OCR
RECOGNISING ACHIEVEMENT

OCR GCSE in Computing J275 (Pilot)

specification

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Why choose OCR GCSE Computing?

A modern course for a modern world

This is a course that has real relevance in our modern world. While learners will no doubt already have some knowledge of computers and related areas, the course will give them an in-depth understanding of how computer technology works and a look at what goes on "behind the scenes". As part of this, they will investigate computer programming, which many learners find interesting.

The fun of computing

Through this study of computer programming, the course will help learners develop critical thinking, analysis and problem solving skills. For many, it'll be a fun and interesting way to develop these skills, which can be transferred to other subjects and even applied in day-to-day life.

In this way, the course will stimulate interest and engagement with technology and technology-related careers.

Looking to the future

In fact, information technologies continue to have a growing importance. This means there will be a bigger demand for professionals who are qualified in this area. If learners want to go on to higher study and employment in the field of Computer Science, they will find that this course provides a superb stepping stone. Learners who have taken a Computing GCSE and who then progress to study the subject at A Level or university will have a sound underpinning knowledge of this subject area.

OCR GCSE in Computing (Pilot) – J275

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1 Introduction to GCSE Computing

1.1 Overview of OCR GCSE Computing

Unit A451	***Computer systems and programming***
Written paper: Candidates answer all questions. 1.5 hours 80 marks 40% of the qualification	Candidates answer all questions.QP that includes a mixture of short and long answer questions, some of which will require candidates to write program code.

and

Unit A452	***Practical investigation***
Controlled assessment An investigative task Approx 20 hours 45 marks 30% of the qualification	Candidates carry out a practical investigation of a topic chosen from a set of options supplied by OCR.

and

Unit A453	***Programming project***
Controlled assessment Approx 20 hours 45 marks 30% of the qualification	Candidates create solutions to computing tasks chosen from a set of options supplied by OCR.

1.2 Aims and learning outcomes

GCSE specifications in Computing should encourage learners to be inspired, moved and challenged by following a coherent, satisfying and worthwhile course of study. They should help learners to gain an insight into related sectors. They should prepare learners to make informed decisions about further learning opportunities and career choices.

GCSE specifications in Computing must enable learners to:

- develop their understanding of current and emerging technologies, understanding of how they work and apply this knowledge and understanding in a range of contexts
- acquire and apply a knowledge, some technical skills and an understanding of the use of algorithms in computer programs to solve problems using programming
- use their knowledge and understanding of computer technology to become independent and discerning users of ICT, able to make informed decisions about its use, and aware of the implications of different technologies
- acquire and apply creative and technical skills, knowledge and understanding of ICT in a range of contexts
- develop computer programs to solve problems
- develop the skills to work collaboratively
- evaluate the effectiveness of computer programs/solutions and the impact of and issues related to the use of computer technology in society.

1.3 Guided learning hours

GCSE Computing requires 120–140 guided learning hours.

2 Content of GCSE Computing

2.1 Unit A451: *Computer systems and programming*

This unit covers the body of knowledge about computer systems on which the examination will be based.

2.1.1 Fundamentals of computer systems

This topic introduces computer systems and provides a foundation for the remaining topics in this unit.

Candidates should develop a mental model of a computer system which comprises hardware and software and in which:

- data is input and converted into the computer's internal representation by input devices
- the data is processed
- the results of the processing are converted from the computer's internal representation and output by an output device
- the data may be stored for later use or transmitted to another computer system while it is still in the computer's internal representation.

This model applies to the personal computer, but candidates should be aware of how it also applies to equipment which uses computer technology.

Computer systems

Candidates should be able to:

(a) define a computer system

(b) describe the importance of computer systems in the modern world

(c) explain the need for reliability in computer systems

(d) explain the need for adherence to suitable professional standards in the development, use and maintenance of computer systems

(e) explain the importance of ethical, environmental and legal considerations when creating computer systems.

2.1.2 Computing hardware

Candidates should be able to define the term hardware and have an understanding of:

The Central Processing Unit (CPU)

Candidates should be able to:

(a) state the purpose of the CPU

(b) describe the function of the CPU as fetching and executing instructions stored in memory

(c) explain how common characteristics of CPUs such as clock speed, cache size and number of cores affect their performance.

Binary logic

Candidates should be able to:

(d) explain why data is represented in computer systems in binary form

(e) understand and produce simple logic diagrams using the operations NOT, AND and OR

(f) produce a truth table from a given logic diagram.

Memory

Candidates should be able to:

(g) describe the difference between RAM and ROM

(h) explain the need for ROM in a computer system

(i) describe the purpose of RAM in a computer system

(j) explain how the amount of RAM in a personal computer affects the performance of the computer

(k) explain the need for virtual memory

(l) describe cache memory

(m) describe flash memory

(n) discuss how changes in memory technologies are leading to innovative computer designs.

Input and output devices

Candidates should be able to:

(o) understand the need for input and output devices

(p) describe suitable input devices for a wide range of computer controlled situations

(q) describe suitable output devices for a wide range of computer controlled situations

(r) discuss input and output devices for users with specific needs.

Secondary storage

Candidates should be able to:

(s) explain the need for secondary storage

(t) describe common storage technologies such as optical, magnetic and solid state

(u) select suitable storage devices and storage media for a given application and justify their choice using characteristics such as capacity, speed, portability, durability and reliability.

2.1.3 Software

Candidates should be able to define the term software and have an understanding of:

Software

Candidates should be able to:

(a) explain the need for the following functions of an operating system: user interface, memory management, peripheral management, multi-tasking and security

(b) describe the purpose and use of common utility programs for computer security (antivirus, spyware protection and firewalls), disk organisation (formatting, file transfer, and defragmentation), and system maintenance (system information and diagnosis, system cleanup tools, automatic updating)

(c) discuss the relative merits of custom written, off the shelf, open source and proprietary software.

2.1.4 Representation of data in computer systems

Units

Candidates should be able to:

(a) define the terms bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte

(b) understand that data needs to be converted into a binary format to be processed by a computer.

Number

Candidates should be able to:

(c) convert positive denary whole numbers (0-255) into 8-bit binary numbers and vice versa

(d) add two 8-bit binary integers and explain overflow errors which may occur

(e) convert positive denary whole numbers (0-255) into 2-digit hexadecimal numbers and vice versa

(f) convert between binary and hexadecimal equivalents of the same number

(g) explain the use of hexadecimal numbers to represent binary numbers.

Character

Candidates should be able to:

(h) explain the use of binary codes to represent characters

(i) explain the term character set

(j) describe with examples (for example ASCII and Unicode) the relationship between the number of bits per character in a character set and the number of characters which can be represented.

Images

Candidates should be able to:

(k) explain the representation of an image as a series of pixels represented in binary

(l) explain the need for metadata to be included in the file such as height, width and colour depth

(m) discuss the effect of colour depth and resolution on the size of an image file.

Sound

Candidates should be able to:

(n) explain how sound can be sampled and stored in digital form

(o) explain how sampling intervals and other considerations affect the size of a sound file and the quality of its playback.

Instructions

Candidates should be able to:

(p) explain how instructions are coded as bit patterns

(q) explain how the computer distinguishes between instructions and data.

2.1.5 Databases

The database concept

Candidates should be able to:

(a) describe a database as a persistent organised store of data

(b) explain the use of data handling software to create, maintain and interrogate a database.

The DBMS

Candidates should be able to:

(c) describe how a DBMS allows the separation of data from applications and why this is desirable

(d) describe the principal features of a DBMS and how they can be used to create customised data handling applications.

Relational databases

Candidates should be able to:

(e) understand the relationship between entities and tables

(f) understand the components of a relational database, such as tables, forms, queries, reports and modules

(g) understand the use of logical operators in framing database queries

(h) explain the use of key fields to connect tables and avoid data redundancy

(i) describe methods of validating data as it is input.

2.1.6 Computer communications and networking

Networks

Candidates should be able to:

(a) explain the advantages of networking stand-alone computers into a local area network

(b) describe the hardware needed to connect stand-alone computers into a local area network, including hub/switches, wireless access points

(c) explain the different roles of computers in a client-server and a peer-to-peer network

(d) describe, using diagrams or otherwise, the ring, bus and star network topologies

(e) describe the differences between a local area network and a wide area network such as the Internet

(f) explain the terms IP addressing, MAC addressing, packet and protocols

(g) explain the need for security measures in networks, such as user access levels, suitable passwords and encryption techniques

(h) describe and justify network policies such as acceptable use, disaster recovery, failover, back up, archiving.

The Internet

Candidates should be able to:

(i) describe the nature of the Internet as a worldwide collection of computer networks

(j) describe the hardware needed to connect to the Internet including modems, routers etc

(k) explain the need for IP addressing of resources on the Internet and how this can be facilitated by the role of DNS servers

(l) explain the importance of HTML and its derivatives as a standard for the creation of web pages

(m) describe common file standards associated with the Internet such as JPG, GIF, PDF, MP3, MPEG

(n) explain the importance of compressing files that are transmitted via the Internet

(o) describe the differences between lossy and lossless compression.

2.1.7 Programming

Algorithms

Candidates should be able to:

(a) understand algorithms (written in pseudocode or flow diagram), explain what they do, and correct or complete them

(b) produce algorithms in pseudocode or flow diagrams to solve problems.

Programming languages

Candidates should be able to:

(c) explain the difference between high level code and machine code

(d) explain the need for translators to convert high level code to machine code

(e) describe the characteristics of an assembler, a compiler and an interpreter

(f) describe common tools and facilities available in an integrated development environment (IDE): editors, error diagnostics, run-time environment, translators, auto-documentation.

Control flow in imperative languages

Candidates should be able to:

(g) understand and use sequence in an algorithm

(h) understand and use selection in an algorithm (IF and CASE statements)

(i) understand and use iteration in an algorithm (FOR, WHILE and REPEAT loops).

Handling data in algorithms

Candidates should be able to:

(j) define the terms variable and constant as used in an imperative language

(k) use variables and constants

(l) describe the data types integer, real, Boolean, character and string

(m) select and justify appropriate data types for a given program

(n) perform common operations on numeric and Boolean data

(o) use one-dimensional arrays.

Testing

Candidates should be able to:

(p) describe syntax errors and logic errors which may occur while developing a program

(q) understand and identify syntax and logic errors

(r) select and justify test data for a program, stating the expected outcome of each test.

2.2 Unit A452: *Practical investigation*

This unit is designed to provide candidates with an opportunity to carry out a practical investigation into a computing issue and engage them with computing in the real world.

The unit deliberately extends the candidate's work beyond the topics in Unit A451 in order to provide a stimulating experience.

Candidates should study one from a range of topics which will be supplied by OCR. Candidates will be expected to carry out practical investigations of the topic(s) and any supplementary research necessary to complete these investigations. They will produce a report in which the topic is analysed, justified and evaluated showing evidence of the practical work undertaken.

Candidates will be expected to produce a report which will then be assessed under the four headings:

- Practical activity
- Effectiveness and efficiency of the solution
- Technical understanding
- Testing, evaluation, judgements and conclusions

The finished work will be assessed according to a best fit approach to the marking criteria.

2.2.1 Practical activity

Candidates should be able to:

(a) plan and carry out a practical investigation of a topic

(b) use practical skills effectively and efficiently to develop solutions to problems

(c) test their solutions

(d) evaluate and modify these solutions in light of test results.

2.2.2 Effectiveness and efficiency

Candidates should be able to:

(a) select suitable techniques for the development of their solution

(b) use suitable techniques to solve all aspects of the problem

(c) deploy practical techniques in an efficient and logical manner.

2.2.3 Technical understanding

Candidates should be able to:

(a) show an understanding of the relevant information by presenting evidence of the development of their solutions

(b) show an understanding of the technical terminology/concepts that arise from their investigation through their analysis of the data collected

(c) use the terminology/concepts surrounding their topic and contained in the information collected correctly when it comes to producing their analysis in the supporting script.

2.2.4 Testing, evaluation and conclusions

Candidates should:

(a) produce a full report covering all aspects of the investigation

(b) present the information in a clear form which is understandable by a third party and which is easily navigable

(c) critically appraise the evidence that they have presented

(d) test their own solution

(e) present their evaluation in a relevant, clear, organised, structured and coherent format

(f) use specialist terms correctly and appropriately

(g) present a conclusion to the report

(h) justify their conclusions based on the evidence provided.

2.3 Unit A453: *Programming project*

OCR will issue a range of assessment tasks each consisting of up to three sub tasks. The set of tasks within the controlled assessment will provide opportunities for the candidate to demonstrate practical ability to use the skills outlined in the specification for this unit.

Candidates will need to create suitable algorithms which will provide a solution to the stated problem then code their solutions in a suitable programming language. The solutions must be tested at each stage to ensure they solve the stated problem using a suitable test plan with appropriate test data.

The code must be suitably annotated to describe the process. Test results should be annotated to show how these relate to the code, the test plan and the original problem.

Candidates will need to provide an evaluation of their solution based on the test evidence.

There are no restrictions on the programming language chosen providing it has the features indicated within the specification. It is anticipated that the work for this unit will follow on from the programming elements in unit A451 and that the same programming language may, therefore, be appropriate. The tasks are set so that they can be completed in a wide range of languages including those frequently used to 'teach' programming techniques including all forms of BASIC and C. There may be a question which states that the work must be completed within a specific package. If this is the case, that package will be available for free and legal download, for example 'SCRATCH' from MIT and 'ALICE' from Carnegie.

2.3.1 Programming techniques

Standard programming techniques

Candidates should be able to:

(a) identify and use variables, operators, inputs, outputs and assignments

(b) understand and use the three basic programming constructs used to control the flow of a program: Sequence; Conditionals; Iteration

(c) understand and use suitable loops including count and condition controlled loops

(d) use different types of data including Boolean, String, Integer and Real appropriately in solutions to problems

(e) understand and use basic string manipulation

(f) understand and use basic file handling operations: open, read, write and close

(g) define and use arrays as appropriate when solving problems.

2.3.2 Design

Designing a coded solution to a problem

- analyse the problem
- develop suitable algorithms
- design suitable input and output formats
- identify suitable variables and structures
- identify test procedures.

Candidates should be able to:

(a) analyse and identify the requirements for a solution to the problem
(b) design suitable algorithms to represent the solution to a problem
(c) design suitable input and output formats and navigation methods for their system
(d) identify the data requirements for their system
(e) identify suitable variables and structures with appropriate validation for their system
(f) identify test procedures to be used during and after development to check their system against the success criteria.

2.3.3 Development

Create a coded solution

- fully annotate the developed code to explain its function.

Candidates should be able to:

(a) develop a solution to the identified problem using a suitable programming language
(b) demonstrate testing and refinement of the code during development
(c) explain the solution using suitable annotation and evidence of development.

2.3.4 Testing and evaluation

Test their solution

- to show functionality
- to show how it matches the design criteria
- identify success and any limitations.

Candidates should be able to:

(a) use a suitable test plan and data to test the function of the system
(b) test the system against the success criteria
(c) provide good evidence of test procedures
(d) modify the system, if required, to meet success criteria where these are not met;
(e) evaluate the system against the success criteria to establish how successful, or otherwise, their implementation has been.

3 Assessment of GCSE Computing

3.1 Overview of the assessment in GCSE Computing J275

Unit A451:	*Computer systems and programming*
40% of the total GCSE 1 hour 30 minutes written paper 80 marks	Question paper includes short answer questions and essay type questions.

Unit A452:	*Practical investigation*
30% of the total GCSE Controlled assessment Approx 20 hours 45 marks	Practical investigative task. OCR set scenario with choice of research tasks.

Unit A453:	*Programming project*
30% of the total GCSE Controlled assessment Approx 20 hours 45 marks	Programming tasks that enable candidates to design, develop and test a solution to a problem. OCR set tasks.

3.2 Tiers

This scheme of assessment is untiered, covering all of the ability range grades from A* to G. Candidates achieving less than the minimum mark for Grade G will be ungraded.

3.3 Assessment objectives

Candidates are expected to demonstrate the following in the context of the content described:

AO1	**Recall, select and communicate** • Candidates demonstrate their ability to recall, select and communicate their knowledge and understanding of computer technology
AO2	**Apply knowledge, understanding and skills** • Candidates demonstrate their ability to apply knowledge, understanding and skills to solve computing or programming problems
AO3	**Analyse and evaluate** • Candidates demonstrate their ability to analyse, evaluate, make reasoned judgements and present conclusions

AO weightings – GCSE Computing

The relationship between the units and the assessment objectives of the scheme of assessment is shown in the following grid:

Unit	% of GCSE			Total
	AO1	AO2	AO3	
Unit A451: *Computing systems and programming*	21	14	5	**40**
Unit A452: *Practical investigation*	4	18	8	**30**
Unit A453: *Programming project*	5	16	9	**30**
Total	**30**	**48**	**22**	**100**

3.4 Grading and awarding grades

GCSE results are awarded on the scale A* to G. Units are awarded a* to g. Grades are indicated on certificates. However, results for candidates who fail to achieve the minimum grade (G or g) will be recorded as *unclassified* (U or u) and this is **not** certificated.

GCSE are unitised schemes. Candidates can take units across several different series provided the terminal rules are satisfied. They can also re-sit units.

When working out candidates' overall grades OCR needs to be able to compare performance on the same unit in different series when different grade boundaries have been set, and between different units. OCR uses a Uniform Mark Scale to enable this to be done.

A candidate's uniform mark for each unit is calculated from the candidate's raw marks on that unit. The raw mark boundary marks are converted to the equivalent uniform mark boundary. Marks between grade boundaries are converted on a pro rata basis.

When unit results are issued, the candidate's unit grade and uniform mark are given. The uniform mark is shown out of the maximum uniform mark for the unit, eg 100/120.

The specification is graded on a Uniform Mark Scale. The uniform mark thresholds for each of the assessments are shown below:

(GCSE) Unit Weighting	Maximum Unit Uniform Mark	Unit Grade								
		a*	a	b	c	d	e	f	g	u
40%	120	108	96	84	72	60	48	36	24	0
30%	90	81	72	63	54	45	36	27	18	0

Candidate's uniform marks for each unit are aggregated and grades for the specification are generated on the following scale:

Qualification	Maximum uniform mark	Qualification Grade								
		A*	A	B	C	D	E	F	G	U
GCSE	300	270	240	210	180	150	120	90	60	0

The written paper will have a weighting of 40% and controlled assessment a weighting of 60%.

A candidate's uniform mark for each paper will be combined with the uniform mark for the controlled assessment to give a total uniform mark for the specification. The candidate's grade will be determined by the total uniform mark.

3.5 Grade descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of the assessment may be balanced by better performance in others.

The grade descriptors have been produced by the regulatory authorities in collaboration with the awarding bodies.

Grade F

Candidates recall, select and communicate a basic knowledge and understanding of computer hardware, software and other related technologies.

They identify, with guidance, the information relevant to solve a problem from the context. They apply limited knowledge, understanding and skills to design and implement basic computer programs which solve these problems. In their solutions they use simple models, collect some necessary data, use simple instructions to process the data and present the results.

They sometimes review their work and provide comments on how they and others use computer technology to solve problems and make simple modifications to improve their work.

Candidates demonstrate some awareness of the need for safe, secure and responsible practices. They use ICT to communicate, demonstrating limited awareness of purpose and audience.

Grade C

Candidates recall, select and communicate a good knowledge and understanding of the function, application merits and implications of a range of computer hardware, software and other related technologies.

They analyse problems, identifying and collecting some information relevant to solve them from the context of the problem. They apply knowledge, understanding and skills to design and implement computer programs which solve these problems. In their solutions, they model situations, acquire input data, sequence instructions, manipulate and process data and present the results of the processing in a mostly appropriate format.

They review their work and evaluate the way they and others use computer technology to solve problems and make improvements on their work where appropriate.

Candidates work using safe, secure and responsible practices. They use ICT to communicate, demonstrating consideration of purpose and audience.

Grade A

Candidates recall, select and communicate a thorough knowledge and understanding of the function, application, merits and implications of a broad range of computer hardware, software and other related technologies.

They systematically analyse problems, identifying and collecting the information required to solve them from the context of the problem. They apply knowledge, understanding and skills to design and implement effective computer programs which solve these problems. In their solutions, they effectively model situations, acquire and validate input data, sequence instructions, manipulate and process data and present the results of the processing in an appropriate format.

They work systematically and critically evaluate the way they and others use computer technology to solve problems. They iteratively review their work and make improvements where appropriate.

Candidates work systematically and understand and adopt safe, secure and responsible practices. They use ICT to communicate effectively, demonstrating a clear sense of purpose and audience.

3.6 Quality of written communication

Quality of written communication is assessed in all units.

Candidates are expected to:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- present information in a form that suits its purpose;
- use a suitable structure and style of writing.

4 Controlled Assessment in GCSE Computing

This section provides general guidance on controlled assessment: what controlled assessment tasks are, when and how they are available; how to plan and manage control assessment and what controls must be applied throughout the process. Detailed guidance relating to controlled assessment is given in the JCQ document 'Instructions for conducting controlled assessments'. More specific guidance and support is provided in the Guide for Controlled Assessment in GCSE Computing, available on the OCR website (www.ocr.org.uk).

4.1 Controlled assessment tasks

All controlled assessment tasks are set by OCR.

Controlled assessment tasks will be available from Interchange from 1 June and will be reviewed every two years. Guidance on how to access controlled assessment tasks from Interchange is available on the OCR website (www.ocr.org.uk).

Centres must ensure that candidates undertake a task applicable to the correct year of the examination by checking carefully the examination dates of the tasks on Interchange.

The candidate can complete the research phase in a group with limited supervision. The carrying out of the task must be completed individually and under direct supervision. The teacher must be able to authenticate the work.

Feedback to the candidate will be permissible but tightly defined. Within this specification, OCR expects teachers to equip the candidate with the knowledge, understanding and skills before they begin the Controlled Assessment task. It should be remembered that candidates are required to reach their own judgements and conclusions without any guidance or assistance. When supervising the Controlled Assessment task, teachers are expected to:

- offer candidates advice on how best to prepare for the research/data collection elements of this unit
- exercise continuing supervision of work in order to monitor progress and to prevent plagiarism
- exercise continuing supervision of practical work to ensure essential compliance with Health and Safety requirements
- 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.

It is the responsibility of the Head of Centre to ensure that the controls set out in the specification and the individual units are imposed.

4.2 Planning and managing controlled assessment

Controlled assessment tasks are available at an early stage to allow planning time. It is anticipated that candidates will spend a total of about 20 hours in producing the work for each unit. Candidates should be allowed sufficient time to complete the tasks.

Suggested steps and timings are included below, with guidance on regulatory controls at each step of the process. Teachers must ensure that control requirements indicated below are met throughout the process.

4.2.1 Preparation and research time

The Controlled Assessment task should be completed within the suggested time limit (see section 3.1) and supervised and marked by the teacher.

- Introduction to the task (teacher led)

Includes choice of tasks, possible approaches and sources of evidence, time allocations, programmes of work and deadlines, methods of working, control requirements.

- Research/collection of evidence

In the research stage, a low level of control is required, which means that candidates can undertake this part of the process without direct teacher supervision and outside the centre as required. Candidates are also able to work in collaboration during this stage. However, when producing their final piece of work, candidates must complete and/or evidence all work individually. With all internally assessed work, the teacher must be satisfied that the work submitted for assessment is the candidate's own work and be able to authenticate it using the specified procedure.

During the research phase candidates can be given support and guidance. Teachers can explain the task, advise on how the task could be approached, advise on resources and alert the candidate to key things that must be included in their final piece of work.

Access to resources will be limited to those appropriate to the Controlled Assessment task. Candidates will need to be provided with the most appropriate materials and equipment to allow them full access to the marking criteria, but this must be closely monitored and supervised.

Research material can include fieldwork, internet- or paper-based research, questionnaires, audio and video files etc. Candidates must be guided on the use of information from other sources to ensure that confidentiality and intellectual property rights are maintained at all times. It is essential that any material directly used from a source is appropriately and rigorously referenced.

4.2.2 Producing the final piece of work

The final piece of work is produced in the centre under controlled conditions, which means under direct teacher supervision: teachers must be able to authenticate the work and there must be acknowledgement and referencing of any sources used. If writing up is carried out over several sessions, work must be collected in between sessions.

During the carrying out of the task, candidates may have access to the notes which they have made during the research/data collection phase of task taking. It is the responsibility of the centre to ensure that these are indeed research notes and do not include a draft or final version of the task.

When supervising tasks, teachers are expected to:

- exercise continuing supervision of work in order to monitor progress and to prevent plagiarism
- exercise continuing supervision of practical work to ensure essential compliance with Health and Safety requirements
- 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.

Teachers must not provide templates, model answers or feedback on drafts. Candidates must work independently to produce their own final piece of work.

4.2.3 Presentation of the final piece of work

Candidates must observe certain procedures in the production of controlled assessment tasks.

- Tables, graphs and spreadsheets may be produced using appropriate ICT. These should be inserted into the report at the appropriate place.
- Any copied material must be suitably acknowledged.
- Quotations must be clearly marked and a reference provided wherever possible.
- Work submitted for moderation or marking must be marked with the:
  – centre number;
  – centre name;
  – candidate number;
  – candidate name;
  – unit code and title;
  – assignment title.

Work submitted on paper for moderation or marking must be secured by treasury tags. Work submitted in digital format (CD or online) must be in a suitable file structure as detailed in Appendix A at the end of this specification.

4.3 Marking and moderating controlled assessment

All controlled assessed units are marked by the centre assessor(s) using OCR marking criteria and guidance and are moderated by the OCR-appointed moderator. External moderation is either postal moderation or e-moderation where evidence is supplied in a digital format.

4.3.1 Applying the marking criteria

The starting point for marking the tasks is the marking criteria. These contain levels of criteria for the skills, knowledge and understanding that the candidate is required to demonstrate. Before the start of the course, and for use at INSET training events, OCR will provide exemplification through real or simulated candidate work which will help to clarify the level of achievement the assessors should be looking for when awarding marks.

4.3.2 Use of 'best fit' approach to marking criteria

The assessment task(s) for each unit should be marked by teachers according to the given marking criteria within the relevant unit using a 'best fit' approach. For each of the assessment objectives/criteria, teachers select one of the five band descriptors provided in the marking grid that most closely describes the quality of the work being marked.

Marking should be positive, rewarding achievement rather than penalising failure or omissions. The award of marks **must be** directly related to the marking criteria.

Teachers use their professional judgement in selecting the band descriptor that best describes the work of the candidate.

To select the most appropriate mark within the band descriptor, teachers should use the following guidance:

- where the candidate's work *convincingly* meets the statement, the highest mark should be awarded
- where the candidate's work *adequately* meets the statement, the most appropriate mark in the middle range should be awarded
- where the candidate's work *just* meets the statement, the lowest mark should be awarded.

Teachers should use the full range of marks available to them and award *full* marks in any band for work which fully meets that descriptor. This is work which is 'the best one could expect from candidates working at that level'. Where there are only two marks within a band the choice will be between work which, in most respects, meets the statement and work which just meets the statement. For wider mark bands the marks on either side of the middle mark(s) for 'adequately met' should be used where the standard is lower or higher than 'adequate' but **not** the highest or lowest mark in the band.

Only one mark per assessment objective/criteria will be entered. The final mark for the candidate for each controlled assessment unit is out of a total of 45 and is found by totalling the marks for each of the marking objective/criteria strands.

4.3.3 Authentication of work

Teachers must be confident that the work they mark is the candidate's own. This does not mean that a candidate must be supervised throughout the completion of all work but the teacher must exercise sufficient supervision, or introduce sufficient checks, to be in a position to judge the authenticity of the candidate's work.

Wherever possible, the teacher should discuss work-in-progress with candidates. This will not only ensure that work is underway in a planned and timely manner but will also provide opportunities for assessors to check authenticity of the work and provide general feedback.

Candidates must not plagiarise. Plagiarism is the submission of another's work as one's own and/or failure to acknowledge the source correctly. Plagiarism is considered to be malpractice and could lead to the candidate being disqualified. Plagiarism sometimes occurs innocently when candidates are unaware of the need to reference or acknowledge their sources. It is therefore important that centres ensure that candidates understand that the work they submit must be their own and that they understand the meaning of plagiarism and what penalties may be applied. Candidates may refer to research, quotations or evidence but they must list their sources. The rewards from acknowledging sources, and the credit they will gain from doing so, should be emphasised to candidates as well as the potential risks of failing to acknowledge such material. Candidates may be asked to sign a declaration to this effect. Centres should reinforce this message to ensure candidates understand what is expected of them.

Please note: Centres must confirm to OCR that the evidence produced by candidates is authentic. The Centre Authentication Form includes a declaration for assessors to sign and is available from the OCR website and Interchange.

4.3.4 Internal standardisation

It is important that all internal assessors, working in the same subject area, work to common standards. Centres must ensure that the 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 preliminary meetings 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.

4.3.5 Moderation

All work for controlled assessment is marked by the teacher and internally standardised by the centre. Marks are then submitted to OCR, after which moderation takes place in accordance with OCR procedures: refer to the OCR website for submission dates of the marks to OCR. The purpose of moderation is to ensure that the standard of the award of marks for work is the same for each centre and that each teacher has applied the standards appropriately across the range of candidates within the centre.

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.

Each candidate's work should have a cover sheet attached to it with a summary of the marks awarded for the task. If the work is to be submitted in digital format, this cover sheet should also be submitted electronically within each candidate's files.

4.4 Submitting the moderation samples via the OCR Repository

The OCR Repository allows centres to submit moderation samples in electronic format.

The OCR GCSE Computing units A452 and A453 can be submitted electronically to the OCR Repository via Interchange: please check Section 7.2.1 page 28 for unit entry codes for the OCR Repository.

Instructions for how to upload files to OCR using the OCR Repository can be found on OCR Interchange and in Appendix A of Controlled Assessment Guide for GCSE Computing available from the OCR website.

There should be clear evidence that work has been attempted and some work produced. If a candidate submits no work for an internally assessed component, then the candidate should be indicated as being absent from that component on the mark sheets submitted to OCR. If a candidate completes any work at all for an internally assessed component, then the work should be assessed according to the internal assessment objectives and marking instructions and the appropriate mark awarded, which may be zero.

5 Support for GCSE Computing

5.1 Free resources available from the OCR website

The following materials will be available on the OCR website www.ocr.org.uk:

- GCSE Computing Specification
- Specimen assessment materials for each unit
- Guide to Controlled Assessment
- Teachers Handbook
- Sample Schemes of Work and Lesson Plans for each unit.

5.2 Other resources

OCR offers centres a wealth of quality published support with a fantastic choice of 'Official Publisher Partner' and 'Approved Publication' resources, all endorsed by OCR for use with OCR specifications.

OCR works in close collaboration with three Publisher Partners: Hodder Education, Heinemann and Oxford University Press (OUP) to ensure centres have access to:

- published support, available when you need it, tailored to OCR specifications
- quality resources produced in consultation with OCR subject teams, which are linked to OCR's teacher support materials
- more resources for specifications with lower candidate entries
- materials which are subject to a thorough quality assurance process to achieve endorsement.

Hodder Education is the publisher partner for OCR GCSE Computing.

OCR still endorses other publisher materials, which undergo a thorough quality assurance process to achieve endorsement. By offering a choice of endorsed materials, centres can be assured of quality support for all OCR qualifications.

5.3 Training

OCR is providing a comprehensive programme of (training) events to support the delivery and assessment of GCSE Computing. They are designed to give you a taste of our new specifications direct from the experts, providing useful information and an opportunity to chat with our team. To search for details of courses near you and to book your place, please visit www.ocr.org.uk/eventbooker.

5.4 OCR support services

5.4.1 OCR Interchange

OCR Interchange has been developed to help you to carry out day to day administration functions online, quickly and easily. The site allows you to register and enter candidates online. In addition, you can gain immediate free access to candidate information at you convenience. Sign up at https://interchange.ocr.org.uk

6 Access to GCSE Computing

6.1 Disability Discrimination Act (DDA) information relating to GCSE Computing

GCSEs often require assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare candidates for a wide range of occupations and higher level courses.

This GCSE qualification has been reviewed by the regulators in order to identify whether any of the competences required by the subject presented a potential barrier to any disabled candidates. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability groups and with disabled people.

Reasonable adjustments are made for disabled candidates in order to enable them to access the assessments and to demonstrate what they know and can do. For this reason, very few candidates will have a complete barrier to the assessment. Information on reasonable adjustments is found in *Regulations and Guidance Relating to Candidates who are Eligible for Adjustments in Examinations* produced by the Joint Council www.jcq.org.uk.

Candidates who are unable to access part of the assessment, even after exploring all possibilities through reasonable adjustments, may still be able to receive an award based on the parts of the assessment they have taken.

The access arrangements permissible for use in this specification are as follows:

	Yes/No	Type of assessment
Readers	Yes	All written and practical assessments
Scribes	Yes	All written and practical assessments
Practical Assistants	Yes	For written assessments only. The practical assistant may switch on the computer and insert a disk at the candidate's instruction but must not perform any skill for which marks are credited.
Word Processors	Yes	All written and practical assessments
Transcripts	Yes	All written and practical assessments
BSL interpreters	Yes	All written and practical assessments
Oral language modifiers	Yes	All written and practical assessments
MQ papers	Yes	All written and practical assessments
Extra Time	Yes	All written and practical assessments

6.2 Arrangements for candidates with particular requirements

All candidates with a demonstrable need may be eligible for access arrangements to enable them to show what they know and can do. The criteria for eligibility for access arrangements can be found in the JCQ document *Access Arrangements, Reasonable Adjustments and Special Consideration.*

Candidates who have been fully prepared for the assessment but who have been affected by adverse circumstances beyond their control at the time of the examination may be eligible for special consideration. Centres should consult the JCQ document *Access Arrangements, Reasonable Adjustments and Special Consideration.*

7 Administration of GCSE Computing

7.1 Availability of assessment

There are two examination series each year: January and June. GCSE units will be assessed from 2011.

Assessment availability can be summarised as follows:

	Unit A451	Unit A452	Unit A453	Certification availability
January 2011	✓	–	–	–
June 2011	✓	✓	✓	✓
January 2012	✓	✓	✓	✓
June 2012	✓	✓	✓	✓
January 2013	✓	✓	✓	✓
June 2013	✓	✓	✓	✓

GCSE certification is available for the first time in June 2011, and each January and June thereafter.

7.2 Making entries

7.2.1 Making unit entries

Centres must be registered with OCR in order to make any entries, including estimated entries. It is recommended that centres apply to OCR to become a registered centre well in advance of making their first entries. Centres must have made an entry for a unit in order for OCR to supply the appropriate forms and/or moderator details for controlled assessment.

It is **essential** that unit entry codes are quoted in all correspondence with OCR.

For Units A452 and A453 candidates must be entered for either component 01 or 02. Centres must enter all of their candidates for ONE of the components. It is not possible for centres to offer both components within the same series.

Unit entry code	Component code	Assessment method	Unit titles
A451	01	Written Paper	***Computer systems and programming***
A452A	01	Moderated via OCR Repository	***Practical investigation***
A452B	02	Moderated via Postal moderation	
A453A	01	Moderated via OCR Repository	***Programming project***
A453B	02	Moderated via Postal moderation	

7.2.2 Qualification entries

Candidates must enter for qualification certification separately from unit assessment(s). If a certification entry is **not** made, no overall grade can be awarded.

Candidates may enter for:

- GCSE certification J275.

A candidate who has completed all the units required for the qualification must enter for certification in the same examination series in which the terminal rules are satisfied.

GCSE certification is available from June 2011.

7.3 Terminal rule

Candidates must take at least 40% of the overall assessment in the same series they enter for the qualification certification. This 40% of assessment will contribute to the candidate's final grade.

7.4 Unit and qualification re-sits

Candidates may re-sit each unit once before entering for certification for a GCSE.

Candidates may enter for the qualification an unlimited number of times.

7.5 Enquiries about results

Under certain circumstances, a centre may wish to query the result issued to one or more candidates. Enquiries about Results for GCSE units must be made immediately following the series in which the relevant unit was taken (by the Enquiries about Results deadline).

Please refer to the *JCQ Post-Results Services* booklet and the *OCR Admin Guide* for further guidance about action on the release of results. Copies of the latest versions of these documents can be obtained from the OCR website.

7.6 Shelf-life of units

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

7.7 Prohibited qualifications and classification code

Every specification is assigned a national classification code indicating the subject area to which it belongs. The classification code for this specification is 2610.

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

Centres may wish to advise candidates that, if they take two specifications with the same classification code, schools and colleges are very likely to take the view that they have achieved only one of the two GCSEs. The same view may be taken if candidates take two GCSE specifications that have different classification codes but have significant overlap of content. Candidates who have any doubts about their subject combinations should seek advice, for example from their centre or the institution to which they wish to progress.

8 Other information about GCSE Computing

8.1 Overlap with other qualifications

There is some overlap between the content of this specification and that of specifications in GCSE ICT.

8.2 Progression from this qualification

GCSE qualifications are general qualifications which enable candidates to progress either directly to employment, or to proceed to further qualifications, eg Level 3 qualifications such as GCE Computing and GCE ICT.

Progression to further study from GCSE will depend upon the number and nature of the grades achieved. Broadly, candidates who are awarded mainly Grades D to G at GCSE could either strengthen their base through further study of qualifications at Level 1 within the National Qualifications Framework or could proceed to Level 2. Candidates who are awarded mainly Grades A* to C at GCSE would be well prepared for study at Level 3 within the National Qualifications Framework.

8.3 Avoidance of bias

OCR has taken great care in preparation of this specification and assessment materials to avoid bias of any kind.

8.4 Code of Practice/Common criteria requirements/Subject criteria

This specification complies in all respects with the current *GCSE, GCE and AEA Code of Practice* as available on the QCA website and *The Statutory Regulation of External Qualifications 2004.* Currently there are no subject criteria for GCSE Computing, however it compares in substance and range to the GCSE ICT criteria.

8.5 Language

This specification and associated assessment materials are in English only.

8.6 Spiritual, moral, ethical, social, legislative, economic and cultural issues

This specification offers opportunities that can contribute to an understanding of these issues in the following ways.

This specification encourages candidates to explore the spiritual, moral, ethical, social, legislative, and cultural aspects of the introduction of computer-based solutions to problems through a study of their effects on society.

Through candidates' study of Units A451 and A452, they have an opportunity to develop their understanding of spiritual, moral, ethical, social, legislative, and cultural issues. These units consider issues such as changing leisure patterns and work practices, privacy and confidentiality of data held in systems, opportunities for access to information, and environmental issues.

8.7 Sustainable development, health and safety considerations and European developments, consistent with international agreements

This specification supports these issues, consistent with current EU agreements, as outlined below.

These units encourage candidates to develop environmental responsibility based upon a sound understanding of the principle of sustainable development.

8.8 Key Skills

This specification provides opportunities for the development of the Key Skills of *Communication, Application of Number, Information Technology, Working with Others, Improving Own Learning and Performance and Problem Solving* at Levels 1 and/or 2. However, the extent to which this evidence fulfils the Key Skills criteria at these levels will be totally dependent on the style of teaching and learning adopted for each unit.

The following table indicates where opportunities may exist for at least some coverage of the various Key Skills criteria at Levels 1 and/or 2 for each unit.

Unit	C		AoN		IT		WwO		IoLP		PS	
	1	2	1	2	1	2	1	2	1	2	1	2
A451	✓	✓	✓	✓	✓	✓	–	–	–	–	✓	✓
A452	✓	✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓
A453	✓	✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓

Detailed opportunities for generating Key Skills evidence through this specification are posted on the OCR website (www.ocr.org.uk). A summary document for Key Skills Coordinators showing ways in which opportunities for Key Skills arise within GCSE courses has been published.

Appendix A: Guidance for the production of electronic controlled assessment

A

Structure for evidence

A controlled assessment portfolio is a collection of folders and files containing the candidate's evidence. Folders should be organised in a structured way so that the evidence can be accessed easily by a teacher or moderator. This structure is commonly known as a folder tree. It would be helpful if the location of particular evidence is made clear by naming each file and folder appropriately and by use of an index called 'Home Page'.

There should be a top level folder detailing the candidate's centre number, candidate number, surname and forename, together with the unit code A452/3, so that the portfolio is clearly identified as the work of one candidate.

Each candidate produces an assignment for controlled assessment. The evidence should be contained within a separate folder within the portfolio. This folder may contain separate files.

Each candidate's controlled assessment portfolio should be stored in a secure area on the Centre's network. Prior to submitting the controlled assessment portfolio to OCR, the centre should add a folder to the folder tree containing controlled assessment and summary forms.

Data formats for evidence

In order to minimise software and hardware compatibility issues it will be necessary to save candidates' work using an appropriate file format.

Candidates must use formats appropriate to the evidence that they are providing and appropriate to viewing for assessment and moderation. Open file formats or proprietary formats for which a downloadable reader or player is available are acceptable. Where this is not available, the file format is not acceptable.

Electronic controlled assessment is designed to give candidates an opportunity to demonstrate what they know, understand and can do using current technology. Candidates do not gain marks for using more sophisticated formats or for using a range of formats. A candidate who chooses to use only word documents will not be disadvantaged by that choice.

Evidence submitted is likely to be in the form of word processed documents, PowerPoint presentations, digital photos and digital video.

To ensure compatibility, all files submitted must be in the formats listed below. Where new formats become available that might be acceptable, OCR will provide further guidance. OCR advises against changing the file format that the document was originally created in. It is the centre's responsibility to ensure that the electronic portfolios submitted for moderation are accessible to the moderator and fully represent the evidence available for each candidate.

A Accepted File Formats

Movie formats for digital video evidence
MPEG (*.mpg)
QuickTime movie (*.mov)
Macromedia Shockwave (*.aam)
Macromedia Shockwave (*.dcr)
Flash (*.swf)
Windows Media File (*.wmf)
MPEG Video Layer 4 (*.mp4)

Audio or sound formats
MPEG Audio Layer 3 (*.mp3)

Graphics formats including photographic evidence
JPEG (*.jpg)
Graphics file (*.pcx)
MS bitmap (*.bmp)
GIF images (*.gif)

Animation formats
Macromedia Flash (*.fla)

Structured markup formats
XML (*xml)

Text formats
Comma Separated Values (.csv)
PDF (.pdf)
Rich text format (.rtf)
Text document (.txt)

Microsoft Office suite
PowerPoint (.ppt)
Word (.doc)
Excel (.xls)
Visio (.vsd)
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