantages of the use of these alternative software packages, so that the client is well equipped to make informed decisions about which software should be used; deadlines are agreed with the client and they are kept; the notes include details of the material to be included in the final document, examples of previously published materials to be used as a guide to house-style, a schedule for completion of the work and documentation of amendments.
b	**AO1**	**1**	Candidates produce some information that needs to be imported into the final document, e.g. initial ideas for images, simple text file;
		2	candidates produce different types of information that need to be imported into the final document, e.g. images for inclusion into the final product, text file, database information; examples of manipulation could include images having been edited using some tools available in the computer graphics software, or using mail merge facilities with a database;
		3	candidates produce a variety of information for inclusion in the final product; candidates use advanced editing techniques such as mail merge, improve efficiency by using hyperlinks, OLE (object linked embedding), and alter images using a range of tools available within graphics packages.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b	AO3	1	Candidates produce some analysis of previously published material and use this research to produce at least **three** different design plans of a standard and quality to suit the needs of the client – this work does not necessarily meet the needs of the brief;
		2	candidates produce reasonably detailed analysis of house-style leading from an analysis of previously published material – they use this to produce a final CRC that partially meets the design brief;
		3	candidates produce reasonably detailed analysis of house-style leading from an analysis of previously published material – they use this to produce a final CRC that fully meets the design brief.
c	AO1	1	Candidates create a document that meets the client's brief; the document does not have any errors in it;
		2	candidates create a document that demonstrates the inclusion of a variety of information and formatting techniques;
		3	candidates create a document that is almost professional in quality and incorporates advanced editing and formatting techniques, such as OLE, merging information from a database.
	AO2	1	Candidates produce a letter to the client that is professional in appearance;
		2	candidates identify some of the further stages of production, with no real breakdown of the stages; they produce a letter to the client that is professional in appearance;
		3	candidates identify and break down the further stages of production; they produce a letter to the client that is professional in appearance.
d	AO4	1	Candidates describe the CRC in general terms and are able to give some very general indications of how the work may be improved in the future, but these improvements will be, at best, general and will not concentrate on specific choice or use of software in any detail;
		2	candidates compare their product to the standards set by both the client's previously produced material and the relevant industry – they are aware that there may be differences between their work and the standards set and give some ways in which this may be remedied in the future, although, at the lower end of this mark band, this tends to concentrate on the document as a whole and not on the quality of writing or of individual images; at the higher end of this mark band, there are the beginnings of a full analysis of all images and text used, both in terms of content and quality; the description of their role in the process shows some awareness of the issues involved and candidates suggest realistic improvements;

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	**AO4**	**3**	candidates evaluate the CRC to see how well it meets the client's requirements, as set out by the initial brief and any further additions to the brief, the house-style and the standards set by similar documents used within the relevant industry and make recommendations for further improvement; at the higher end of this mark band, candidates include discussion of each image and piece of text, and show that the decision to include them was the result of referring back to an identified house-style and the negotiated brief; candidates evaluate their role in the process of producing the CRC from the negotiation of the initial brief through to the production of the CRC, together with a full discussion of their strengths and weaknesses and a reflection on how they may address these issues to be more effective in the future.

12.4.3 Resources

Publications	A full copy of proof-reading symbols required for use in this unit may be obtained by requesting BS 5261 Part 2 (1976) from: *British Standards Institution*, 2 Park Street, London W1A 2BS.
Textbooks	A useful resource for gaining an in-depth knowledge of the publishing process: Butcher J *The Cambridge Handbook: Copy-editing for Editors, Authors and Publishers* CUP 052 140 074 0

13 Unit 13: Artwork and Imaging
[A2 level, optional, internally assessed]

13.1 ABOUT THIS UNIT

This A2 level unit is optional and is internally assessed.

This unit helps you to:

- develop skills needed when producing artwork for inclusion in publications;
- improve your skills in creating and modifying artwork and images for display;
- understand the kind of work undertaken by designers, illustrators, newspaper artists and draughtspersons;
- understand the laws and guidelines that relate to the use of ICT.

In this unit you will:

- extend previous ICT graphics work;
- cover the skills and techniques used in the creation of more complex artwork and images, such as editing photos;
- work alongside a client whose needs you must meet;
- research a brief, plan a response, and produce a quality solution.

The unit builds on Unit 1: *Using ICT to communicate*. It has links with Unit 11: *Interactive multimedia products*, Unit 12: *Publishing* and Unit 14: *Developing and creating websites*. It could also complement GCE A/AS level work in Art and in Design and Technology.

This unit may be useful if you want to use your artistic skills along with your ICT skills in your career.

This unit will be assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce:

- a portfolio of artwork samples produced to demonstrate a range of artwork skills;
- evidence of the development of computer artwork, using a variety of graphics software, following negotiation of a brief from a client, from initial ideas to final product accepted by the client, to include:
  – a range of initial proposals in response to a complex problem;
  – development of a final product, showing editing techniques;
- an evaluation of both the final product, including consideration of the hardware and software used, and your own performance.

13.2 WHAT YOU NEED TO LEARN

You need to learn about:

- developing artwork and images;
- editing artwork and images;
- file formats;
- final printed output;
- laws and guidelines;
- researching a brief, planning your response and presenting your solutions.

It is important to know how to produce information that communicates effectively and accurately and is fit for purpose and meets the needs of the audience.

13.2.1 Development of Artwork and Images

Images may be created freehand or taken from existing sources. You need to learn how to capture images from different sources, such as:

- digital cameras;
- video cameras and players;
- scanners;
- on-line information systems.

You then need to develop images by:

- drawing basic shapes;
- creating artwork by combining text, pictures and basic shapes;
- choosing the most appropriate software tools and techniques for creating artwork and images, for example:
  – use layers for different components;
  – use different styles (text, line, fill);
  – apply shading and rendering;
  – import images;
  – include the features of object overlay, borders;
  – control grid spacing and snap to grid;
  – use appropriate scaling;
  – include polygons;
  – utilise object libraries, including clip art;
  – sharpening;
  – removing scratches/blemishes;
  – darkening/lightening shadows (dodge/burn);
  – colour correction (loading);
  – control page size and orientation;
  – use different styles (text, brush, fill);
  – use tools to cut and paste, copy, crop and mask;
  – include polygons;
  – use colour (hue, tint and saturation), colour inversion and key colour;
  – apply colour separation and balance (CMYK, RBG);

– apply shading and rendering;
– repeat a pattern (full, half drop);
– understand technical terms, for example, washing, dithering, pixellation, posterisation, edge-finding and distortion, and apply them appropriately;
– take account of the image resolution and method of output e.g. screen, hardcopy.

13.2.2 Editing Artwork and Images

You need to:

- use basic tools and techniques that are appropriate, such as:
  – transform, scale, rotate, distort filters, effects, colour balance, levels and curves, masks and layers;
  – layering, grouping, 3D objects and tracing;
- change the resolution, colour depth and file formats to suit different users;
- adjust images to ensure compatability between different software and operating systems.

13.2.3 File Formats

You need to know:

- how to save files:
  – in digital picture format , e.g. jpeg, psd;
  – as bitmaps, bmp;
  – as vector graphics, e.g. syg, eps;
- which file formats:
  – take up more/less space;
  – are suitable for websites;
  – are application specific;
  – are more generic, e.g. psd, html;
- the concepts and limitations of different image file formats;
- the impact on file size and image quality of:
  – file format;
  – compression technique;
  – image resolution;
  – colour depth;
- how to save files efficiently and effectively for the intended use.

13.2.4 Final Printed Output

You need to know what range of effects can be achieved by printing on different types of printer (laser, dot-matrix, bubble-jet, colour, monochrome) and on different media (different colours and qualities of paper, fabrics, acetate).

You need to understand:

- the effect of printer resolution on the quality of the final image;
- the processes that are used by commercial business to print images.

13.2.5 Laws and Guidelines

You need know what guidelines and laws affect the day-to-day use of ICT, for example:

- Data Protection Act;
- Equal Opportunities;
- Disability;
- Health and Safety;
- Copyright.

13.2.6 Research into a Brief, Planning of your Response and Presentation of your Solutions

Before a client will consider you for a commission, you need to prove the quality of the work you can do. For this, you need to produce a portfolio of work, in which you need to show that you are able to offer a range of styles. This portfolio may include:

- simple line drawings with a consistent labelling style;
- simple statistical charts, e.g. pie charts, bar charts and graphs, all suitably labelled and with effective use of space and colour;
- boxed charts showing a sequence of events or activities, with the boxes appropriately linked and suitably labelled, and demonstrating effective use of line styles;
- a variety of icons to punctuate a text, e.g. to show which keys are to be depressed, to identify an activity is needed at this point, or to enclose an important fact;
- different background styles, e.g. using a graph paper style for graphs, presenting charts on a background as it may appear in your workbook, presenting newspaper articles to look like extracts from a newspaper, making a shopping list look hand-written on a notepad;
- scientific and mathematical material, e.g. chemical formulae, or mathematical diagrams including common shapes with angles marked appropriately, or complex diagrams (such as of the construction of the eye or ear in Biology, or soil composition in Geography, and so on) all suitably laid out and labelled;
- hand-drawn cartoons or sketches to illustrate a point;
- a variety of styles to meet the needs of different audiences, e.g. for very young children, for college candidates, or for those interested in a particular hobby.

You will be given a commission to produce material for a client and you need to:

- negotiate a brief with the client;
- consider ICT tools available;
- choose a suitable solution to meet the needs of your client;
- plan your presentation of your portfolio of ideas to your client;
- get product approval from your client.

13.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 13: Artwork and imaging

What you need to do:

Your evidence needs to include:

a: [AO1] a portfolio of artwork samples produced to demonstrate a range of artwork skills [**9**];

b: evidence of the development of computer artwork, using a variety of graphics software, following negotiation of a brief from a client, from initial ideas to final product accepted by the client, to include:

(i) [AO2/4] a range of initial proposals in response to a complex problem [**14**];

(ii) [AO1/3] development of a final product, showing editing techniques [**18**];

c: [AO4] an evaluation of both the final product, including consideration of the hardware and software used, and an evaluation of your own performance [**9**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO1**	You show your competence in using a variety of ICT tools by including, in your artwork, samples of at least **one** example of **each** of: simple line drawings, simple statistical charts and boxed charts suitably scaled, icons, background styles and repeated patterns, scientific and mathematical material and the use of colour, colour inversion, colour separation and balance; **[0 1 2 3]**	you show your competence in using a variety of ICT tools by including, in your artwork, samples of at least **one** example of **each** of: simple line drawings, simple statistical charts and boxed charts suitably scaled, icons, background styles and repeated patterns, scientific and mathematical material and the use of colour, colour inversion, colour separation and balance, some of which must show evidence of images having been manipulated to explore different styles of presentation using ICT methods; **[4 5 6]**	you show your competence in using a variety of ICT tools by including, in your artwork, samples of at least **one** example of **each** of: simple line drawings, simple statistical charts and boxed charts suitably scaled, icons, background styles and repeated patterns, scientific and mathematical material and the use of colour, colour inversion, colour separation and balance, showing clear evidence of the use of a comprehensive range of advanced editing and manipulation tools available within the chosen graphics package, in order to explore different means of presenting the same image using ICT methods. **[7 8 9]**	**/9**
b(i)	**AO2**	You produce initial ideas in the form of sketches, either using ICT or non-ICT methods, in response to a client brief; you consider possible software solutions, together with some discussion of alternative solutions; **[0 1 2 3]**	you produce several different proposals and then justify and develop **one** idea in response to client feedback; **[4 5 6]**	you produce several different proposals and then justify and develop **one** idea in response to client feedback, together with a full discussion of the implications of the solution. **[7 8]**	**/14**
	AO4	You comment on the effectiveness of your designs; your evaluation may contain errors in spelling, punctuation and grammar; **[0 1 2]**	you identify the strengths and weaknesses of your designs, and use these to inform your choice of which design to implement; your evaluation contains few spelling, punctuation and grammar errors; **[3 4]**	you provide a critical analysis of your designs – you identify their strengths and weaknesses and use these to inform your choice of which design to implement ; your report is consistently well-structured and there are few, if any, spelling, punctuation and grammar errors. **[5 6]**	

Unit 13: Artwork and imaging (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
b(ii)	**AO1**	You identify some of the ICT skills that you have used; **[0 1 2]**	you identify the range of ICT skills that you have used; **[3 4]**	you use your initiative to develop and extend your range of ICT skills as required by the solution; you identify the range of ICT skills that you have used. **[5 6]**	**/18**
	AO3	You show development of a final product and, in doing so, show that you can create, capture and develop images, import material from other packages and use object libraries including clip art; **[0 1 2 3 4]**	you show development of a final product, taking account of client feedback, and, in doing so, show that you can create, capture and develop images, import material from other packages and use object libraries including clip art; **[5 6 7 8]**	you show development of a final product taking account of client feedback, and, in doing so, show you can be critical in selecting appropriate material for inclusion in the final product; you demonstrate individuality and imagination; you show that you can use a comprehensive range of ICT tools to produce a professional standard of artwork. **[9 10 11 12]**	
c	**AO4**	You comment on the effectiveness of the final product, with some overall indication of how the work may be improved, together with some suggestions as to how they may be improved in the future; you identify an appropriate printer type, resolution and media; you comment on your actions and role in solving the problem and identify areas for improvement; **[0 1 2 3]**	you provide an analysis of your final product, identifying the strengths and weaknesses in order to refine the solution; you detail an appropriate printer type, resolution and media; you include an analysis of your own performance by identifying your strengths and weaknesses, with some suggestions for improvement to the overall process; **[4 5 6]**	you provide a full critical analysis of your final product, identifying how well it meets the client brief; you detail an appropriate printer type, resolution and media; you include an analysis of your own performance by identifying your strengths and weaknesses, together with a reflection on how you could address these issues to be more effective in the future. **[7 8 9]**	**/9**
				Total mark awarded:	**/50**

13.4 GUIDANCE FOR TEACHERS

13.4.1 Guidance on Delivery

The emphasis of this unit is for candidates to produce a quality solution to an artwork brief. This will involve them in researching a need, examples of which include:

- graphics for a presentation (open day talk, candidate presentation);
- computer-aided drawings (circuit board design, kitchen planning, garden planning, architectural design, maps);
- computer-generated painting (design, advertising, Fine Art (expressive and observational)).

There may be opportunities for candidates to obtain such briefs from real clients or during work experience. Equally, it would be valid to obtain real or simulated briefs from staff and candidates within the centre.

The quantity of evidence required is intended to allow candidates to demonstrate a range of ICT techniques. It needs to be emphasised that they are not expected to produce work that includes all techniques in the final product; however, they need to include a comprehensive sample of material in their sample portfolio. Candidates need to study existing images to develop their understanding of those software techniques and hardware effects that they cannot experience directly.

Critical feedback and evaluation may be given by the client to the candidate and should then be reflected on by the candidate. Alternatively, candidates may demonstrate their ability to evaluate by criticism of existing images that formed part of their research. They may also demonstrate it by giving advice to peers.

You may envisage only a small group of candidates as having the requisite artistic talent needed to achieve distinction in this unit. It may be possible to co-teach this unit with Unit 12: *Publishing*, allowing those candidates with greater talent to study this unit either instead of, or as well as, Unit 12.

13.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 13.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO1**	**1**	Candidates use a variety of ICT tools (including bit-mapped and vector based) to produce at least **one** example of each of: simple line drawings, statistical charts and boxed charts suitably scaled icons, background styles and repeating patterns, scientific and mathematical material and the use of colour, colour separation and balance;
		2	additionally, candidates edit/manipulate, e.g. alter colours or shading, some of the images in their portfolio;
		3	candidates show individuality and imagination in their sample artwork and their finished product; they also show that they can use a comprehensive range of ICT tools to produce a professional standard of artwork; candidates explore different ways of presenting the same image by manipulating at least **one** image several times.
b(i)	**AO2**	**1**	Candidates suggest some software solutions in general terms, but are unable to suggest alternative approaches to the solution of the problem;
		2	candidates suggest some possible alternative solutions to the problem, but this is limited to discussion of the software only and not to the implications of using the software;
		3	candidates both suggest alternative solutions to the problem and explain to the client the full advantages and disadvantages of the use of these alternative software packages, so that the client is well-equipped to make informed decisions about which software should be used.
	AO4	**1**	Candidates give a basic comparison of their designs as a whole to the requirement of the brief;
		2	candidates comment using their own assessment of their designs; they identify both advantages and disadvantages of each design;
		3	candidates make an informed assessment of their designs; their analysis looks at both advantages and disadvantages of each design and candidates draw on these to make a reasoned argument for the design which is implemented;

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b(ii)	AO1	1	Candidates list some of the editing and manipulation techniques that they have used;
		2	candidates list most of the editing and manipulation techniques that they have used;
		3	candidates list all of the editing and manipulation techniques that they have used; additionally, they identify and list the manipulation techniques that they have learnt autonomously in order to complete the task.
	AO3	1	Candidates create, capture, and develop images, import material from other packages and use object libraries including clip art;
		2	additionally, candidates show that they use user feedback to refine their artwork and make decisions on the artwork to be used in the final product;
		3	candidates are critical in their selection of material for inclusion in their final product; they discuss both positive and negative points of their artwork and use this information to explain the inclusion/exclusion of artwork in the final product; candidates use a variety of methods to capture and develop images.
c	AO4	1	Candidates identify the appropriateness of the solution; they link it back to the original user objectives; candidates also make a comment on the method that they used to produce a solution, e.g. they identify whether they broke the task into sub-tasks; candidates identify an appropriate printer type and media and an appropriate resolution;
		2	additionally, candidates identify some of the strengths and weaknesses of their solution and the method that they used to tackle the problem; candidates identify at least **one** way that they could improve their method to produce a solution in the future;
		3	additionally, candidates offer knowledge of most of the strengths and weaknesses of their solution and the method that they used to tackle the problem; candidates offer a number of ways that they could improve their performance in the future, e.g. acquire different ICT skills.

13.4.3 Resources

Candidates would benefit from access to a variety of graphic design, word processing and DTP software. Candidates will further benefit from having access to microprocessor systems that have sufficiently fast processing, large RAM and sufficient storage space. In order to allow candidates the opportunity to cover the full range of tasks required for this unit, centres are advised, where possible, to make use of scanning equipment, digital cameras and video recorders. In order to fully evidence the quality and range of work produced during the unit, candidates also need access to both black and white and colour printers.

Publications	A full copy of proof-reading symbols required for use in this unit may be obtained by requesting BS 5261 Part 2 (1976) from: *British Standards Institution*, 2 Park Street, London W1A 2BS.
Textbooks	A useful resource for gaining an in-depth knowledge of the publishing process: Butcher J *The Cambridge Handbook: Copy-Editing for Editors, Authors and Publishers* CUP 052 140 074 0

14 Unit 14: Developing and Creating Websites
[A2 level, optional, internally assessed]

14.1 ABOUT THIS UNIT

This A2 level unit is optional and is internally assessed.

This unit helps you to understand:

- the requirements for setting up a website;
- terminology relating to the Internet;
- the differences in the range of web programming languages available for developing web pages and components within them;
- the differences between Internet and intranet sites, and the network security implications of running web servers.

In this unit you need to use software to develop web pages to convey relevant information to website visitors.

The use of the Internet and intranets has expanded rapidly over the last few years. Recently, there has been an increase in the need for people with the skills for planning, building and maintaining websites. This unit should help you to develop these valuable skills.

This unit will be assessed through your portfolio work only. The mark on that assessment will be your mark for the unit. You will produce:

- an evaluation of commercial websites that have been downloaded;
- design notes for the website of at least **three** pages, together with detailed plans for publishing your website;
- annotated print outs of your own web pages in WYSIWYG (What You See Is What You Get) format identifying the features and techniques used in the web page;
- annotated printouts of your own web pages in HTML format identifying edits to script commands to change page layout; documentation of website testing;
- documentation of website testing;
- an evaluation of both your website and the tools used to produce it, and your own performance.

14.2 WHAT YOU NEED TO LEARN

You need to learn about:

- web server requirements;
- planning a website;
- designing and documenting a website;
- creating a website;
- testing a website;
- uploading a website;
- evaluating a website;
- laws and guidelines.

14.2.1 Web Server Requirements

You need to understand and explain the hardware and software requirements for setting up a website on a server including:

- the operating system;
- web server software;
- protocols (TCP/IP) (transfer control protocol/Internet protocol);
- Internet naming (DNS - domain naming system) and addressing systems;
- security (firewalls, gateways);
- proxy servers.

14.2.2 Planning a Website

You need to:

- access and search the Internet to review existing websites, to obtain ideas on design and the use of both multimedia and interactive features;
- consider the benefits and drawbacks of different features for both the user and the website owner;
- consider the strategies used to increase the number of site 'hits', e.g. use of metatags;
- download graphics and information.

When you plan your website, you need to be clear about the purpose of the site and the audience that it is aimed at. Your website needs to be well-structured and communicate effectively with the intended audience.

You need to know how websites are structured, including:

- linear;
- hierarchical;
- web or mesh.

You need to understand the need for planning and designing websites. You need to understand and consider:

- layout of page;
- consistency of design between pages;
- use of text;
- use of graphics;
- use of navigational aids;
- use of hyperlinks;
- style of font;
- use of colour;
- use of interactive features such as guest books, message boards, feedback forms, sending a message.

14.2.3 Designing and Documenting a Website

It is important that websites contain up-to-date information. To ensure that this is the case, you need to appreciate the requirement for documentation, including:

- structure diagrams;
- a storyboard;
- an index of pages in the site;
- a task list or action plan for development.

You need to choose a domain name and decide whether to host the site internally (in which case, you have to deal with hardware and security issues) or with an Internet Service Provider or web hosting service.

14.2.4 Creating a Website

You need to understand the purpose of Internet tools so that you can select appropriate tools to carry out a specific task. A lot of website creation can be done using wizards. You need to appreciate the usefulness of wizards and use WYSIWYG and other features to make the creation of the website simpler. You also need to use basic tools. The tools you need to learn about are:

- web programming languages, such as HTML (hypertext markup language), Java, JavaScript, VBScript, ActiveX, Perl and VRML (virtual reality markup language) for the creation of web pages or components of pages;
- web page development software for the creation of web pages;
- graphic software for editing graphics and converting file formats to Internet standards of JPEG and GIF;
- the creation of animation using GIFs;
- the use of video and audio standards, such as AVI, MPEG, WAV, MP3, real audio and video.

You need to use web page development software to create, edit and present web pages with:

- text, graphics, numbers;
- background and foreground features;
- cascading style sheets;
- templates and colour schemes;
- tables, forms, interactive features, e.g. full text search, table of contents and other components, e.g. ActiveX, Java applet, CGI script;
- hyperlinks (text and graphic) within a web page, to another page at the same website, to an external WWW (world wide web) site, to e-mail, to an FTP server document.

You need to:

- use graphics software to edit graphics;
- convert files to a required file format, to insert in own web pages;
- identify the HTML script used to create features on web pages;
- edit a script to change the page layout.

You need know that some users may have difficulties viewing some websites, e.g. some users may have a slow link to the Internet and will have difficulty viewing pages with a lot of graphics. You may wish to create alternative text-only sites for these users.

You need to set domain name, address of the start-up home page and e-mail address set for own use.

14.2.5 Testing a Website

You need to understand the need to test a website, including:

- whether the website works with different hardware/software specifications;
- checking that the structure, style and formatting help understanding of the content;
- testing that all pages can be accessed in the correct order;
- testing that all elements on each web page can be viewed and accessed – this will involve consideration of colour depth and file formats;
- proof reading of the pages to ensure that there are no spelling or grammatical errors.

14.2.6 Uploading a Website

You need to understand the process and considerations involved in uploading a website, such as:

- domain name registering;
- file and folder names and organisation;
- use of a file exchange program, such as ftp or http, to publish your website.

14.2.7 Evaluation

You need to evaluate the pages in your website, giving reasons for the components you included, analysing their strengths and weaknesses taking into account any comments received from visitors to your website, and suggesting and justifying improvements that you could make to your storyboard and its implementation. You need to consider whether your website:

- meets the original list of intentions;
- attracts the intended audience;
- puts the right information across;
- is easy to use.

Additionally, you need to:

- identify the good and bad features of the website;
- describe any difficulties with the software that was used.

14.2.8 Laws and Guidelines

You need to know of the laws and guidelines that affect the use of ICT as stated in Unit 1: *Using ICT to communicate*.

14.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 14: Developing and creating websites

What you need to do::

You evidence needs to include:

a: [AO4] an evaluation of commercial websites that have been downloaded [**6**];

b: [AO3] design notes for the website that has at least **three** pages together with detailed plans for publishing your website [**6**];

c: [AO1] annotated printouts of own web pages in WYSIWYG format identifying the features and techniques used in the web page [**15**];

d: [AO3] annotated printouts of own web pages in HTML format identifying edits to script commands to change page layout [**6**];

e: [AO2] documentation of website testing [**8**];

f: [AO4] evaluation of both your website and the tools used to produce it and of your own performance [**9**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO4**	You comment on the features in the commercial web pages that have provided you with ideas for your own website; **[0 1 2]**	you explain clearly your reasons for choosing/not choosing the features in web pages that have provided you with ideas for your own website; **[3 4]**	you evaluate critically the design and structure of at least **two** existing websites, identifying the features that have provided you with ideas for inclusion or exclusion in your own website. **[5 6]**	**/6**
b	**AO3**	You produce documentation including structure diagrams, a storyboard, an index of pages in the site and a task list or action plan; you have little or no explanation for the choice of font style, graphics, colour and hyperlinks used; you identify domain name and home-page location to set up and install web pages on a site so that website visitors can access your pages in the correct sequence; **[0 1 2]**	you produce documentation including structure diagrams, a storyboard, an index of pages and files used in the site and a task list or action plan for a hierarchical or mesh website; you have some explanation for the choice of font style, graphics, colour and hyperlinks used; you identify domain name and home page location to set up and install web pages on a site so that website visitors can access your pages in the correct sequence; you clearly explain the reason for the choice of domain name and home-page location; **[3 4]**	you produce documentation including structure diagrams, a storyboard, an index of pages and files used in the site and a task list or action plan for a hierarchical or mesh website; you clearly explain the reason for the choice of font style, graphics, colour and hyperlinks planned; you identify domain name and home page location to set up and install web pages on a site so that website visitors can access your pages in the correct sequence; you clearly explain the reason for the choice of domain name and home-page location giving alternative options. **[5 6]**	**/6**

Unit 14: Developing and creating websites (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO1**	You create a multiple-page website and identify the design techniques, hyperlinks, multimedia and interactive features used; **[0 1 2 3 4 5]**	you create a multiple-page website and describe some of the design techniques, hyperlinks, multimedia and interactive features used; **[6 7 8 9 10]**	you create a multiple-page website and fully explain each of the design techniques, hyperlinks, multimedia and interactive features used. **[11 12 13 14 15]**	**/15**
d	**AO3**	You demonstrate understanding of HTML by explaining **three** different script commands; **[0 1 2]**	you demonstrate knowledge of script commands by editing script commands to change page layout; **[3 4]**	you demonstrate knowledge of script commands by adding script commands for at least **two** additional components from graphic, table or hyperlink. **[5 6]**	**/6**
e	**AO2**	You carry out tests to check that the website meets the design specifications; **[0 1 2 3]**	you produce a test plan and carry out testing of your website to ensure that the website meets the design specifications and is functional; **[4 5 6]**	you produce a detailed test plan and carry out thorough testing of your website to ensure that the website meets the design specifications and is functional, revising the website if necessary. **[7 8]**	**/8**
f	**AO4**	You comment on how well your website met the needs of the users and the effectiveness of the software tools used; you comment on your actions and role in creating the website and identify areas for improvement; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3]**	you identify strengths and weaknesses in your website and the approach you took to designing, implementing and testing the website; you include an analysis on your own performance by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; your report contains few errors in spelling, punctuation and grammar; **[4 5 6]**	you provide a critical analysis of your website, giving reasons for the components you included, analysing their strengths and weaknesses taking into account any comments received from visitors to your website and suggesting and justifying improvements that you could make; additionally, you provide a critical analysis of the approach you took to designing, implementing and testing the website and suggest how you would refine your approach in the future; your report is consistently well-structured and there will be few, if any, errors in spelling, punctuation and grammar. **[7 8 9]**	**/9**
				Total mark awarded:	**/50**

14.4 GUIDANCE FOR TEACHERS

14.4.1 Guidance on Delivery

Candidates need to evaluate existing websites to identify the good and not so good features of these sites. They also need to use the results of their evaluation to feed into the design for their own website.

There is now a range of software packages for developing web pages and special effects on websites for most of the web programming languages. It is expected that candidates will use **one** of these to produce their websites. Some of these packages also have facilities for planning and tracking the development of a website and candidates should be encouraged to use these.

It is important though that candidates have a basic understanding of the script or language used to create web pages since there may be features that they feel they need to include that are not available in the software package they are using. Candidates may use dynamic objects on a page which are evaluated and executed when the author saves the page or the website visitor browses to the page. Most of these components generate their own HTML script. Indeed, candidates may use any available web development tools. Some allow, as a feature, a drag-and-drop overall link view of every page on the database. Such tools may also have a built-in WYSIWYG editor and a technology that allows non-programmers to incorporate interactive features such as full-text search, threaded discussion groups, automatic end user registrations, etc.

To aid candidates to carry out the annotation of a web page in HTML script format, some teaching of the basic structure and layout of scripts will be needed, but candidates also need to use language reference books to complete this task.

Candidates need to know how to install their website and test it through a browser such as Netscape, MS Internet Explorer or Mosaic. Candidates should be encouraged to publish their website so that they gain a practical knowledge of the processes involved.

14.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 14.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO4**	**1**	Candidates use Internet tools to select and download web pages to provide ideas for their own web pages, annotating these to show how they provided those ideas;
		2	candidates use Internet tools to select and download web pages to provide ideas for their own web pages, annotating these to explain clearly their reasons for choosing/not choosing the features in existing web pages;
		3	candidates use Internet tools to select and download web pages to provide ideas for their own web pages, annotating these to explain clearly their reasons for choosing/not choosing the features in existing web pages; candidates also evaluate the design and structure of at least **two** existing websites.
b	**AO3**	**1**	Candidates produce documentation, including structure diagrams, a storyboard, an index of pages in the site and a task list or action plan; candidates identify a domain name and home page location to set up and install web pages on a site;
		2	candidates produce documentation, including structure diagrams, a storyboard, an index of pages and files used in the site and a task list or action plan for a hierarchical or mesh website; candidates identify a domain name and home page location to set up and install web pages on a site – they clearly explain the reason for the choice of domain name and home page location;
		3	candidates produce documentation, including structure diagrams, a storyboard, an index of pages and files used in the site and a task list or action plan for a hierarchical or mesh website; candidates clearly explain the reason for the choice of font style, graphics, colour and hyperlinks planned for; candidates identify a domain name and home page location to set up and install web pages on a site – they clearly explain the reason for the choice of domain name and home page location, giving alternative options.
c	**AO1**	**1**	Candidates create a multiple-page website and identify the design techniques, hyperlinks, multimedia and interactive features used, e.g. they identify hyperlinks, tables, images, colours used;
		2	candidates create a multiple-page website and describe some of the design techniques, hyperlinks, multimedia and interactive features used, e.g. they describe hyperlinks, tables, image types, colours used;
		3	candidates create a multiple-page website and fully explain each of the design techniques, hyperlinks, multimedia and interactive features used, e.g. they explain why they have used hyperlinks, tables, image types, colour schemes, style sheets.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	AO3	1	Candidates explain **three** different script commands, e.g. explain html to set up a font size;
		2	candidates edit script commands to change page layout and print out the script commands before and after changes, e.g. explain how they have changed the code to change the colour of a font;
		3	candidates add script commands for at least **two** additional components and print out the script commands before and after the additions, e.g. they add a script command to hyperlink to a different part of the web page.
e	AO2	1	Candidates carry out tests to check that the website meets the design specifications, e.g. the website is fit for purpose, suits the intended audience and has been proof read;
		2	candidates produce a test plan and carry out testing of their website to ensure that the website meets the design specifications and is functional, e.g. the website is fit for purpose and the user can navigate correctly;
		3	candidates produce a detailed test plan and carry out thorough testing of their website to ensure that the website meets the design specifications and is functional; candidates make and document any changes in light of errors found.
f	AO4	1	Candidates comment on how well their website met the needs of the users and the effectiveness of the software tools used – they refer back to the design specification;
		2	candidates identify both strengths and weaknesses in their website – they also comment on their approach to designing, implementing and testing the website;
		3	candidates provide a critical analysis of their website, giving reasons for the components that were included; they analyse their strengths and weaknesses taking into account any comments received from website users – improvements will be suggested; additionally candidates provide a critical analysis on their approach to designing, implementing and testing the website, suggesting refinements to their approach in the future.

14.4.3 Resources

Websites	http://www.bitlaw.com/internet/webpage.html http://www.createafreewebsite.net/website_workshop/choosing_colors.html http://www.edselect.com/web_page_design.htm http://www.getawebsite.friezedesign.co.uk/resources.htm http://www.ratz.com/featuresgood.html http://www.rci.rutgers.edu/~au/workshop/create-t.htm http://www.useit.com/alertbox/9605.html http://www.users.nac.net/falken/annoying/main.html http://www.w3schools.com/html/default.asp http://www.weblens.org/fivesteps.html http://www.webpagesthatsuck.com/ http://www.webstyleguide.com/index.html

15 Unit 15: Software development
[A2 level, double award, optional, externally assessed]

15.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is externally assessed.

This unit helps you to:

- understand the principles of software development;
- apply the principles of software development to design a software system to meet the needs of an end-user and to provide a solution;
- apply the principles of software development to develop and test a software system to meet the needs of an end-user and to provide a solution.

The process of developing software has various stages which need to be completed to ensure that the final product meets the needs of the end-user. There are many different methodologies which can be used when developing software but all of them have pre-defined stages which need to be completed. In this unit you need to develop a software system to meet the needs of an end-user.

This unit is assessed through an external assessment. A case study and tasks will be released before the external assessment. You need to examine the case study and complete the tasks and take them into the test with you. In the test you will be asked questions on what you have produced and on other aspects that you have studied. The mark on that assessment will be your mark for the unit.

15.2 WHAT YOU NEED TO LEARN

You need to learn about:

- initial/feasibility study;
- analysis and design;
- implementation and maintenance.

15.2.1 Initial/Feasibility Study

The feasibility study is the initial stage in any methodology, in which the existing information processing system is investigated, to decide how feasible it will be to develop the software system. This may be the upgrading of an existing software system, or computerising a manual system. There are a number of approaches to this:

- software can be bought off-the-shelf;
- software can be bought off-the-shelf and then be customised to suit the user;
- software can be written especially for the user (bespoke/tailor-made software).

You need to investigate a system and produce a feasibility report that includes:

- the purpose of the system;
- functional and non-functional requirements;
- process constraints;
- a list of deficiencies of the current system;
- the user requirements of the new system;
- recommendations for the development of the new system;

In order to produce a feasibility study, you have to investigate the system. There are various methods which can be used. You need to research the differing methods of investigation and identify the most appropriate method(s) for the investigation of the system. The methods which can be used include:

- interviews;
- observations;
- shadowing;
- questionnaires;
- document analysis;
- record/document inspection.

You need to identify the benefits and limitations of each of the methods so as to make an informed choice as to the method you are going to use.

During your investigation of the current system, you need to collect information about the following:

- flow of information;
- types of data;
- sources of data;
- decisions taken;
- data capture methods;
- documents used;
- types of processing;
- storage methods;
- personnel involved;
- manual operations;
- types of output;
- automated operations.

By investigating these components you will gather the information to help develop the new software system. If the information collected at this point is full and complete then the information can be used in later stages of the development methodology.

15.2.2 Analysis and Design

Once you have collected all the information and completed the feasibility study, then it is possible to move onto the next stage in the development methodology. In this stage, data models need to be completed as part of the design stage. If the information you collected during the investigation and feasibility stage was complete then all the information you need to complete this stage should be available.

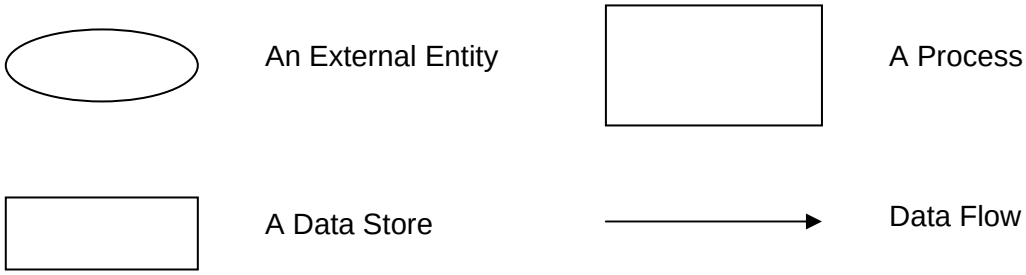
There are various techniques which can be used during this stage, all of which will enable a system to be developed which fully meets the needs of the end-user. The techniques and tools which you may use are:

- Data Flow Diagrams (DFD);
- storyboards;
- rich pictures;
- system flowcharts;
- entity-relationship diagrams;
- data dictionary;
- decision trees/tables;
- structured English;
- flowcharts.

The choice of tools and techniques used will depend upon the type of system being developed, e.g. if a website were to be developed then it would be appropriate to use a storyboard to develop the user-interface of the system. If for example the website is to be used for on-line booking or shopping, then it may be appropriate to use a DFD to show the flow of data which occurs during these processes which are not seen by the end-user.

You need to ensure that the tools and techniques you select are appropriate to the system being developed.

A Data Flow Diagram (DFD) of the current system needs to be constructed. There are **two** levels of Data Flow Diagram which are required: a Level 0 (Context Diagram) and a Level 1. There are many different symbols which could be used to develop the DFD; an example of a set of symbols is given below:



A context diagram (Level 0) is a DFD which shows the entire system as a single process, with data flowing between it and the outside world represented by external entities. The main purpose of a Level 0 DFD is to help fix the boundaries of the system and to show its interaction with external entities.

To develop a context diagram, the following activities need to be carried out:

- identify all sources and recipients of data from the system (the external entities);
- identify the main data flows to and from the external entities;
- convert each source or recipient into an external entity symbol;
- add the data flows between each external entity and a single box representing the whole system.

Once you have developed the context diagram, you need to expand this to develop a Level 1 DFD. The Level 1 DFD breaks down the actual processes which occur within the current system. The information which you collected during the investigation and feasibility stage should help you when you are developing the Level 1 DFD.

When you have developed the DFDs (Level 0 and Level 1) for the system you need to develop an entity relationship model (ERM) for the new system. You need to ensure that the entity model is resolved to 1NF (first normal form) and that there are no instances of M:M (many-to-many) relationships between any of the entities.

There is a relationship between the Level 1 DFD and the ERM, in that you need to identify the entities to be used in the new system from the entities and data stores used in the DFD.

You need to analyse the data collected during your investigation to identify the attributes that form the entities. To define the relationships between entities and their attributes you need to use logical data modelling techniques.

Logical data modelling for software development uses specific terms to describe the data structures. You need to understand, and apply correctly, the data modelling terms:

- entity;
- attribute;
- primary key;
- foreign key;
- relationship;
- entity relationship diagram.

An entity relationship diagram (ERD) is a graphical way of showing the entities and the relationships between them in a system.

You need to know how to create an ERD. You need to understand and identify different types of relationship, including:

- one-to-one;
- many-to-one;
- one-to-many;
- many-to-many.

You need to develop a Data Dictionary. A Data Dictionary is simply a record of data about data. It is necessary to hold Data Dictionary entries about data elements, data structures, data flows, data stores and processes. The structure of each of the Data Dictionaries for each of these elements will vary. Generally the following elements need to be incorporated into a Data Dictionary:

- name;
- description;
- aliases;
- type;
- format;
- values;
- security;
- editing;
- comments.

For any process required in the new system, you need to produce a process specification using a suitable method. You need to understand, and use correctly, various methods for defining a process, including:

- structured English;
- decision table/tree;
- flow chart.

When using structured English to define a process, you need to use common English verbs with suitable constructs, such as:

- IF...THEN...ELSE...;
- WHILE...DO...;
- SELECT CASE...END SELECT;
- REPEAT...UNTIL...;

In producing process specifications, you need to understand and use correctly the relational operators =, <, >, <=, >=, < >.

You also need to understand and use correctly the logic operators AND, OR and NOT.

Structured English is a tool which is best used whenever the problem involved combines sequences of actions with decisions and loops. Once you have developed the structured English, you need to test or dry run the routine to ensure that the procedure works and that it fulfils the needs and requirements of the end-user. Structured English is sometimes referred to as pseudo-code.

Decision tables provide a very simple way of showing actions which take place under certain rules. The advantage of a decision table is that all combinations of the rules will have to be considered, and it is easy to see if all the rules have been identified. There is a standard layout for decision tables which means that all the information included in the table can be understood by the end-users. It is easier to write the structured English once the decision table has been developed as, by referring to the decision table, you are less likely to omit any possible combinations of actions and rules.

Flowcharts are a method of representing the processes of a system in a pictorial form using different shaped boxes to represent different types of actions. Flowcharts help break down a complex process into small steps and are easy to understand. However, flowcharts do not convert into program code very easily and can, in some cases, become very complex, making them hard to follow. Flowcharts are, therefore, best used to give an overview of the functions of a process with decision tables or structured English used to describe the detail.

A physical design specification then needs to be developed. You need to consider the following:

- hardware specification;
- software specification;
- input specification;
- output specification.

You need to produce a *hardware specification* that defines in detail:

- memory capacity;
- storage devices;
- peripheral specifications;
- data capture equipment;
- communication equipment.

You need to produce a *software specification* that defines in detail:

- outline program specifications;
- a system flowchart;
- file organisation;
- access methods;
- error messages;
- screen and report layouts.

You need to produce an *input specification* that defines in detail:

- data sources;
- methods of data capture;
- validation methods;
- data input form or screen layouts;
- verification methods used.

You need to produce an *output specification* that defines in detail:

- data required for output;
- screen report layouts;
- methods of data output;
- printed report layouts.

15.2.3 Implementation and Maintenance

Once the system has been developed, implementation and maintenance procedures need to be detailed for the end-user. You need to identify the implementation method which you are going to use. The options are:

- parallel;
- phased;
- pilot;
- direct/big bang.

You need to identify the benefits and limitations of each of these implementation methods and identify the most appropriate method for the end-user.

Over the life of a system, it may be necessary to perform maintenance. There are many reasons for maintenance and different types of maintenance strategies. You need to know about and explain the different types of maintenance strategies which are used. These include:

- adaptive;
- perfective;
- corrective;
- preventive.

The end-users of the system need to be trained to use the system. There are various options available for training and you need to research these options and identify the benefits and limitations of each training method you have identified.

Once the system has been implemented, it is essential that documentation is passed to the end-user. The documentation, *which needs to be passed to the end-user*, comprises:

- detailed program specifications;
- recovery procedures;
- operating procedures;
- user manuals;
- test plans, data and logs;
- security details;
- version details.

You need to identify *why* each of these pieces of documentation needs to be given to the end-user and explain how they may be used at a future time in the life of the system.

15.3 GUIDANCE FOR TEACHERS

15.3.1 Guidance on Delivery

This unit links with Unit 5: *Problem solving using ICT* and Unit 6: *Designing computer solutions*, but to ensure that each unit is meaningful in its own right there is a small overlap in content. The overlap is appropriate because the approach in each case is different. In systems analysis, data modelling tools are used to investigate existing or potentially new systems, while in database design they are concerned with aspects of logical design, reliability and integrity.

The type of resources required are:

- examples of DFDs and process definitions;
- examples of structured data modelling;
- simulated systems with copies of input-output documents, organisation charts, etc.
- access to manual data processing systems suited to investigation for computerisation;
- access to computerised database systems that are not meeting their customers needs.

It is likely that a good deal of teaching will be required before candidates acquire the necessary skills in using the tools of systems analysis. Each of these tools requires knowledge and experience before they can be used on a realistic task. This teaching needs to be based on the use of a variety of case studies so candidates will have the opportunity to work on a range of problems to improve their skills in producing:

- high-level DFDs;
- low-level DFDs;
- process specifications using structured English, decisions and flow charts;
- entity-attribute definitions;
- entity-relationship diagrams;
- a normalised data model to first normal form (atomic and no repeating elements);
- a data dictionary;
- rich-picture;
- decision trees/tables.

15.3.2 Resources

Websites	http://www.bcs.org.uk – The home page for the British Computer Society http://www.computer.org – The Home page for the IEEE Computer Society		
Textbooks	Avison DE & Shah H 1997	*The Information Systems Development Life-Cycle: A first course in information systems*	McGraw-Hill
	Curtis G & Cobnam D 2002	*Business Information Systems – Analysis, Design and Practice* (4th Edition)	Prentice Hall
	Deeks D & Lejk M	*Introduction to Systems Analysis Techniques*	Prentice Hall
	Kendall JE & Kendall KE	*Systems Analysis and Design*	Irwin
	Pressman RS	*Software Engineering: A practitioners approach (European adaptation)*	McGraw-Hill
	Robertson J & Robertson S	*Complete Systems Analysis: The work book, the text book and the answers*	Dorset House
	Shelly GB, Cashman TJ & Rosenblatt HJ	*Systems Analysis and Design*	Course Technolgy
	Skidmore S	*Introducing Systems Analysis*	Macmillan
	Sommerville I 2001	*Software Engineering* (6th Edition)	Addison Wesley
	Whitten & Bentley	*Systems Analysis and Design Methods*	McGraw-Hill

16 Unit 16: Networking Solutions
[A2 level, double award, optional, externally assessed]

16.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is externally assessed.

This unit helps you to:

- understand the advantages and disadvantages of computer networks;
- understand the difference between peer-to-peer and client-server networks;
- know the differences between LAN and WAN;
- design a network using the correct components and topologies.

This unit has links with Unit 7: *Communicating using computers*.

This unit may be helpful if you plan to pursue a career in network management or customer support services.

This unit is assessed through an external assessment. A case study and tasks will be released before the external assessment. You need to examine the case study and complete the tasks and take them into the test with you. In the test you will be asked questions on what you have produced and on other aspects that you have studied. The mark for that assessment will be your mark for the unit.

16.2 WHAT YOU NEED TO LEARN

You need to learn about:

- computer networks;
- network design;
- network software;
- safety and security.

16.2.1 Computer Networks

A computer network is a number of computers that are linked together for some data-processing purpose. Examples of computer networks are:

- the point-of-sale terminals in a computerised store;
- an office with **three** computers connected together to share data;
- a large company with many interconnected computers sharing resources and security systems.

A computer network offers various benefits over the use of stand-alone computers. You need to understand the advantages of computer networks, including:

- sharing hardware resources;
- sharing software resources;
- sharing common data;
- potential intranet provision;
- e-mail communication between users;
- centralised management services.

There are some disadvantages to networking computers. You need to learn about problems such as:

- potential loss of security;
- loss of speed;
- cost of purchase and set-up;
- maintenance and supervision costs.

You need to learn the difference between peer-to-peer and client-server networks. Peer-to-peer networks are usually very small and often connect only **three** or **four** computers together. Extensive use of shared resources on peer-to-peer networks may result in a reduction in performance. They are also less secure than server-based networks.

You need to learn that:

- client computers use, but do not provide, network services;
- peer computers both use and provide network services;
- servers only provide network services.

You need to understand the differences between these **two** types of network and the factors that affect the choice of type of network, including:

- size of the network;
- level of security required;
- level of administration support available;
- amount of network traffic;
- cost.

A local area network (LAN) is a computer network that covers a local geographical area, such as **one** building or **one** site. A LAN can be subdivided into virtual private networks – logical segments on a physical network.

A wide area network (WAN) is a computer network that operates over wide geographical areas, such as town to town or country to country.

Extranets are LANs that are linked together by WAN communication methods.

You need to know:

- the different types of LAN and WAN that exist, such as VLAN, WLAN and VPN;
- the characteristics of each;
- the advantages and disadvantages of each;
- the equipment – both hardware and software required to install, configure and run each type of network;
- situations where the use of each type of network is appropriate.

A WAN provides various additional services. You need to explain the purpose of such services and how they work, including:

- e-mail;
- video- and tele-conferencing;
- access to the World Wide Web (WWW);
- access to public domain software;
- data file exchange (file attachment and FTP);
- commercial transactions (e-commerce);
- access to bulletin boards and discussion forums;
- web-based marketing and advertising.

You need to explain different methods of connecting a LAN to a WAN and the advantages and disadvantages of each method. Methods can include:

- dial-up modem;
- broadband.

You need to explain the equipment required to make the connection and the different types of each method.

16.2.2 Network Design

You need to describe and sketch the following network topologies:

- bus;
- ring;
- star;
- mesh.

For each topology, you need to know:

- advantages and disadvantages;
- what features make it useful;
- what features make it vulnerable to hardware failure.

You need to understand the difference between a *physical* and a *logical* topology.

You need to learn how to design a simple computer network. To design a network you need to select and justify:

- a suitable topology;
- the cables and connectors;
- any servers required;
- a suitable Network Interface Card (NIC);
- switches, hubs, gateways, bridges, routers, repeaters and patch panels;
- the network client software;
- the required communication protocols;
- the network services.

You need to learn how to specify these resources and how to use graphic images to indicate clearly the layout and construction of the computer network.

There are many technical terms used to describe the operation and construction of computer networks. You need to understand the technical terms outlined below and how they affect specifications and configuration:

- terms relating to signals and types of signal:
  – analogue;
  – digital;
  – modulation (and demodulation);
- terms relating to transmission media and connectors, including:
  – cables (including STP, UTP, Fibre Optic);
  – connectors (including ScTP, STP, RJ);
  – wireless transmission;
  – fibre transmission;
  – data packets;
  – bandwidth (including data transfer calculations: Estimated Time = $\frac{\text{Size of File}}{\text{Bandwidth}}$);
- terms related to LAN technologies:
  – ethernet;
  – token ring;
  – fibre distributed data interface (FDDI).

When **two** or more computers are connected together they need an agreed way of communicating with one another. You need to understand the meaning and use of a variety of protocols, including:

- NetBIOS – Network basic input/output system;
- IPX/SPX – Internet packet exchange/sequenced packet exchange;
- NetBEUI – NetBIOS extended user interface;
- FTP – File Transport Protocol;
- HTTP – Hypertext Transfer Protocol.

The most popular implementation of a hierarchical network addressing scheme is the Internet Protocol (IP). IP is the protocol that the Internet uses.

You need to understand the Internet Protocol including:

- contents of the IP header;
- IP address classes;
- converting IP addresses to binary equivalents;
- converting binary IP addresses to decimal equivalents;
- IP addressing and subnet addressing.

LAN and WAN communications systems make use of particular types of hardware. You need to understand the purpose of:

- computers as file servers;
- computers as print servers;
- computers as application servers;
- computers as proxy servers;
- network interface cards (including broadband adapters);
- active and passive hubs, switches and repeaters;
- transmission medium and connectors;
- modems;
- Uninterrupted Power Supply (UPS);
- firewalls;
- bridges and gateways.

16.2.3 Network Software

LAN and WAN communication systems use various types of software. Some operating systems have network client software available within the operating system. Others require the installation of network operating software.

You need to understand the purposes of the different types of software and the functions each perform, including:

- standard operating system (OS) – often includes provision for network client software;
- a dedicated network operating system;
- network adapter software to configure the network interface card;
- network client software to act as, or interact with, a network operating system;
- protocol software for network communications;
- network service software, such as file or printer-sharing facilities;
- connection software to connect to the Internet via an ISP (including permanent and dial-up connections);
- web browser software;
- ftp software;
- HTML and web page editors.

You need to know how to set up a connection from a computer to the Internet and install and use web browsing software and ftp software. This will require you to:

- document all the settings used;
- change the default configuration settings of the software;
- produce a report on the installation.

16.2.4 Safety and Security

You need to work safely and take precautions to avoid hurting yourself or others. In setting up a network or communication system, you need to understand proper safety procedures, including those which involve:

- cables (to ensure that they do not obstruct and are electrically safe);
- ergonomic and physical stress considerations.

You also need to understand the necessity for proper security procedures and how they can be implemented, including those that ensure that:

- data and software backup is maintained;
- confidential information is protected;
- passwords are used;
- virus checking is undertaken;
- copyright is protected;
- theft is avoided (data, software, equipment).

If a problem occurs, it is useful to refer to a communications log to help with the diagnosis of the problem and to spot any recurring patterns. You need to understand that such a log needs to contain:

- date and time of communication;
- duration of communication;
- connection used;
- protocols used;
- source, destination, size and file type of data transferred.

If a problem has occurred, it is useful to have it documented along with the solution. These problem logs need to be filed in such a way that they can be effectively retrieved and used to solve the same problem in the future. You need to understand the need for and implement:

- an easily understandable file-naming system;
- suitable directory structure for the problem logs;
- access rights to be applied to those files and directories.

16.3 GUIDANCE FOR TEACHERS

16.3.1 Guidance on Delivery

This unit allows candidates to investigate how communication and network systems work, the principles behind their design and the components required to construct them. It provides an opportunity for candidates who do not have access to the equipment required to set up and manage a network themselves to gain an understanding of how this is done.

As far as possible, the theoretical knowledge required needs to be gained from practical experience. This may be acquired by using different types of network. Where this is not possible, candidates need to be given the opportunity to observe different types of network. The network systems in the centre may be studied and compared with a system in a small office, for example.

Candidates need practice in designing and specifying simple computer networks for specific purposes and in producing diagrams to indicate clearly their layout and construction. They also need to be encouraged to learn, use and understand the technical terms associated with communications and networks.

16.3.2 Guidance on Assessment

This unit is assessed externally.

16.3.3 Resources

Websites	Cisco - www.cisco.com Networking Site - http://compnetworking.about.com/ Networking Site - http://networking.ittoolbox.com/ RASD University -http://www2.rad.com/networks/netterms.htm
Textbooks	Groth D *Network+ Study Guide* Lammle T *CCNA: Cisco Certified Network Associate Study Guide* Lowe D *Networking All-in-one Desk Reference for Dummies (For Dummies S.)* Plumley S *Home Networking Bible*
Publications	Network Computing - http://www.nwc.com/ Network Magazine - http://www.networkmagazine.com/

17 Unit 17: Program Design, Production and Testing
[A2 level, double award, optional, internally assessed]

17.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is internally assessed.

This unit helps you to:

- understand how to analyse problems to define program requirements;
- develop program designs from initial requirements specifications;
- understand the stages involved in program production;
- build on your programming skills;
- plan and carry out program testing;
- produce technical documentation.

In this unit you need to:

- analyse given programming problems;
- define program requirements;
- use structured program design methods;
- use programming tools and techniques to produce programs in a language of your choice;
- design test strategies;
- carry out testing procedures to show how well your program works;
- write technical documentation.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a working program with complete documentation to meet a given user requirement. Your evidence will include:

- a program specification to meet the given requirement and you need to describe how your specification meets the program requirements and how you have considered the user's needs;
- a program design arising from your specification and an analysis of your finished design, identifying its strengths and weaknesses;
- an annotated modular program to realise the design, which must include at least **one** data structure, all data types, all control structures and all appropriate operators listed in the programming section;
- test documentation including a test plan with valid, invalid and boundary data, expected results, actual results and changes identified as a result of testing;
- a program review and evaluation report including an evaluation of your own performance.

17.2 WHAT YOU NEED TO LEARN

You need to learn about:

- program specification;
- program design;
- programming;
- planning a test strategy;
- testing;
- technical documentation;
- program evaluation and review.

17.2.1 Program Specification

Programming problems often arise from systems analysis. When analysing a programming problem you need to learn to consider:

- inputs (what they are, what form they take, input file descriptions);
- processing required;
- outputs (what they are and what form they need to take, output file descriptions).

You need to define input, processing and output requirements in a specification of program requirements. You need to reflect on your definitions and compare them against the original requirements.

17.2.2 Program Design

You need to learn to produce a program design to meet the definition of requirements given in the specification. You need to select and use structured design methods including:

- top-down;
- bottom-up;
- object-based;
- data driven;
- process driven;
- event driven.

You need to use structured methods to design:

- inputs (method of data capture, input screen design, verification and validation);
- outputs (design of screen and printed output);
- processes (specifications using structured English, decision tables, flowchart, action charts, event sequence diagrams);
- data structures;
- file structure and organisation (serial, sequential, indexed, random).

17.2.3 Programming

You need to learn the major features of a selected programming language. You need to learn to use modularity in program production.

While writing your program, you need to include routines using appropriate tools, techniques and constructs for:

- input (screen layouts, controlling an input event such as a mouse click, keyboard entry or sensor);
- output (screen display, hardcopy, disc);
- processing – concatenation, operations (arithmetic, logical, relational, string manipulation), logging, file handling (creating, opening, reading, writing, closing), file maintenance (add, delete and edit records), file updating, events, objects;
- on-screen help and error handling, including validation, verification and program run-time errors;
- annotating your programme by including comments to simplify understanding for future maintenance.

You need to use data structures including:

- simple variables;
- arrays;
- records;
- files.

You need to also use data types, variables and constants including:

- number (real, integer);
- character and string;
- Boolean.

You need to make appropriate use of control structures (sequence, selection, iteration).

You need to understand how to use operators including:

- arithmetic (+, -, *, /, ( ));
- relational (=, <, >, <=, >=, <>);
- logical (AND, OR, NOT);
- string manipulation, e.g. LEN, TRIM$, LEFT$.

You need to learn to use development tools that are appropriate to the chosen programming language, including:

- project builders;
- CASE tools;
- editors;
- debuggers;
- data-entry form generators;
- report generators;
- program translators (compilers, interpreters).

You need to understand how to choose and use appropriate routines for input, output and file handling.

17.2.4 Planning a Test Strategy

You need to understand the need for thorough testing to ensure that programs meet the explicit and implicit requirements of the specification.

You need to learn to plan the testing process so that all paths through the program and all user operations are tested. You need to identify valid, invalid and boundary data and state the expected results.

17.2.5 Testing

You need to learn to implement your test plan and record the actual results. You need to identify and correct errors.

You need to:

- identify, develop and document a test strategy for the design;
- select suitable test data for the design;
- test the solution, illustrating how the solution evolves;
- produce detailed output from the testing, cross-referencing as appropriate the test plan.

17.2.6 Technical Documentation

You need to learn about the importance of good technical documentation to enable easy and effective maintenance of the final program. All stages of program specification, design, production and testing will result in the production of documentation that will form part of the final technical documentation.

You need to collect together this documentation, co-ordinate it, and supplement it to produce detailed and accurate technical documentation that will include:

- data dictionary;
- annotated program listings;
- data structure diagrams;
- program structure diagrams.

17.2.7 Program Evaluation and Review

You need to learn to review your program in response to your testing, to identify problems that require correction.

You need to learn to evaluate, in terms of the final outcome, the methods you used to design the program, and to suggest ways in which the program could be improved by the use of different methods, different techniques or different logic.

17.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 17: Program design, production and testing

What you need to do:

You will produce: a working program with complete documentation to meet a given user requirement.

Your evidence needs to include:

a: [AO1/2/3] a program specification to meet the given requirement and describe how your specification meets the program requirements and how you have considered the user's needs [**8**];

b: [AO1/2/3] a program design arising from your specification and an analysis of your finished design identifying its strengths and weaknesses [**9**];

c: [AO1/3] an annotated modular program to realise the design, which must include at least **one** data structure, all data types, all control structures and all appropriate operators listed in the programming section [**7**];

d: [AO1/3] test documentation including a test plan with valid, invalid and boundary data, expected results, actual results and changes identified as a result of testing [**8**];

e: [AO2/4] a program review and evaluation report including an evaluation of your own performance [**18**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	AO1	You show, by identifying inputs, outputs and processing requirements for your program, that you have developed your ICT skills; **[0 1]**	you show, by correctly identifying all input, output and processing requirements for your program, that you have extended your ICT skills; **[2]**	you show, by correctly identifying all input, output and processing requirements for your program, that you have used your initiative to extend and enhance your ICT skills. **[3]**	**/8**
	AO2	You demonstrate a knowledge of tools and techniques by using correct techniques for developing your specification; **[0 1]**	you demonstrate a detailed knowledge of tools and techniques by using correct techniques for developing your specification. **[2]**		
	AO3	You apply your knowledge and skills to solve a *straightforward* problem to produce a complete specification; **[0 1]**	you apply your knowledge and skills to solve a *complex* problem to produce a complete and correct specification; **[2]**	you apply your knowledge and skills to solve a *complex* problem to produce an effective, complete and correct specification. **[3]**	
b	AO1	You show by defining all processes, input screens, output formats, validation and verification, data structures and file structures, that you have extended your range of ICT skills and techniques; **[0 1]**	you show, by defining all processes, input screens, output formats, validation and verification, data structures and producing complete and well-designed screens, file structures and organisation that work, that you have extended your ICT skills; **[2]**	you show, by defining all processes, input screens, output formats, validation and verification, data structures and producing effective, complete and well-designed screens, file structure and organisation that work, that you have used your initiative to extend and enhance your IT skills. **[3]**	**/9**
	AO2	You demonstrate knowledge of techniques by using an appropriate technique, such as pseudocode, flowcharts, event-action charts, to design processes; **[0 1]**	you demonstrate knowledge of different techniques, such as pseudocode, flowcharts, event-action charts, to design processes; **[2]**	you demonstrate thorough, detailed knowledge of formal and informal techniques by using a structured design method and a wide range of appropriate techniques, such as pseudocode, flowcharts, event-action charts. **[3]**	
	AO3	You show that you can apply your knowledge by designing at least **one** file structure and a user interface; **[0 1]**	you show that you can use a methodical approach to problem solving by producing a complete and accurate design covering the whole program (input, output, processes, data structure, all file structures, file organisation); **[2]**	you show that you can use an analytical approach to produce an effective solution covering the whole program (input, output, processes, data structure, all file structures, file organisation) expressed clearly and fluently. **[3]**	

Unit 17: Program design, production and testing (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO1**	You show that you have developed your skills by producing a working program from your specification and design; **[0 1 2]**	you show that you have used your initiative to develop your skills in order to produce a working program from your specification and design; **[3 4]**	you show enhanced skills in producing a fully working program with clear and fluent annotation. **[5]**	**/7**
	AO3	You show that you can apply your knowledge and skills to a straightforward problem by producing a working program to meet original requirements; **[0 1]**	you show that you can apply your knowledge and skills to a complex problem by producing an effective, easy to use program that meets original requirements. **[2]**		
d	**AO1**	You show that you have developed your skills by producing a complete set of testing documentation; **[0 1]**	you show that you have extended your skills by producing a test plan with valid, invalid and boundary data; **[2 3]**	you show initiative in development of skills by producing a test plan that covers all paths and user operations as well as all valid, invalid and boundary data. **[4]**	**/8**
	AO3	You show that you can apply your knowledge and skills to a straightforward problem by using a test plan and documenting test results that cover all data validation; **[0 1]**	you show that you can use methodical and analytical approaches to a complex problem by using a test plan and documenting test results that cover all eventualities; **[2 3]**	you show that you can use methodical and analytical approaches to a complex problem by using a test plan and documenting test results that cover all eventualities and using the results to refine the solution. **[4]**	
e	**AO2**	You demonstrate a *recognition* of the effects your solution will have on the end user by producing an easy-to-use program; **[0 1]**	you demonstrate a *thorough understanding* of the effects your solution will have on the end user by producing an easy-to-use program; **[2]**	you demonstrate a *thorough understanding* of the effects your solution will have on the end user by producing an easy-to-use program that makes effective use of programming constructs. **[3]**	**/18**
	AO4	You comment on the effectiveness of your solution by comparing your final program to the original requirements and identifying improvements you might make; you comment on your actions and role in solving the problem and identify areas for improvement; your report may contain errors in spelling, punctuation and grammar; **[0 1 2 3 4 5]**	you comment on the effectiveness of your solution by identifying its strengths and weaknesses and by considering the problems found during testing – comment on how you could have reduced testing errors by changes to your design; you include an analysis on your own performance by identifying strengths and weaknesses , with some suggestions for improvement to the overall process; your report contains few spelling, punctuation and grammar errors; **[6 7 8 9 10]**	you provide a critical analysis of your solution, taking account of user feedback to identify the strengths and weaknesses so that you can refine your solution; you include an analysis on your own performance by identifying strengths and weaknesses and use this analysis to show how you will address these issues to be more effective in the future; your report is consistently well-structured and there will be few, if any, spelling, punctuation and grammar errors. **[11 12 13 14 15]**	
				Total mark awarded:	**/50**

17.4 GUIDANCE FOR TEACHERS

17.4.1 Guidance on Delivery

This unit is intended to give candidates an opportunity to extend programming skills learnt from Unit 8: *Introduction to programming*. This unit builds on these skills and incorporates them into the whole design process. Candidates need to, at the end of the unit, analyse program requirements, write detailed specifications for straightforward programs, and develop program designs by considering all input, output, processing and data/file requirements. Candidates need to choose and use techniques for defining processes and structured methods for overall program design.

17.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 17.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO1**	**1**	Candidates identify some relevant inputs, outputs and processing requirements;
		2	candidates correctly identify all inputs, processes and outputs;
		3	candidates correctly identify all inputs, processes and outputs (a simple input/process/output chart is sufficient).
	AO2	**1**	Candidates produce a specification that contains definitions of inputs, processes, and outputs in either table form or otherwise;
		2	candidates describe how the user might prefer the program, e.g. point and click, menu of guided choices, etc.
	AO3	**1**	Candidates provide a complete specification; there may be errors/inaccuracies which have not been identified in the specification;
		2	candidates provide a complete and accurate specification;
		3	candidates provide a complete and accurate specification; acknowledgement of the user's needs is made and matched to the specification.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
b	AO1	1	Candidates make all the required definitions and screen designs, even if they are not completely correct;
		2	candidates make all the required definitions and screen designs and all definitions are correct and file organisation is defined;
		3	candidates produce screen designs that aid user input through use of, for example, drop-down boxes/radio buttons; candidates use file structures that are effective in their use of space and organisation.
	AO2	1	Candidates use any design technique such as pseudocode, flowchart, event-action chart, decision table;
		2	candidates use more than **one** technique;
		3	candidates use a wider variety of techniques which might include prototyping.
	AO3	1	Candidates design a file structure and a user interface;
		2	candidates present a complete and accurate design that is presented in a methodical way;
		3	candidates present a complete and accurate design; the design is presented in a methodical way and shows clarity of thought.
c	AO1	1	Candidates produce a program which closely matches both specification and design;
		2	candidates produce a program which is easy to use, e.g. helpful messages, consistent user interface, no surprises, etc.;
		3	candidates produce a program which clearly meets all the program requirements and is explained clearly and fluently.
	AO3	1	Candidates produce a program which works and matches the original requirements;
		2	candidates produce a program which works easily, e.g. helpful messages, consistent user interface, no surprises, etc.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	AO1	1	Candidates produce test documentation that shows that they are aware of the need to identify the test, the test data and the expected outcome;
		2	candidates produce test documentation that shows that they additionally need to identify whether the test data is valid/invalid or boundary data;
		3	candidates produce test documentation that shows that they additionally need to test all paths and user operations through the programme.
	AO3	1	Candidates produce test documentation that includes the tests, the test data and the expected outcomes;
		2	candidates produce test documentation that includes the tests, the test data, identification of the type of test data, e.g. boundary data, and the expected outcomes;
		3	candidates produce test documentation that includes the tests, the test data, identification of the type of test data, e.g. boundary data, and the expected outcomes; the test plan includes tests of user operations and different paths through the programme and is complete.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
e	AO2	1	Candidates describe **one** technique that they have used to make the program easy to use, e.g. how the user interface is consistent all the way through the program or how they have kept all the user actions on **one** form so that the user doesn't have to navigate any more than necessary, etc.;
		2	candidates describe more than **one** technique that they have used to make the program easy to use, e.g. how the user interface is consistent all the way through the program or how they have kept all the user actions on **one** form so that the user doesn't have to navigate any more than necessary, etc.;
		3	candidates describe more than **one** technique that they have used to make the program easy to use, e.g. how the user interface is consistent all the way through the program or how they have kept all the user actions on **one** form so that the user doesn't have to navigate any more than necessary, etc.; candidates also describe additional enhancements that they have made to make the program easy to use, e.g. help messages.
	AO4	1	Candidates describe how their design meets the requirements of the original specification efficiently, e.g. how it is designed for minimal storage, ease of use or efficient algorithms; candidates at the higher end of this mark band make a valid comparison and identify at least **one** improvement that could be made;
		2	candidates comment on the effectiveness of the solution and relate it back to the results of the testing; candidates at the higher end of this mark band identify **one** area of their design that is particularly strong, indicating why this is so, and identify **one** area that could be improved, indicating how;
		3	candidates produce a critical analysis that takes account of the user feedback, together with strengths and weaknesses; candidates suggest refinements to the solution.

17.4.3 Resources

Textbooks	French CS	*Computer Science*	Continuum
	Horton I	*Beginning Visual C++ 6*	WROX Press
	Lhotka R & Hollis B	*Fast Track Visual Basic.NET*	WROX Press
	Robertson L	*Simple Program Design*	Thomson Learning
	Wright P	*Beginning Visual Basic 6*	WROX Press
Websites	www.freenetpages.co.uk www.VBcode.com www.wtvl.net/mike/webjr/begcpp.htm		

18 Unit 18: Database Design
[A2 level, double award, optional, internally assessed]

18.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is internally assessed.

This unit helps you to:

- explore how record-structured databases are used in organisations;
- explore how information is structured for database storage and processing;
- understand and use logical data modelling;
- learn and apply the principles of relational database design;
- design, implement and test a relational database to meet a given specification;
- produce user documentation;
- develop good practice in your use of ICT.

You need to produce a relational database and design notes, technical documentation and user instructions.

This unit applies the knowledge and skills gained from Unit 3: *ICT solutions for individuals and society*, Unit 5: *Problem solving using ICT* and Unit 6: *Software development - design.*

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a relational database to meet a given specification requiring at least **three** related tables, supported by design and analysis notes, technical and user documentation and an evaluation of the database produced. Your evidence will include:

- design and analysis notes, including normalisation of the data model;
- a user interface, including data input forms and methods of obtaining output;
- a working relational database;
- user and technical documentation;
- testing of the database produced;
- an evaluation of the database;
- an evaluation of your own performance.

18.2 WHAT YOU NEED TO LEARN

You need to learn about:

- database concepts;
- logical data modelling;
- normalisation;
- relational database structures;
- relational database construction;
- testing;
- documentation.

18.2.1 Database Concepts

In this unit you need to learn about the use and application of record-structured relational databases. You need to investigate various manual and computerised systems, how they work and the types of information (data) that they process.

The investigation could include databases in areas such as:

- health (doctors, patients, appointments);
- employment (name, pay, department);
- agencies (clients, services, reservations);
- sale of goods (orders, goods, invoices);
- libraries (books, loans, members);
- police (offenders, crime, officers).

These databases will have **two** or more tables. You need to understand that a single table can have relationships with other tables. An example of this would be a hospital appointments table, which will have a relationship to the other tables because each appointment involves a patient and a doctor.

When investigating databases, you need to consider:

- ways in which the user interacts with the database, such as data input forms, menus, buttons;
- the data that is input;
- the form and content of the output produced;
- how the output is generated;
- the database structure, such as the tables used, the relationships between them.

Many types of data are used when presenting information in databases. You need to identify and use the following data types:

- text (string);
- date;
- number;
- time;
- currency;
- logical (true or false).

Many data types have various formats. You need to understand and use the different formats correctly, including:

- text (string), e.g. limited length, unlimited length, memo;
- number, e.g. integer, auto record number, long;
- date, e.g. dd/mm/yy, dd month, 24-hr clock;
- currency, e.g. pound (£), dollar ($);
- logic, e.g. true and false, Y and N.

To avoid incorrect data entry, you need to validate data, including checking:

- data type;
- number range;
- the text or case;
- date range;
- format;
- length of data.

18.2.2 Logical Data Modelling

Logical data modelling makes use of specific terms to describe the data structures as a first step towards designing a database. You need to understand and apply correctly, the data modelling terms:

- entity;
- attribute;
- relationship;
- primary key;
- foreign key;
- composite key.

An entity is any object of the real world, e.g. a person, a company, a course, a customer or a country.

An attribute is **one** of the elements that define an entity, e.g. the entity 'customer' could have attributes such as name, address and telephone number. When attributes need not be broken down any further they are said to be atomic. Thus you would avoid placing the attribute 'John Smith' in **one** field. To make this attribute atomic, you would use **two** fields, with 'John' in **one** field and 'Smith' in the other. This would, for example, allow searching by last name or sorting by last name then first name.

A key is a database field that has a particular significance. Relational database software makes use of different types of key. A relational database dictates that each row (record) of the table be unique. You guarantee uniqueness by designating **one** column (field) to be the primary key. This column needs to contain unique values for every row. All columns that contain unique values for every row are called candidate keys. The primary key needs to be selected from the candidate keys. All remaining candidate keys are called alternate keys.

Keys may be simple or composite. A composite key is one that is made up of **two** or more columns (fields). A primary key may be a composite key. You need to identify and use composite keys to sort data in a table, e.g. using last name and first name to sort a list of people. There may even be a need to have a third field such as 'date of birth' in the key to ensure that it is unique.

When the primary key in **one** table is related to a field in a second table, the field in the second table is known as a foreign key. You need to identify a suitable foreign key when relating **two** tables.

From an outline specification, you need to explore the system to create an initial logical data model. In such a model, you need to:

- identify all the entities;
- define the entities in terms of attributes;
- ensure that attributes are atomic (cannot be broken down into further attributes);
- define relationships between entities;
- define the model diagrammatically using an initial entity-relationship diagram (ERD).

You need to analyse the initial data model to resolve:

- many-to-many relationships;
- which data attributes or combinations of attributes provide the keys.

18.2.3 Normalisation

A database needs to have integrity. This means that it needs to be consistent, accurate and reliable. You need to learn that to ensure integrity in a database:

- there must be no repeating groups of data in a table;
- all attributes in a table need to be atomic;
- all primary keys need to remain unique;
- every foreign key needs to have a matching primary key in its related table.

Normalisation is a process that reduces errors due to badly designed data structures (entities, attributes, and relationships). Normalisation can be carried out at various levels of complexity. You need to understand the purpose of, and the methods used to normalise, an initial data model to:

- first normal form (no repeating groups of attributes and atomic data items);
- second normal form (all attributes depend only on the primary key);
- third normal form (all attributes are mutually independent of one another).

You need to analyse and change a database structure or logical model, as necessary, to make it meet the first **three** forms of normalisation. Following normalisation, you need to build a definitive logical data model comprising an entity-relationship diagram (ERD) and a Data Dictionary (DD).

18.2.4 Relational Database Structures

Relational database software provides various design facilities. You need to understand and use these to create suitable database structures. There is a wide variety of software available and many use different terminology to describe database design. You need to understand and use terms that have the same or very similar meaning, including:

- table, relation, entity (note that a relation is different from a relationship);
- record, row, tuple, unique entity instance;
- field, column, entity attribute.

In creating a database structure you need to:

- identify the tables (entities) to form the structure;
- identify the fields (attributes) for each table;
- normalise the tables (a re-iterative process);
- define suitable field names;
- define the data type for each field;
- define the size (length) of each data field;
- identify which field(s) are primary keys;
- identify which field(s) are foreign keys (the relationships between tables).

18.2.5 Relational Database Construction

Relational database software allows you to build a database to meet the needs of the normalised data model. You need to understand how to:

- construct tables defining the entities;
- define the fields in each table;
- define primary and foreign keys;
- define relationships between tables;
- include calculations in reports;
- use wizards effectively;
- create data entry forms;
- create report forms;
- create queries (single and multiple field);
- use relational logic in queries;
- integrate queries and reports.

Data entry in most databases requires the user to enter the data into screen-based forms using the keyboard. You need to understand and use the software to create screen data entry forms that:

- enable the entry of data into a single table;
- enable the entry of data into multiple tables;
- have appropriate entry form field lengths;
- provide clear labeling of entry form fields;
- provide instruction fields where necessary;
- include validation checks on field entries as appropriate;
- enable the selection and entry of data from built-in lists (constructed from other tables);
- comply with the data dictionary;
- include calculation (formula) fields;
- make use of automated number fields (counter fields);
- use date and time fields.

Various types of reports are used for computer databases. Examples of printed reports are invoices, statements, price lists and stock lists. Examples of screen reports are those used by travel agents and rail information staff. You need to understand and create database report forms that:

- produce printed reports;
- produce screen reports;
- have suitable headers and footers;
- have sorted data grouping;
- include calculations and total fields;
- meet specified interrogation needs;
- include specified queries, such as SQL (structured query language) and QBE (query by example).

How the user will interact with the database is important. Most users will not need access to the underlying database or understand its functions. You need to learn how to hide the underlying database from the user by customising the user interface. This may involve the creation of menu screens with macro controlled buttons to navigate the database and select the output required.

18.2.6 Testing

You need to learn to test your database solutions. You could ask yourself the following questions:

- Does my solution meet the specification agreed with the user?
- Does my database accept all the data for which it was designed, including normal, extreme and abnormal data?
- Do users find my database easy to operate?
- Is my database robust or can it be made to crash?

You need to create a test specification that defines tests for:

- acceptable data input values (including maximum and minimum values);
- unacceptable data values that need to be automatically rejected;
- inputs, such as mouse or key depressions, that require a specific response;
- inputs, such as mouse or key depressions, to which the system should not respond;
- checking every facility provided in the database, e.g. data entry, queries, reports;
- checking, independently, that all functions and/or formulae work correctly;
- checking that the system meets user requirements.

18.2.7 Documentation

You need to learn to document the development of your database and create instructions for users. Technical documentation is for specialists. It records the design and development of the database. You need to learn to record your work. Your records may include:

- a copy of the specification agreed with the user;
- details of the hardware, software and other resources required;
- a detailed entity-relationship diagram;
- a detailed data dictionary;
- details of any program code;
- details of validation and verification procedures;
- details of all input and output screens and printed reports;
- copies of the test specification.

User documentation helps others to use your database. You need to learn to write user instructions that are simple to understand. Your instructions could include:

- how to start the database;
- how to append, delete and edit records;
- examples of screens and data entry forms;
- instructions about using queries and producing reports;
- advice about how to respond to error messages;
- examples of data output screens and printed copy.

18.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 18: Database design

What you need to do:

You need to produce: a relational database to meet a given specification requiring at least **three** related tables supported by design and analysis notes, technical and user documentation and an evaluation of the database produced.

Your evidence needs to include:

a: [AO3] design and analysis notes including normalisation of the data model [**12**];

b: [AO1] a user interface including data input forms and methods of obtaining output [**9**];

c: [AO1] a working relational database [**6**];

d: [AO2] user and technical documentation [**8**];

e: [AO4] testing of the database produced [**3**];

f: [AO4] evaluation of the database [**6**];

g: [AO4] evaluation of your own performance [**6**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO3**	You produce design and analysis notes that present the initial data model and show its normalisation to 1st normal form, and that clearly show the entities, attributes, keys, relationships and internally-generated or processed data; **[0 1 2 3 4]**	you produce design and analysis notes that use technical language fluently, and which include correct ERDs, the entities, attributes, keys, relationships and internally-generated or processed data, the design of the user interface, and screen and printed reports; **[5 6 7 8]**	you produce design and analysis notes that use technical language fluently, and which include correct ERDs, the design of the user interface, screen and printed reports and graphic images to define the data model clearly and demonstrate that it is correctly normalised to 3rd normal form. **[9 10 11 12]**	**/12**
b	**AO1**	You produce suitable and correct data input forms and provide straightforward means of obtaining output; **[0 1 2 3]**	you make effective use of validation and produce user-friendly, well laid out data-input forms with title labels, field names, set widths, pull down lists and instructions, as appropriate; **[4 5 6]**	you produce a fully-customised user interface that hides the underlying database from the user and provide input forms that allow data entry into multiple tables. **[7 8 9]**	**/9**
c	**AO1**	You produce a working relational database that allows the user to append, delete and edit data, initiate queries and print reports; **[0 1 2 3]**	you create reports that make correct and effective use of queries, grouping, arithmetic formulae and related tables; **[3 4]**	you create reports that make correct and effective use of queries, grouping, arithmetic formulae and related tables. **[5 6]**	**/6**

Unit 18: Database design (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
d	**AO2**	You produce a user guide that enables a novice user to make effective use of the database; you define, clearly and accurately, the database structure and data relationships in the technical documentation; you include a data dictionary with the range of acceptable data; you include example output from queries and reports and outline test procedures; **[0 1 2 3 4]**	you make good use of graphic images and use annotated screen prints to create effective user instructions and technical documentation; you define, clearly and accurately, the database structure and data relationships in the technical documentation; you include a data dictionary including the range of acceptable data; you include example output from queries and reports and outline test procedures; **[5 6]**	you create high-quality technical documentation that would enable someone else to recreate or maintain the database; you define, clearly and accurately, the database structure and data relationships in the technical documentation; you include a data dictionary including the range of acceptable data; you include example output from queries and reports and outline test procedures. **[7 8]**	**/8**
e	**AO4**	You carry out basic test procedures to demonstrate that the database meets the specification; **[0 1]**	you design and implement test procedures to check reliable operation; **[2]**	you thoroughly test the operation of the database, including rejection of data outside the acceptable range. **[3]**	**/3**
f	**AO4**	You comment on the effectiveness of the database in relation to user needs and suggest some improvements; **[0 1 2]**	you comment critically on the operation of the database and how well it meets the specification; **[3 4]**	you provide a critical analysis of how well your database solution meets requirements, identifying strengths and weaknesses in order to refine the solution, taking account of user feedback. **[5 6]**	**/6**
g	**AO4**	You comment on your actions and role in solving the problem and identify areas for improvement; your report may contain errors in spelling, punctuation and grammar; **[0 1 2]**	you include an analysis on your own performance by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; your report contains few errors in spelling, punctuation and grammar; **[3 4]**	you include an analysis on your own performance by identifying strengths and weaknesses, and use this analysis to show how you will address these issues to be more effective in the future; your report is consistently well-structured and there will be few, if any errors in spelling, punctuation and grammar. **[5 6]**	**/6**
				Total mark awarded:	**/50**

18.4 GUIDANCE FOR TEACHERS

18.4.1 Guidance on Delivery

This unit includes the concepts of normalisation to third normal form. It is essential to introduce candidates to normalisation at this level if they are to create a database that has **three** or more related tables.

You need to provide candidates with a variety of databases that contain **two** or more related tables, and demonstrate why the normalisation procedures are so important in producing a stable and reliable database. The tables provided could be incorrect and require normalisation, so that candidates acquire experience of normalising.

Before starting the assessment for the unit, candidates need to handle information in a wide variety of ways. It is very likely that the requirement in Sub-Section 18.2.1 (Database Concepts) will be met by the examples provided by you. Candidates need to exercise their database skills extensively before they are ready to design, analyse and produce their own database application.

It is also important that candidates acquire some experience of live database systems. This experience is essential if they are to design and construct information databases to meet specified user requirements.

It is suggested that candidates could spend some time working together, both in pairs and as small groups, to:

- identify appropriate database applications;
- collect information about the processing problem;
- discuss what has to be done;
- analyse the data requirements;
- produce outline proposals for a database.

Having worked as a team to identify, analyse and design databases, it is essential that candidates work individually to design and construct their own database to produce the necessary assessment evidence. You need to ensure that the products used for assessment are the individual work of the candidate and not simply copies of other candidates' work.

18.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 18.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO3**	**1**	Candidates analyse the specification and identify the entities and attributes involved; candidates show how they normalise the initial data model to at least 1st normal form; their design notes include details of the entities, attributes, keys and relationships to be used, as well as details of any internally generated or processed data;
		2	candidates demonstrate fluent use of the technical language relating to data modelling in their design notes; the final data model is shown graphically by the use of correct entity relationship diagrams; design notes also include sketched designs for the layout of the user interface and the screen and printed reports to be generated;
		3	candidates, in addition to Mark Band 2, use graphic images, such as dataflow diagrams and ERDs, to fully define the data model; candidates demonstrate clearly the process of normalisation and present the final data model in correct 3rd normal form.
b	**AO1**	**1**	Candidates produce simple but correct data input forms that allow the user to input data; candidates also provide switchboard or macro buttons to enable the user to obtain specific output;
		2	candidates apply validation rules to some input data, including at least **one** range check on numeric data; data input forms are well laid out and user friendly, with suitable labels, instructions and pull-down lists for limited data sets;
		3	candidates make use of the facilities available in the database management software to create a fully customised solution that hides the underlying database from the user; this includes input forms with sub-forms that allow the entry of data into more than **one** table.
c	**AO1**	**1**	Candidates use the data model they have developed to create a database to meet the specification; where the data model is weak, candidates may need to make changes to implement the database successfully; as well as enabling the user to append, delete and edit data, the database needs to allow the user to access queries and print reports that candidates have provided; the range of queries and reports provided is limited;
		2	candidates provide a range of reports for the user that are based on appropriate queries, include data from more than **one** related table and include the use of grouping and arithmetic formulae; candidates use of queries, grouping and arithmetic formulae may not work or be entirely correct;

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	**AO1**	**3**	candidates provide a range of reports for the user that are based on appropriate queries, include data from more than **one** related table and include the use of grouping and arithmetic formula; candidate's use of queries, grouping and arithmetic formulae works and is entirely correct and effective in their use.
d	**AO2**	**1**	Candidates produce a user guide which gives instructions on how to input data and obtain output from the database created, **not** how to use the DBMS to generate queries and design reports; the instructions tell the user how to start the database, how to append, delete and edit records and how to use queries and produce reports; the technical documentation includes details of the structure and data relationships actually implemented (which may differ from the data model); the Data Dictionary includes details of all entities and attributes, including data type, length, whether a key, any validation rules and the range of acceptable data; example outputs from the available queries and reports are included; test procedures include ensuring that the user can append, delete and edit data successfully, and that the queries and reports generate the expected outcomes;
		2	both the user guide and technical documentation include the effective use of graphic images, including annotated screen prints, to demonstrate the actions being described;
		3	the technical documentation includes full details of the data model and database implementation, such that someone else could recreate or maintain it.
e	**AO4**	**1**	Candidates carry out the test procedures identified in **Task d**; candidates make brief comments on how well their database meets user needs and suggest some simple improvements;
		2	candidates design and implement test procedures to ensure that the database works reliably, e.g. that any buttons and/or switchboard items work and that the user can access all input screens, queries and reports; candidates comment on how well the database operates, including aspects that could be improved, and how well it meets the specification, e.g. identifying aspects of the specification that have not been met;
		3	candidate's testing of the spreadsheet includes systematic testing of acceptable, unacceptable and boundary input data to ensure that data outside the acceptable range is rejected; candidates provide a critical analysis of their database solution that includes consideration of its strengths and weaknesses; candidates use this and feedback from the user to refine or suggest refinements to their solution.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
f	AO4	1	Candidates provide a description of the operation of a commercial database which includes the data input, the layout and content of the outputs available and, where possible, the tables, relationships and queries used; candidates identify the purpose of the database and make brief comments on how suitable it is for this purpose;
		2	candidates evaluate the user interface of a commercial database in terms of, for example, its ease of use and the level of expertise required; candidates suggest simple improvements to the user interface, such as providing additional instruction fields or adding buttons for frequently used features;
		3	candidates consider the database as a whole and comment critically on its strengths and weaknesses; candidates make realistic suggestions that would clearly improve the operation of the database.

18.4.3 Resources

Textbooks	Doyle S	*Information and Communication Technology, Vocational A-Level* 2nd Edition	Stanley Thornes 2001
	Knott G & Waites N	*Advanced VCE: Information and Communication Technology (comprehensive cover of compulsory Units 1-6 – AVCE).*	BC Publications 2000
	Lawson J (Ed)	*Information and Communication Technology Longman Vocational A-Level*	Pearson Education (Longman) 2000
	Mott J & Rendell I	*Database Projects in Access for A Level (*2nd Edition*)*	Hodder & Stoughton 2003 034 081 201X
	Richards RP & Heathcote PM	AVCE Information and Communication Technology Units 4-6	Payne-Gallway 2001
Websites	http://databases.about.com/cs/specificproducts/a/designmenu.htm http://www.cit.cornell.edu/atc/materials/old/dbdesign/erd.shtml http://www.geekgirls.com/menu_databases.htm http://www.intelinfo.com/it_training_materials_and_books/free_database_design_training_materials.html		

19 Unit 19: Developing and Maintaining ICT Systems for Users
[A2 level, double award, optional, internally assessed]

19.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is internally assessed.

This unit helps you to

- understand the roles of the hardware components of a microcomputer system and how they interact;
- recognise the characteristics and functions of different components and their suitability for particular tasks;
- understand the need for the different components of a microcomputer system to be compatible with each other and the user's requirements;
- select suitable components to specify microcomputer systems for particular purposes;
- advise a user on the most appropriate system to meet their needs;
- select components and upgrade systems;
- use troubleshooting procedures to identify and replace faulty components.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce records of specifying, upgrading and repairing ICT systems, to include:

- records of interviews with **two** different users to identify their key requirements;
- detailed specifications for an ICT system for each user, along with explanations of the reasons for selecting particular components, in non-technical language;
- records of carrying out an upgrade involving selecting and adding a new component to a system;
- records of carrying out an upgrade by replacing a component in a system;
- records of troubleshooting procedures carried out to identify faulty components;
- an evaluation of the information sources used to find information on components;
- an evaluation of the specifications and approaches taken to specifying, upgrading and repairing systems.

19.2 WHAT YOU NEED TO LEARN

Although many users purchase 'off-the-shelf' computer systems to meet their needs, others prefer to have a system custom-built to exactly match their requirements, or to build a system themselves to save money.

Users may also wish to add to, upgrade or replace components of an existing system, either to provide additional performance and/or functionality or simply as a result of system problems or failure.

You need to learn about:

- components of microcomputer systems;
- compatability and other factors;
- meeting a user's needs;
- upgrading;
- simple hardware faults.

19.2.1 Components of Microcomputer Systems

Suppliers' catalogues and websites list a wide range of components that can be used to build microcomputer systems. These components have different functions and characteristics. The components chosen for a particular system will depend on what the system is required to do.

In order to specify components for a system, you need to learn about the functions and characteristics of components, including microprocessors, storage and peripheral devices.

Most software packages have particular memory, storage and other requirements to run efficiently. You need to understand that these represent the absolute minimum that the software manufacturer recommends. You need to learn how the software needed for a task helps to determine your choice of hardware components.

You need to have a thorough understanding of the meaning of all technical terms and acronyms used in this section so that you are able to explain them to a user who has little knowledge of computers.

Microprocessors

You need to learn about the characteristics and performance of different types of microprocessors and the instruction sets that they support, including:

- simple processors and co-processors;
- multiprocessors;
- the amount and levels of cache memory and its impact on performance.

Motherboards

You need to know the characteristics and performance of a range of motherboards, including:

- the type of motherboard (including the socket or slot type) and the clock speeds of the buses supported;
- the number of memory slots and the amount and type of memory supported;
- the number and types of device controllers, ports and expansion slots;
- the motherboard BIOS and its functions;

You need to also know about the different bus types, e.g. ISA, PCI, USB, Firewire, AGP.

Memory

You need to know about different types of memory and their characteristics, including:

- random access memory (RAM), e.g. SDRAM, DDR and RAMBUS (RIMM);
- read only memory (ROM), e.g. PROM and EPROM.

You need to learn how memory is used and allocated, including:

- non-volatile ROM for boot settings;
- physical and virtual memory.

You also need to know the characteristics of these types of memory, including their:

- size and speed;
- volatility and parity.

Storage devices

You need to know about a wide range of storage devices, including:

- magnetic disc systems, e.g. hard, floppy;
- magnetic tape systems, e.g. Travan, Digital Audio Tape (DAT), Advanced Intelligent Tape (AIT);
- optical disc systems, e.g. CD-ROM, CD-RW, DVD-ROM, DVD-RW and DVD-RAM;
- USB flash drives, memory cards/readers.

You need to know their properties, including their:

- connection type, e.g. SCSI, IDE/ATA, Serial ATA;
- connectivity, e.g. master/slave/cable select, primary/secondary, devices per channel;
- physical size, data capacity, access and transfer speeds;
- purpose;
- compatibility and portability between systems.

Expansion cards and device controllers

You need to know the characteristics and purpose of the different types of expansion cards and device controllers available, some of which may be integrated on the motherboard, including:

- sound and graphics cards and controllers and video-imaging cards;
- card modem, PCMCIA cards, and network cards and controllers;
- SCSI controllers and cards, IDE controllers and cards, RAID controllers and cards.

Computer cases

Computer cases are available in a range of shapes and sizes to suit different purposes. The case chosen will affect the components that can be fitted into it. You need to know about the different types of cases, including:

- desktops, mini-towers, midi-towers and full towers;
- 'barebones' cases (with integrated motherboards and controllers).

You need to know the different facilities offered by the different cases:

- size (how much desk space is required, what vertical clearance is needed);
- number of expansion slots;
- type and rating (watts) of power supply;
- number and size of drive bays.

Display systems

You need to learn about different display systems and know which characteristics affect their performance and use. These include:

- for visual display units (VDU):
  – the type of screen, e.g. CRT, LCD and Plasma;
  – the physical and viewable screen size and screen area capability;
  – the dot pitch and refresh rate;
- for display adapters:
  – the size of the memory and processor speed;
  – the colour resolution and screen area capability.

Peripheral devices

Microprocessors are of little use without the ability to input data and output results. You need to learn about the different types of devices that can be used. These include:

- input devices:
  – keyboards, e.g. QWERTY, overlay, ergonomic;
  – pointing devices, e.g. mouse, joystick, touch screen;
  – image capture devices, e.g. scanner, camera, digitiser;
  – other input devices, e.g. barcode reader, microphone, MIDI keyboard;
- output devices:
  – printers;
  – plotters;
  – sound production devices, e.g. loudspeaker, voice synthesiser.

For each of these, you need to know:

- the different types available;
- the way they operate and what they are used for;
- how they are connected to the system, e.g. to a parallel port, to a USB port, using an interface card;
- particular characteristics, e.g. speed, quality, ease of use, size.

19.2.2 Compatibility and Other Factors

A microcomputer system will not work if its components are not compatible. You need to know about the factors which affect compatibility, including:

- physical factors, e.g. size and type of connector;
- transfer speeds;
- bus type;
- trade-off between components, e.g. reduced processor speed vs. increased memory size.

You need to know about other factors that may affect the choice of components, including:

- cost;
- availability;
- future proofing, e.g. ability to enhance/upgrade.

19.2.3 Meeting a User's Needs

You need to identify from discussions with a user, or from information supplied, what specification of computer system meets the needs of the user. You need to take into account the key requirements of the user. A key requirement may be to:

- provide an order processing system for a small business;
- provide computing facilities for a candidate on a ICT course;
- communicate with clients by e-mail, fax and video conference;
- produce DTP documents with high resolution graphics;
- provide an information system for visitors, accessed via the screen;
- produce and edit promotional videos;
- edit and enhance photographs and print them at high quality.

You then need to take into account other factors, for example:

- equipment already purchased by the user;
- software which the user wants to install and use on the new computer system;
- the importance of availability of the system;
- the volume of information that may need to be processed and stored on the computer system;
- cost constraints.

You need to suggest a configuration that meets the user's needs and will provide a usable system at an acceptable cost, with the option for expansion at a later date.

19.2.4 Upgrading

When a user wishes to upgrade a system, you also need to identify from discussions with them, or from information supplied, what additional or replacement components meet the needs of that user.

In the case of replacing components as a result of system problems or failure, you need to identify the potential cause of the failure and recommend appropriate procedures and/or components to rectify the situation.

When adding or replacing components, you also need to identify any changes that are required to the operating system configuration, e.g. loading appropriate device drivers, or changing IRQ settings.

Additions to existing systems

An upgrade requiring the addition of components will usually be the easier of the above requirements. However, you need to select an appropriate component that does not compromise the existing system, e.g. selecting a 512 MB memory module when the motherboard maximum is 256 MB.

In addition, you need to identify any limitations of the existing system that may cause problems in the upgrade, e.g. insufficient additional expansion slots, insufficient memory slots or simply insufficient physical space or power provision in the existing case.

You also need to identify that some additions to existing systems may themselves require additional components and/or re-configuration of the system, e.g. the addition of an IDE storage device may require it to be set as master or slave on an existing connection, or may even require an additional channel on an expansion card.

You also need to recognise that some additions require the BIOS to be re-set, e.g. enabling USB ports on the motherboard, or changing the mode of a parallel port.

Replacing components in existing systems

When an upgrade requires the replacement of selected parts, you need to apply your knowledge of components to select those that are compatible with all elements of the existing system.

You need to recognise that a simple upgrade request may require the replacement of more than **one** component, e.g. to upgrade the processor on an older system may also require the replacement of the motherboard, the memory or even the case and power supply.

You also need to recognise that some replacements will also require the BIOS to be re-set or even upgraded, e.g. changing hard-drive parameters or acquiring a BIOS upgrade to recognise a newer model of CPU.

Troubleshooting components in existing systems

When system problems occur, you need to identify the components that may be causing this, e.g. no output on a display screen could be caused by failure of the actual display screen, failure of the graphics controller card, or even failure of a slot on the motherboard.

You need to know how to find the meaning of any hardware error messages and BIOS beep-codes, e.g. using the appropriate hardware manual or using appropriate sites on the Internet. You need to apply testing tools and procedures to identify any component that has failed, e.g. disc scanners and memory testers.

In the case of total system failure, you need to decide whether to test the components that may be causing the failure by trying replacement components in the existing system, or by removing suspect components and testing them on a working system. For example, a disk boot failure will require the disk to be tested on another system, while a total boot failure will normally require testing by replacing components in the existing system.

Many of the previous statements in Sub-Sections 19.2.2 (Compatibility and other factors) and 19.2.3 (Meeting a user's needs) also apply when upgrading or replacing components in existing systems.

19.2.5 Simple Hardware Faults

Some hardware problems can be diagnosed either by observation, by questioning, or by simple diagnostic tests. You need to learn when it is best to use each method.

You then need to solve the problem by:

- checking the external electrical supply, e.g. by checking it is switched on;
- checking and replacing leads;
- replacing paper, ribbons, ink cartridges or toner cartridges, and clearing paper jams in printers;
- adjusting the display of visual display units (VDUs);
- replacing faulty peripheral devices such as mice, printers, or keyboards.

You must not attempt to dismantle equipment unless instructed to do so by your teacher/supervisor. When working with hardware, it is important to follow the rules and regulations relating to electrical equipment and health and safety guidelines.

19.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 19: Developing and maintaining ICT systems for users

What you need to do:

You need to produce: records of specifying, upgrading and repairing ICT systems.

Your evidence needs to include:

a: [AO3] records of interviews with **two** different users to identify their key requirements [**6**];

b: [AO2] detailed specifications for an ICT system for each user, along with explanations of the reasons for selecting particular components, in non-technical language [**8**];

c: [AO1] records of carrying out an upgrade involving selecting and adding a new component to a system [**8**];

d: [AO1] records of carrying out an upgrade by replacing a component in a system [**7**];

e: [AO3] records of troubleshooting procedures carried out to identify faulty components [**6**];

f: [AO4] an evaluation of the information sources used to find information on components [**7**];

g: [AO4] an evaluation of the specifications and approaches taken to specifying, upgrading and repairing systems [**8**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO3**	You analyse each user's needs and establish their key requirement; **[0 1 2]**	you plan the questions you will ask each user to establish their key requirement; **[3 4]**	you use in-depth questioning to analyse each user's needs and establish their key requirement. **[5 6]**	**/6**
b	**AO2**	You specify, for the **two** different systems, at least **one** of **each** of the following components: – micro-processor and associated components; – display system; – memory; – storage device; – input device; – output device; and include, in the specification for each component, details of type, size, speed, method of connection, bus type, type of case, device controllers and other cards, as appropriate; explain, in language that can be understood by each user, the characteristics of components that relate to their requirements; **[0 1 2 3]**	you use a range of sources of information, such as computer magazines, technical manuals, text books and the Internet to gather information about the components listed in Mark Band 1, and their prices and configurations, in order to advise each user of configurations which closely match the requirements, renegotiating these if necessary and amending your specification to meet the revised requirements; **[4 5 6]**	you justify your choice of each configuration by matching it to the user's key requirements; you include consideration of the compatibility of the recommended components and show that, in recommending a configuration, you have considered other factors such as cost and availability; you include advice about 'future-proofing' in your report to each user. **[7 8]**	**/8**

Unit 19: Developing and maintaining ICT systems for users (continued)					
Task	**Assessment Objective**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO1**	You select components that meet the user's needs for an upgrade and that are compatible with the existing system, and you carry out an upgrade that requires the addition of a single component, following correct procedures; **[0 1 2 3]**	you recognise the limitations of the existing system when recommending and selecting components to upgrade it, and carry out an upgrade that requires the BIOS to be reset, following correct procedures; **[4 5]**	you select components for an upgrade, identifying any additional components or reconfiguration required, and carry out an upgrade where such additional components and/or reconfiguration are required, following correct procedures. **[6 7 8]**	**/8**
d	**AO1**	You upgrade a system by replacing **one** component with another that is compatible with the existing system, following correct procedures; **[0 1 2]**	you upgrade a system where the upgrade of **one** component requires the replacement of another, following correct procedures; **[3 4 5]**	you carry out an upgrade to a system that requires the BIOS to be changed or upgraded. **[6 7]**	**/7**
e	**AO3**	You use an appropriate method to identify the component that is causing a system to fail, keeping brief records of problems and solutions; **[0 1 2]**	you use a systematic approach to identifying the component that is causing the system to fail, keeping detailed records of problems and solutions; **[3 4]**	you use testing tools and procedures and locate information on hardware error messages to help you identify the component that has caused a system to fail, indexing detailed records of problems and solutions to help solve similar problems in the future. **[5 6]**	**/6**
f	**AO4**	You show that you have considered the accuracy, currency and relevance of the information sources you have used when specifying and upgrading systems;**[0 1 2 3]**	you compare the information sources used when specifying and upgrading systems in terms of their accuracy, currency and relevance; **[4 5]**	you evaluate critically the accuracy, currency and relevance of the information sources you have used when specifying and upgrading systems. **[6 7]**	**/7**
g	**AO4**	You comment on how well your specifications met the needs of the users and the effectiveness of the approach you took to specifying, upgrading and repairing ICT systems; your report may contain errors in spelling, punctuation and grammar; **[0 1 2]**	you identify strengths and weaknesses in your specifications and the approach you took to specify, upgrading and repairing ICT systems, recommending improvements; your report will contain few spelling, punctuation and grammar errors; **[3 4 5]**	you provide a critical analysis of your specifications and the approach you took to specifying, upgrading and repairing ICT systems, taking into account user feedback, and suggest how you would refine them in the future; your report will be consistently well-structured and there will be few, if any, spelling, punctuation and grammar errors. **[6 7 8]**	**/8**
				Total mark awarded:	**/50**

19.4 GUIDANCE FOR TEACHERS

19.4.1 Guidance on Delivery

The unit builds on the knowledge and understanding gained in Unit 4: *System specification and configuration*, but to ensure that each unit is meaningful in its own right there is a small overlap in content. In order to deliver this unit, centres need to provide students with the hardware and software components which will enable them to set up a computer system which they can manage themselves. Centres may consider retaining older equipment for this purpose when systems are being upgraded. However, they need to ensure that the equipment allows candidates to carry out all the activities specified in Section 19.2.

In this unit, the emphasis is on specifying hardware components for a custom-built system. This will require candidates to acquire a far more detailed technical knowledge of components, how they operate and how they can be combined to create systems to meet the specific needs of users.

Specialist computer shops and consultants are able to design and custom-build computer systems from individual components to meet the specific needs of users. This unit has been designed to give candidates a detailed understanding of the characteristics and capabilities of a wide range of hardware components of microcomputer systems, to enable them to specify systems at this level.

The emphasis in this unit is for candidates to understand and interpret the technical specifications for different components and to select the most appropriate example of a particular type of component for a system. In doing so, they need to consider a range of issues, including compatibility with other components, cost and future-proofing (the ability to replace or upgrade), as well as the requirements of the user, including the hardware requirements of any software to be used.

Candidates need to understand that a user may not, initially, provide sufficiently detailed information about what they need from a system. Before they can specify a system, candidates need to clarify the user's needs, either by questioning the user, or by investigating the processes the system will be required to carry out, or both. They must then identify the key requirements of the user. In some cases, the user may have already purchased equipment which they want to incorporate into the new system. Candidates need to take this into account when selecting components to ensure compatibility.

Candidates need practice in interpreting and clarifying user requirements and selecting components to meet them. You need to prepare suitable scenarios to enable them to do so.

Examples might include:

- a market research company which employs home-workers to interview consumers, enter questionnaire responses into a computer, process these and send summaries back to Head Office;
- a small printing company which processes text and incorporates graphics to produce newsletters/magazines for local small businesses;
- a kitchen-design/installation company which employs 'consultants' to visit prospective customers' homes to measure up and produce a quotation, the plans being produced later at the main office to a level suitable for the installation team to follow;
- the treasurer of a charitable organisation who has special needs, e.g. a visual impairment, who wants to use ICT to keep track of the accounts of the organisation, and for general correspondence.

The resources required for this unit will include a wide range of suppliers' and manufacturers' catalogues, technical manuals, computer magazines and textbooks providing explanations of standards and operational characteristics of the components under investigation. Candidates would also benefit from being able to use a wide range of such components so that they can gain practical knowledge of their features and operating characteristics. A range of diagnostic software is available for running benchmark tests on the components of computer systems. This would also provide candidates with practical experience and enable them to compare the performance of components empirically.

Taking old systems apart and rebuilding them may also help candidates acquire practical experience of components. Building a system from scratch is another possible practical activity. Undertaking this type of activity gives candidates the opportunity to question the need for the various components of a motherboard and observe the practical mechanics of fitting system components together in a box (main processing unit).

The section on microprocessor architecture requires candidates to realise that there are different types of architecture and to look at how they are organised.

When studying display systems, candidates need to understand that this is more than just the VDU and includes factors that affect display performance such as screen memory, graphic adapters and video cards. Similarly, the features of secondary storage devices include both the media and the drives required to access them.

It is recognised that new and improved components are continuously being developed and it is expected that candidates will include in their investigations those that are available at the time.

Candidates need to be taught tools and strategies for troubleshooting computer systems. They need to identify the components that may be causing the problem.

Many of the previous statements regarding Sub-Sections 19.2.2 (Compatibility and other Factors) and 19.2.3 (Meeting a User's Needs) will also apply when upgrading or replacing components in existing systems.

19.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 19.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO3**	**1**	Candidates use information provided to identify the user's key requirements;
		2	candidates interview users to establish their key requirements, planning the questions they ask in advance;
		3	candidates use supplementary questions to gain precise information from users that enables them to establish each user's key requirements.
b	**AO2**	**1**	Candidates specify components for **two** different systems as indicated – users need to be chosen to enable candidates to specify very different systems; candidates use non-technical language to explain to the users the characteristics of the components chosen and relate these to the users' requirements;
		2	candidates use a range of sources of information, both paper-based and on-line, to gather the information they require; candidates renegotiate requirements with the user, e.g. by suggesting a slight increase in cost to enable the performance requirements to be met fully, or replacing a component that is unavailable with another that has a different specification; candidates then amend the specification to take account of such changes;
		3	candidates demonstrate that they have considered the compatibility of components in the systems they recommend, as well as other factors such as cost and availability; candidates justify the choices made by matching each configuration chosen to the user's key requirements; candidates also give advice to users on future-proofing the systems recommended, e.g. how they allow for enhancement or upgrading.
c	**AO1**	**1**	Candidates select a suitable component to upgrade a system, e.g. adding a graphics card; candidates carry out the upgrade, following correct procedures including anti-static, rules and regulations relating to electrical equipment and health and safety guidelines; candidates check that the upgrade has been carried out successfully;
		2	candidates identify when a required upgrade is not possible due to the limitations of the existing system; candidates upgrade a system by adding a component that requires the BIOS to be reset, e.g. adding USB ports;
		3	candidates select components for, and carry out, a required upgrade that requires additional components or reconfiguration of the system, e.g. the addition of an IDE storage device.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	AO1	1	Candidates carry out the simple upgrade of a system by replacing **one** device with another, e.g. replacing a hard-disk drive with **one** of higher capacity; candidates carry out the upgrade, following correct procedures including anti-static, rules and regulations relating to electrical equipment, and health and safety guidelines; candidates check that the upgrade has been carried out successfully;
		2	candidates carry out an upgrade that requires the replacement of more than **one** component, e.g. where replacing the CPU also requires the replacement of the motherboard;
		3	candidates carry out an upgrade where changing a component requires the BIOS to be changed or upgraded, e.g. replacing the CPU with a newer model that requires the BIOS to be upgraded.
e	AO3	1	Candidates use a range of straightforward methods, such as observation, questioning, simple diagnostic tests and component swapping, to identify the component that has caused a system to fail; candidates keep a log that identifies each problem and outlines how it was solved;
		2	candidates use a systematic approach to identifying the component that has caused a system to fail; candidates keep a log that describes each problem and its solution in detail, so that a similar problem could be solved in future;
		3	candidates use testing tools, such as disk scanners and memory testers, to help them identify the component that has caused a system to fail; candidates use hardware manuals or sites on the Internet to locate information on hardware error messages; candidates index their problem log to easily locate solutions to specific problems when they occur again.
f	AO4	1	Candidates, for example, use more than **one** source to confirm the accuracy of information, use only information that is relevant to the specification being developed, and check the date of publication of the information, using the most up-to-date;
		2	candidates include a comparison of different information sources such as books, magazines, suppliers' catalogues and websites;
		3	candidates include a critical evaluation of the information sources used based on their accuracy, relevance and currency.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
g	AO4	1	Candidates provide brief comments matching each specification to the needs of the user; candidates also provide brief comments on the effectiveness of their approach to specifying, upgrading and repairing ICT systems;
		2	candidates identify aspects of their specifications that fully met the user's needs and aspects that did not; candidates also identify approaches to specifying, upgrading and repairing ICT systems that worked well and those that worked less well or did not work; candidates suggest some ways to improve their performance;
		3	candidates provide a detailed and critical evaluation of their work that draws on feedback from the users involved; candidates suggest ways of refining their approach to future specification, upgrading and repairing tasks.

19.4.3 Resources

Websites	http://www.buildyourowncomputer.net/learntobuild.html http://www.computer.howstuffworks.com/channel.htm?ch=computer&sub=sub-hardware http://www.computer.howstuffworks.com/channel.htm?ch=computer&sub=sub-peripherals http://www.daileyint.com/build/ http://www.karbosguide.com/ http://www.learnthat.com/courses/computer/buildpc/http://www.tomshardware.com/

20 Unit 20: ICT Solutions for People with Individual Needs
[A2 level, double award, optional, internally assessed]

20.1 ABOUT THIS UNIT

This A2 level unit is an optional part of the double award only and is internally assessed.

Special and individual needs covered are likely to include:

- sensory impairments;
- speech impairments;
- motor disabilities;
- mind disorders;
- learning difficulties;
- temporary limitations, e.g. from a fractured wrist;
- limitations from age and infirmity.

You need to see that anyone may, at some stage in life, have individual needs which can be assisted and alleviated by the careful use of technology.

This unit helps you to:

- understand about disabilities and impairments;
- understand how technology can be used to alleviate the limitations of disabilities and impairments;
- explore how ICT improves the quality of life for some people;
- evaluate the effectiveness of ICT solutions;
- consider how ICT may be further used to help individuals.

You will study individuals' use of ICT to enable them to achieve equality and independence, and how they use technology to convert communication into a useable form (to sense and control) in order that disabilities, impairments and difficulties can be overcome.

This unit may be useful for a career in the caring field, using your ICT skills.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce a report or presentation for ICT solutions which assesses the needs, defines ICT solutions and evaluates the solutions in response to **three** case studies. Each of the case studies will have different needs and you need to include **one** case study that relates to an individual who has sensory needs.

Your evidence will:

- show an understanding of legislation and the rights of each of the individuals in connection with your ICT solutions;
- show a clear understanding of the disabilities or limiting factors, and resultant needs, identify and show suitable items of equipment and software as appropriate;
- for at least **one** case study, provide a specification for a complete system, to include configuration and customisation of software and equipment as appropriate and demonstrate that you can customise the available operating system and applications;
- evaluate the viability and effectiveness of your proposed solutions, indicating how the solutions will enhance the quality of life for each individual;
- present your reports or presentations in a way that is suitable for the needs of the individuals outlined in each case study, or for a carer if the case study is that of a young child or a person with very limited understanding.

20.2 WHAT YOU NEED TO LEARN

You need to learn about:

- types of disability;
- types of need;
- ICT usage;
- equipment;
- software;
- customising software;
- legislation.

20.2.1 Types of Disability

There are many terms used in relation to individual and special needs. The terms 'disability', 'impairment' and 'handicap' need to be explored and understood.

Before you can look at ICT solutions, you need to gain an understanding of the limitations caused by a number of disabilities, impairments and other limiting factors that affect individuals. From this you will understand ways in which technology can be used to enhance quality of life.

20.2.2 Types of Need

You need to explore a range of needs that should include:

- blindness and visual impairment;
- deafness and hearing impairment;
- speech impairment;
- motor disabilities that impede or disable mobility;
- dyslexia;
- mind disorders;
- learning difficulties;
- temporary limitations – perhaps during recovery from accident.

An individual or special need is a person's particular requirement that needs to be met in order for them to achieve something which they might otherwise find difficult due to their individual circumstances.

You need to understand the differences between those who were born with a disability, those who have acquired a permanent disability and those who are temporarily disabled. You need to explore how this will affect individuals' attitudes and understanding. You need to learn about the aspirations of individuals to achieve independence and quality of life.

20.2.3 ICT Usage

You need to learn about and understand the types of ICT usage that can be required by people with individual and special needs. This can be general use of technology for business, learning and leisure. It can also include specialised use such as:

- speech synthesis;
- speech recognition;
- conversion between speech and text;
- enlarged text;
- Braille output;
- control of devices, e.g. ventilation, heating, access to building.

There may be a combination of uses needed by the individual.

20.2.4 Equipment

You need to explore the range of specially constructed or modified equipment that is available, how it is used and in what circumstances it would be used. You need to look at special input and output devices plus modification to existing standard equipment. The list is not exhaustive but could include:

- special keyboards;
- mouse alternatives;
- touch screens;
- Braille output devices and printers;
- extra large screens;
- control interfaces.

You need to consider other aspects of technology, such as vibrating alarm clocks, speaking scales, text phones, mobile phones and fax machines, when exploring advantageous equipment. Look also at how existing items may be modified to make their usage easier for an individual. Examples here include tactile markers on home keys and other important keys to help a blind user, or a key guard to help a person with limited hand movement.

You need to learn about the cost and availability of special items of equipment.

20.2.5 Software

You need to learn about the range of software available and what special features are incorporated to meet special and individual needs. This includes:

- control software;
- voice recognition;
- Optical Character Reader (OCR) packages;
- speech synthesis;
- screen reading software.

You need to understand the benefits and limitations of these packages. You need to learn about the cost and availability of special items of software.

20.2.6 Customisation of Software

You need to consider how existing operating systems and application software can be customised to meet individual needs. Some applications software, for example, includes features that may be advantageous to many users. Examples include the facility to set up the system for single touch use of 'Shift' or to reverse the mouse buttons for a left-handed user. You need to learn how to customise the operating system, web browser and applications such as word processing to meet a variety of individual needs.

20.2.7 Legislation

You also need to understand how current legislation affects the rights of people with individual needs. You need to look at:

- Chronically Sick and Disabled Persons' Act (CSDPA) (1970);
- Disability Discrimination Act (DDA) (1995);
- Telecommunications Act (1984);
- Equal Opportunities Policies;
- European Legislation relating to equal opportunities and human rights.

20.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 20: ICT solutions for people with individual needs

What you need to do:

You need to produce: a report or presentation for ICT solutions which assesses the needs, defines ICT solutions and evaluates the solutions in response to **three** case studies. Each of the case studies should have different needs and you need to include **one** case study that relates to an individual who has sensory needs.

Your evidence needs to:

a: [AO2] show an understanding of legislation and the rights of each of the individuals in connection with your ICT solutions [**4**];

b: [AO2] show a clear understanding of the disabilities or limiting factors and resultant needs, identify and show suitable items of equipment and software as appropriate [**4**];

c: [AO1/3/4] for at least **one** case study, provide a specification for a complete system, to include configuration and customisation of software and equipment as appropriate and demonstrate that you can customise the available operating system and applications [**27**];

d: [AO4] evaluate the viability and effectiveness of your proposed solutions, indicating how the solutions will enhance the quality of life for each individual [**9**];

e: [AO1] present your reports or presentations in a way that is suitable for the needs of the individuals outlined in each case study, or for a carer if the case study is that of a young child or a person with very limited understanding [**6**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You list the current legislation that affects the requirements for support for people with individual needs; **[0 1]**	you describe the current legislation that affects the requirements for support for people with individual needs; **[2 3]**	you describe the implications of the current legislation that affects the requirements for support for people with individual needs. **[4]**	**/4**
b	**AO2**	You identify, and explain in detail, ICT solutions for each of the **three** users, listing suitable equipment for use by each of them and alternative equipment available; **[0 1 2]**	you explain your reasons for your choice of equipment in each ICT solution and show how your knowledge, skills and understanding of the development of specialised equipment have led you to your conclusions; **[3]**	you evaluate the effectiveness of your recommended solutions and compare them with an alternative solution. **[4]**	**/4**

Unit 20: ICT solutions for people with individual needs (continued)					
What you need to do:					
Task	**AO**	**Mark Band 1**	**Mark Band 2**	**Mark Band 3**	**Mark Awarded**
c	**AO1**	You give a practical demonstration of *partially* customising the operating system, application software and the hardware; **[0 1 2 3]**	you give a practical demonstration of *completely* customising the operating system, application software and the hardware; **[4 5 6]**	you give a practical demonstration of *completely* customising the operating system, application software and the hardware, to provide an effective solution for the user. **[7 8 9]**	**/27**
	AO3	You identify how the configuration of recommended items will meet individuals' needs; **[0 1 2 3 4]**	you produce an effective solution, including configuration of software and equipment, and explain how the configurations will meet individuals' needs; **[5 6 7 8]**	you produce an effective solution, *with alternative suggestions*, including configuration of software and equipment, and explain how the configurations *of* the proposed solution and the alternatives will meet individuals' needs. **[9 10 11 12]**	
	AO4	You comment on your actions and role in solving the problem and identify areas for improvement; **[0 1 2]**	you include an analysis on your own performance by identifying strengths and weaknesses, with some suggestions for improvement to the overall process; **[3 4]**	you include an analysis on your own performance by identifying strengths and weaknesses and use this analysis to show how you will address these issues to be more effective in the future. **[5 6]**	
d	**AO4**	You comment on how the solutions will enhance the quality of life for the user in each case study; **[0 1 2 3]**	you comment on how the solutions will enhance the quality of life for the user in each case study, suggesting alternatives; **[4 5 6]**	you analyse the strengths and weaknesses of your suggestions for ICT solutions and include, in your recommendations to each user, a discussion of how the solution will enhance their quality of life, giving consideration to realistic aims and objectives. **[7 8 9]**	**/9**
e	**AO1**	You present your recommendations in a way that is easy for the users to follow; **[0 1 2]**	you have specifically used a media, format and style for your recommendations – or a sub-set of them – to suit the special needs of the user; **[3 4]**	you produce well-presented accurate information in your recommendations of ICT solutions for each user, verifying the accuracy of the information by showing that you have used a wide variety of sources. **[5 6]**	**/6**
				Total mark awarded:	**/50**

20.4 GUIDANCE FOR TEACHERS

20.4.1 Guidance on Delivery

It is recommended that support be sought from local organisations for people with disabilities, as many of these are likely to be keen to assist whilst raising awareness of their particular disability.

The order in which disabilities are covered is open to variation but experience has shown that many people envisage 'disabilities' as dependency on a wheelchair, so it may be advantageous to start with motor disabilities.

General discussion and 'brain storming' sessions to identify a wider range of disabilities and needs would be advantageous.

Case studies need to provide enough detail to enable candidates to accurately assess the needs of the person in their case study. If these are based on living people, care needs to be taken to mask the identity of the individual. If candidates wish to use details of individuals in place of case studies, they need to secure permission to use the information.

Candidates need to present their report in an appropriate way for the person outlined in the case study, as well as making sure that all required points are covered. In some circumstances, candidates may find it appropriate to make a sub-report for the person in the case study. Examples of such circumstances are an audio recording of the report for a blind person, or a shortened and simplified version for a child or an adult with limited understanding.

20.4.2 Guidance on Assessment

It is recommended that candidates be encouraged to submit a completed report from just **one** case study initially and that feedback be given promptly so that candidates can benefit from that feedback before submitting the other **two** reports.

You need to look for realistic solutions that are shown to be viable and practical by the analytical skills of candidates. You also need to look for critical evaluation of solutions that should identify *limitations* as well as *advantages* of given solutions.

Evidence of the practical aspect of this unit needs to be recorded in such a way that it can be inspected easily for moderation and standardisation purposes.

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 20.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at A2 level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates show awareness of current and relevant legislation relating to support for people with individual and special needs; the list includes United Kingdom and European law; this may be in the form of a report and does not need to be replicated for each case study;
		2	candidates expand on the list of legislation, giving an explanation of how the legislation relates to people with individual and special needs;
		3	candidates further expand on the basic list of legislation, reflecting on the effectiveness of examples of the legislation, and evaluating the effectiveness; there may be reference to opinions and comments from special needs users.
b	**AO2**	**1**	Candidates review the needs of **three** different case studies who have individual or special needs; the case studies chosen reflect a variety of different needs so that candidates can provide different technology-based solutions for each of the case studies, and **at least one** of the case studies includes a sensory disability; candidates explore solutions relating to a wide range of needs;
		2	candidates expand on the review to give reasoned support to their recommendations by explaining how the user will benefit from the solution and what the limitations are likely to be;
		3	candidates also evaluate the effectiveness of the proposed solution and compare it with an alternative solution, considering such areas as ease of use, cost and suitability to the user's needs.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
c	AO1	1	Candidates are observed customising application and system software and support this with 'Before and After' photographs or screen prints; customising hardware may, of necessity, be limited to something basic, such as exchanging the mouse for a trackerball; candidates need to include a brief statement of the purpose for the customising; **this practical aspect need only be applied to one of the case studies**; care should be taken to select the case study that gives the candidate the best opportunity to show customising skills;
		2	candidates expand on this by customising more than **three** aspects; candidates at the higher end of this mark band customise further applications, adding relevant hardware or selecting more appropriate hardware, e.g. a printer that is easier to use by someone who has limited hand movement;
		3	candidates show how the actions taken will produce an effective solution for the user; candidates show an understanding of the abilities and disabilities of the user for whom the customising was carried out.
	AO3	1	Candidates show an understanding of the needs of **one** case study and explain the effectiveness of the solution, as matched to their identified individual and special needs; they produce a full and itemised specification for an appropriate system, including all customisation, training and support that may be needed, in order that the user in the case study can achieve full potential; candidates pay attention to detail;
		2	candidates provide a solution which clearly meets the needs of the case study, is **practical, useable** and **economically viable**; candidates show reasoning to support each of those points;
		3	candidates expand further on the proposed solution, showing alternative solutions and explaining the reason for the recommendation made as compared to the alternatives; candidates clearly show how the solutions will meet the needs of the individual(s).
	AO4	1	Candidates make brief comments on how effective their method was to find information and provide a specification; they suggest simple improvements to their method;
		2	candidates' evaluations consider both good, and not so good, features of each method used to find information and provide a specification; candidates provide sensible suggestions as to how each method could be improved;
		3	candidates show evidence of evaluation through the refinement of their work as it progresses; they identify the strengths and weaknesses in their initial methods and explain how these were refined to meet the purpose more closely; candidates consider how a more efficient approach might be adopted for similar tasks in future in their final evaluations.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
d	AO4	1	Candidates comment on how the **three** case study solutions will enhance the quality of life by enabling the individuals to achieve greater independence or to do something that was previously more difficult or impossible to achieve; (**one** mark for **each** case study in which this is achieved);
		2	candidates comment on alternative solutions for each case study; (**one** mark for **each** case study in which this is achieved);
		3	candidates analyse the strengths and weaknesses of all **three** solutions, including an outline of how the solutions could realistically enhance the quality of life for each user; (**one** mark for **each** case study in which this is achieved).
e	AO1	1	Candidates present their findings in a way that is appropriate to the case study user; (**one** mark for at least **one** case study, appropriately presented, **two** marks if all **three** case studies substantially meet this criteria);
		2	candidates consider the specific abilities and disabilities of the user in the case study, matching their report, or a sub-set of the report, to the individual needs – this may include large print or an audio-cassette version for a user with impaired vision, or a simplified version for a case study with a learning difficulty; candidates could also present a sub-set of the information verbally in a simulation; it may not be necessary to present all **three** cases in this way, therefore marks will be awarded either to **one** complex adaption of presentation, or across **two** adapted presentations, but the remaining **one** or **two** presentations must still be appropriate to the understanding and ability of the case study;
		3	candidates present all case studies to a high standard, checking and verifying the recommendations and making sure the reports are accurate; they acknowledge the sources of information; **five** marks will be awarded if **one** presentation fully meets the criteria and the other **two** are relatively good, whilst **six** marks will be awarded if all case studies meet the criteria.

20.4.3 Resources

In the fast moving world of access technology, online resources can be more practical than paper-based resources. The following list is offered as a guide but is by no means exhaustive. Your research may reveal many other useful resources.

Organisations	RNIB RNID SCOPE
Websites	Ability.net http://www.abilitynet.org.uk/ Ability online http://www.abilityonline.org.uk/ Database of links http://www.ability.org/index.html Disability Discrimination Act 1995 http://www.hmso.gov.uk/acts/acts1995/Ukpga_19950050_en_1.htm Disabled Living Foundation http://www.dlf.org.uk/ Disability Rights Commission http://www.drc-gb.org/ Disability Rights Commission Act 1999 http://www.legislation.hmso.gov.uk/acts/acts1999/19990017.htm Equipment ideas http://www.remap.org.uk/ Foundation for Assistive Technology http://www.fastuk.org/ Legislation info http://www.disability.gov.uk/ Limbless Association http://www.limbless-association.org National Autistic Society http://www.nas.org.uk/ Our focus is people with cerebral palsy (cp) http://www.scope.org.uk/ Royal National Institute for the Blind http://www.rnib.org.uk/ Royal National Institute for the Deaf http://www.rnid.org.uk/ Skill: National Bureau for Students With Disabilities http://www.skill.org.uk/ Susie describes her life with cerebral palsy (cp) http://www.susiecphome.com/ UK Legislation http://www.hmso.gov.uk/acts/acts2001/20010010.htm Website for Learning Disabilities http://www.ldonline.org/