London Examinations
GCE Ordinary Level

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Computing (7150) May/June 2006

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September 2004

Order code UO 012674

Computing 7105

This subject may be taken only in May/June.

Centres are reminded that private candidates may only enter for Ordinary Level Computing if they are following a properly supervised course. This subject is not open to private candidates studying on their own.

Introduction

Candidates who successfully follow this syllabus will have a good practical understanding of computing and its applications, and will find the transition to AS and Advanced Level Computing easy to make.

Coursework Guidance Notes, Coursework Exemplar Materials and Guidance for Teachers and Candidates are available (details in the syllabus section 'Textbooks and Other Resources').

General information

The minimum computing facilities which should be available at a centre intending to enter candidates for Ordinary Level Computing are as follows:

Candidates and teaching staff must have access to hardware and software facilities for the implementation of coursework and the necessary practical experience dictated by the needs of the syllabus content.

Candidates must have access to a disk based system with hard copy output. There must be sufficient hardware for each candidate to have a reasonable time of access at least once each week.

It is not necessary that a school or college should possess all its own computing equipment. Collaboration between a school and a local computer installation is frequently practicable and can be highly successful. London Examinations will require details of the computing facilities available at the centre and/or details of access to external facilities.

Aims

The course will encourage candidates to:
- develop an understanding of the main principles of using computers to solve problems

- appreciate the range of applications of computers and the effects of their use

- understand the organisation of computer systems, software, data, and hardware, and the implications of this for communications and people

- acquire the skills necessary for them to apply computer-based solutions to problems.

Assessment objectives

Knowledge and understanding

By the end of the course candidates should be able to:
- describe the use of the computer in a range of applications

- demonstrate an understanding of the characteristics of computer hardware, software and communication systems

- describe and explain the use of different forms of data organisation and processing

- understand and explain the need for a systematic approach to the solution of problems

- comment on the social, economic and other consequences of the use of computers.

Skills

By the end of the course candidates should be able to:

- analyse a problem and identify where, in its solution, a computer would be appropriate

- select and apply appropriate techniques for the computer based solution of problems

- design, implement and document effective solutions to problems, using appropriate hardware and software.

Scheme of assessment

The syllabus will be examined annually in May/June. Candidates will be required to sit one examination paper and to submit one piece of coursework. The weightings of these two components will be 70% and 30% respectively.

Written examination

The examination paper will be 2 hours and 30 minutes and be presented in two sections. Each section will be worth approximately half the total mark for the paper. Section A will consist of approximately ten short questions. Section B will contain longer questions based on a Case Study. The Case Study will be made available to centres approximately four weeks before the examination.

60% – 80% of the marks available for the written paper will be based on the Knowledge and Understanding assessment objectives, and 20% – 40% of the available marks for the paper will be based on the Skills assessment objectives.

The Skills assessment objectives are further examined in the coursework.

Coursework

To satisfy the coursework requirements, candidates must submit a report on the use of a computer to solve a problem.

The candidate must identify the problem and solve it by using a commercial software package, or by using a computer program written by the candidate for the purpose, or by a combination of these methods.

Both components of the examination will be externally assessed. The coursework will be assessed according to five criteria, relating to the analysis of the problem, and the design, implementation, testing and evaluation of its solution. The relative weightings of these criteria are detailed in Section 3 of the syllabus content, and are explained more fully under *Coursework Assessment Criteria*.

Candidates' reports must be submitted to London Examinations by a specified date in May in the year of the examination.

All coursework reports must be accompanied by a statement, signed by both the teacher and the candidate, to the effect that the report submitted is the candidate's own work.

All computer printouts included in coursework reports must be original copy and *not* a photocopy. The printouts should also be dated, either by hand or the computer itself.

The submission of joint coursework reports is *not* permitted.

Syllabus Content

The specification of syllabus content is presented in two-column format, with topics in the left-hand column being clarified on the right.

Section 1: Computer Systems

1.1   The range and scope of computer applications

Candidates should be able to demonstrate a knowledge and understanding of the use of computers in a range of applications:

Communication and information systems	Internet, electronic mail, information retrieval systems; databases and hypermedia.
Commercial and general data-processing	Banking systems, school administration, stock control and order processing.
Simulation and modelling	Economic models, population trends, experiments in science.
Monitoring and Control Systems	The monitoring of hospital patients, the use of microprocessors in domestic equipment.
Applications in the arts and the media	Multimedia presentations, television and cinema.

1.2   Hardware

Candidates should be able to demonstrate an awareness of the various items of hardware used in modern computer systems. They should be able to justify the choice of particular peripheral devices for different applications, and show an awareness of the need for, and means of connection between, devices. Detailed technical knowledge of items of hardware is not expected.

Architecture	Processors, buses, interfaces.
Storage	RAM, ROM, optical storage devices, magnetic disks, flash memory. Units of storage – bits, bytes, kilobytes, megabytes, gigabytes, terabytes.
Input and Output	Keyboards, monitors, printers, mice, scanners, digital cameras, bar-code readers. Optical character recognition and speech recognition, speech output and sound generating devices.
Control and Data-logging	Actuators, sensors: temperature, pressure, light, sound, humidity. Feedback.

1.3   Communications

Candidates should be able to demonstrate an awareness of the main features of the use of computers in communications. Candidates should also be able to demonstrate an understanding of computer networks. Detailed technical knowledge is not expected.

Types of network	Local area networks, wide area networks.
Features of networks	Shared resources. Security aspects of networks.

| Communications | Electronic mail systems, Internet and Intranets, web page browsers, search engines. |

1.4   Files and Tables

Candidates should be able to demonstrate an understanding of field types and the nature, use and protection of files and tables.

Files and tables as organised collections of related records	Records and fields, field types, key fields, fixed and variable length fields.
Security	Backup and transaction logs. Archiving.
Privacy	Access privileges, passwords and encryption.

1.5   Software

Candidates should be able to demonstrate a general knowledge of the different kinds of software covered in this section. They should be able to suggest appropriate types of software package for particular applications.

The operating system	The need for, and scope of, an operating system. Technical detail is not required.
The human-computer interface	The effectiveness of the interface. Command-driven, menu-driven and graphical user interfaces.
Applications software	Word processing, databases, spreadsheets, desktop publishing, graphics, browsing, information retrieval and multimedia presentations. Integration of applications.

1.6   Social and economic aspects of the use of computer systems

Candidates should be able to demonstrate an appreciation of the economic reasons for using computers, and the effects of doing so. They should also be able to demonstrate an understanding of the possible implications for society.

Social and economic effects on people, organisations and society	The impact on people of changes to existing production methods and services, and new opportunities for employment. The effects of global communication.
Security of computer systems	The need to ensure privacy and appropriate use of data stored in computer systems.
Computer crime	Unauthorised access to confidential files, financial fraud, breach of copyright. Computer viruses, trojans and worms.
Measures to combat computer crime	Physical security, passwords, encryption, the use of logs to monitor access, firewalls and anti-virus software.

1.7   People and computer systems

Candidates should be able to describe the roles and responsibilities of people who work with computer systems.

| Computer occupations | Systems network manager, data processing manager, software engineer, computer engineer, systems analyst, programmer, operator, user support staff and data input staff. |

Section 2: Information Systems

2.1   Key features of information systems

Candidates should be able to demonstrate a knowledge and understanding of the key features of information systems.

| Key features of an information system | The purpose and required outcome. The communication requirements. The inputs to the system and data capture methods. The organisation of the data, and the processing of the data within the system. The use and organisation of the major software and hardware components of the system. The need for recovery in the event of system failure. The interface between the system and its users. The effectiveness of the system in practice. |

2.2   System analysis and design

Candidates should be able to demonstrate a general understanding of system design. They should be able to select and design appropriate ways of organising data within a system and discuss the merits of different forms of data organisation. They should be able to select suitable software and hardware and to justify their choice.

System specification	The need for clear specification of:
	the function of the system;
	the links between the components of the system (in terms of control and flow); and
	the data used and processed by the system.
Data capture, input and output	The selection of methods of data capture and data verification. Common methods of validating data: length checks, type checks, format checks, range checks, presence checks, check digits.
Organisation of data	The concept of records, files, and tables.
Software, hardware and interface design	The need to consider software and hardware alternatives. Justification of the choice. Design of suitable forms, screens, and reports.
Backup design	Suitable backup strategies of backup files and transaction logs; safe keeping of the files.
System documentation	Data flow diagrams, test plan, test data and expected results.

2.3   Algorithms and software design

Candidates should be able to design algorithms, and understand how a commercial piece of software might have been developed. They should appreciate the different levels of programming languages and be aware of the range of various high level languages.

Algorithmic representation	Structure diagrams, program modules and pseudo code. Structure, sequence, flow and repetition. Objects.
Software design	Prototyping. Modular programming. The use of library modules and existing programs.
Programming languages	The hierarchy of programming languages. The need for different kinds of high level language.
Software compatibility	Transfer of data between packages.

2.4   System Implementation

Candidates are expected to understand the various methods of implementing information systems, and to be able to evaluate their effectiveness.

Implementation	Parallel running and direct changeover.
Documentation	Technical documentation and user documentation.
Evaluation of the implementation	Ease of use, effectiveness, efficiency, costs and reliability.

Section 3: Problem Solving and the Coursework Report

Candidates must use a computer to solve a problem. They should be able to select appropriate hardware and software and justify their choice, describe fully the methods used in solving the problem and offer a complete evaluation of the effectiveness of the solution produced.

While questions raising general points about problem solving may be set on the written paper, it is anticipated that much of the assessment of this part of the syllabus will be achieved through the coursework.

To satisfy the coursework requirements candidates must submit a report on the use of a computer to solve a problem.

The candidate must identify the problem and solve it by using a commercial software package, or by using a computer program written by the candidate for the purpose, or by a combination of these methods.

The report should be presented in a single lightweight A4 folder, and should be no more than 30 sides. *Candidates should be aware that marks for coursework are awarded for quality rather than quantity*. The report should be presented in FIVE sections as detailed in sections 3.1 – 3.5. All pages should be numbered and there should be a contents page.

Coursework guidance notes and coursework exemplar materials are available, details will be found under 'Textbooks and Other Resources'.

3.1   Problem analysis and specification (15 marks)

Candidates should specify a problem from the user's point of view and restate it from the analyst's viewpoint. Candidates should break the problem down into sub-tasks, describe the desired outcomes and establish criteria for success.

3.2   Design and planning of solutions (25 marks)

Candidates should discuss possible ways of solving the problem. They should state what software is available for their use and, if they have a choice of suitable software, justify their final choice. It is recognised that candidates do not always have access to the "ideal" software

for a particular solution. Where this is the case candidates should state with suitable justification what, in their opinion, the ideal software would be.

Where commercial software is to be used, candidates should include:

(a)   a description of the hardware requirements imposed by the choice of software, and the hardware actually used

(b)   a description of the data to be used and the methods of data capture

(c)   a full description of how the software is to be used to solve the problem. A user manual covering all aspects of the software's capabilities is not required.

Where a program is to be written, candidates should:

(a)   state the language to be used and justify the reasons for the choice

(b)   produce an algorithmic design for their intended solution

(c)   describe the files and data structures to be used in the program

(d)   describe how the inputs to the program will be validated

(e)   explain the test data to be used and state the expected results.

3.3   Implementation of design (30 marks)

Candidates should describe their attempt to solve the problem and must provide suitable evidence of their attempt.

Where commercial software is used, candidates should:
(a)   explain how the output was specified

(b)   produce clearly annotated output that is relevant to the problem

(c)   describe any amendments that were made to the original design documented under 3.2.

Where a program is to be written, candidates should:

(a)   produce a clearly annotated listing of the program

(b)   produce annotated output that covers all aspects of the solution

(c)   describe any amendments made to the original design plans documented under 3.2.

3.4   Testing of the solution (10 marks)

Candidates should provide evidence that they have tested their attempt at a solution to the problem. Evidence of testing should be clearly linked to the testing plans described earlier, and the expected output should be compared to the actual output.

3.5   Evaluation of the solution (20 marks)

Candidates should offer a full evaluation of the effectiveness of the solution, and of the means by which it was produced.

In their evaluation candidates should:

(a)   discuss the effectiveness of the solution

(b)   describe any shortcomings of the solution and suggest possible remedies and further developments

(c)   discuss the quality of the man-machine interface.

The assessment criteria are the same as in previous years but the following grid can be applied:

Problem analysis and specification

Context described.	
Problem identified.	
Problem put into context.	
Current methods discussed.	
Disadvantages of current methods discussed.	
Desired outcomes identified.	
Success criteria identified.	
Success criteria or desired outcomes discussed in detail.	
Criteria or outcomes are testable / provable.	
Problem specified from user's viewpoint.	
Problem broken into sub tasks from user's viewpoint.	
Problem specified from solver's viewpoint.	
Problem broken into sub tasks from solver's viewpoint.	
Sub tasks discussed in detail.	
Clear indication of how solver will tackle the sub tasks.	
Total for problem analysis and specification. **Maximum = 15**	

Design and planning of solution

Statement of the range of software available or a statement that shows there is no alternative available.	
List of software to be used in the solution.	
Choice from the range of software is appropriate. {*A mark may still be awarded if there is no range available*	
Choice of software has been justified. *Provided that a statement has been made to that effect.*}	
Software linked to the problem.	
Statement of the range of hardware available or a statement that shows there is no alternative available.	
List of hardware to be used in the solution.	
Choice from the range of hardware is appropriate. {*A mark may still be awarded if there is no range available*	
Choice of hardware has been justified. *Provided that a statement has been made to that effect.*}	
Hardware linked to the problem.	
Outline design for solution. *Minimum requirement for Implementation mark scheme B*	
Outline design + added detail for at least 2 aspects.	
Method of solution described. *Minimum requirement for Implementation mark scheme C*	
Clear description of the whole system, including both manual and computer aspects.	
Description sufficiently detailed to show how it works. *Could an experienced person make it from the Design?*	
Validation considered.	
Clear description of validation.	
Validation methods justified.	
Testing considered.	
Clear description of testing.	
Test data stated or described.	

Test data justified.	
Expected results stated.	
Systems, tools and techniques clear and justified.	
Clear and appropriate presentation of the solution.	
Total for design and planning of solution. **Maximum = 25**	

Implementation of design

Choose scheme A, B or C, below, whichever is the most appropriate. Mark Implementation according to that scheme, then complete the Additions section.

Scheme A

To be used for an unsuccessful program, or a software package used without relating it to the problem. Also award here if there is little or no Design.

Text shows programming attempt or software package use.	
Text gives clear indication of what was attempted.	
Text description has only minor omissions.	
Screen shots or program listings.	
Screen shots or listings have titles and / or annotations.	
Titles and annotations are appropriate and informative.	

Scheme B

To be used where a solution has been attempted using the design plans.

Award 6 marks then add marks for the following:	
Text shows programming attempt / software package use.	
Text gives an indication of (partial) success.	
Text description has only minor omissions.	
Screen shots or program listings.	
Screen shots or listings have titles and / or annotations.	
Titles and annotations are appropriate and informative.	

Scheme C

To be used where tools and techniques from Design have been used to good effect to produce a solution to the problem. Do not award here without a good description of tools and techniques in Design and evidence that the solution **works.**

Award 12 marks then add marks for the following:	
Text shows programming attempt / software package use.	
Text description has only minor omissions.	
Text description is easy to follow.	
Screen shots or program listings.	
Screen shots or listings have titles and / or annotations.	
Titles and annotations are appropriate and informative.	

Additions
Having used scheme A, B, or C, as appropriate, complete the following section.

Amendments to design mentioned.	
Amendments to design discussed.	
Some attempt to justify design amendments.	
Problems with implementation mentioned.	
Amendments identified.	
Evidence that amendments have been carried out.	
Problems from testing mentioned. *Component or prototype tests done during Implementation.*	
Solutions identified. *Component or prototype tests done during Implementation.*	
Evidence that solution has been applied. eg. re-tests. *Component or prototype tests done during Implementation.*	
References made from screen shots to text / program listing. *This may occur in other sections.*	
References made from text / program listing to screen shots. *This may occur in other sections.*	
Text and pictures clearly show how the project solves the problem.	
There is explicit reference by the candidate to how the project solves the problem.	
Total for Implementation of design **Maximum = 30**	

Testing of the solution
Choose scheme D or E, below, whichever is the most appropriate.

Scheme D
No results shown.

Some tests described. *Component, prototype, or system tests done at any stage.*	
Described tests match the test plan. *Component, prototype, or system tests done at any stage.*	

Scheme E
Some results shown.

	award 2 mark then add marks for the following
Some tests described. *Component, prototype, or system tests done at any stage.*	
The tests are systematic. *Component, prototype, or system tests done at any stage.*	
The tests match the test plan. *Component, prototype, or system tests done at any stage.*	
All of the test plan tests are covered. *Component, prototype, or system tests done at any stage.*	
Some mention of errors or modifications. *System tests done after Implementation.*	
Errors and modifications discussed. *System tests done after Implementation.*	
Modifications implemented. *System tests done after Implementation.*	
Attempt to compare results with predictions. *Component, prototype, or system tests done at any stage.*	
All / most results compared with predictions. *Component, prototype, or system tests done at any stage.*	
Total for Testing of the solution **Maximum = 10**	

Evaluation of the solution

Effectiveness of solution mentioned.	
Effectiveness of solution discussed.	
Reference to some of the success criteria or specified outcomes from Identify	
Evidence of meeting success criteria or specified outcomes from Identify.	
Evidence for meeting **all** success criteria or specified outcomes.	
Evidence **clearly linked** to success criteria or specified outcomes.	
Capabilities and / or effectiveness of software mentioned.	
Capabilities of software discussed.	
Effectiveness of software discussed.	
Man-machine interface mentioned.	
Man-machine interface discussed.	
Man-machine interface evaluated **and some evidence presented.**	
Man-machine interface fully evaluated **with clear links to evidence**.	
Weaknesses mentioned.	
Weaknesses discussed.	
Weaknesses discussed are specific to the candidate's work.	
Weaknesses discussed are appropriate to the candidate's work.	
Further development mentioned.	
Further development discussed.	
Further development ideas are appropriate.	
Further development ideas are feasible.	
Total for Evaluation of the solution **Maximum = 20**	

Textbooks and other resources

Edexcel Publications
Coursework guidance notes (order code UO010988), specimen examination papers and copies of past examination papers can be obtained from:
Edexcel Publications
Adamsway
Mansfield
Notts
NG18 4FN
UK
Telephone: +44 1623 467467
Fax: +44 1623 450481
E-mail: publications@linneydirect.com

Coursework guidance notes, specimen examination papers and coursework exemplar materials are also available from our web site at www.edexcel-international.org and will be updated as appropriate.

Chief Examiner's comments

The Computing subject report, including the Chief Examiner's comments and mark scheme, is issued to centres after each summer examination and can also be found on the international web site www.edexcel-international.org

Suggested reading list

Computing, by its nature, is a constantly evolving subject. This means that the recommendation of textbooks is more difficult than in other subjects, since books that are appropriate and up to date when the recommendation is made may not contain the newer developments.

The following list is intended to help centres to find texts that will aid the teaching of the course. It is the intention of the board to keep the list under review and include new texts, as they become available.

Many good sources of information concerning computer applications can be found in the more readily available journals and newspapers as well as on television and radio. It goes without saying that many excellent web sites exist with useful technical reading and reviews; for example the Byte magazine at www.byte.com

Edexcel is always willing to receive suggestions from teachers for books to be included in the list – particularly if such suggestions are accompanied by brief comments.

2 Author	**Title/Edition/ISBN**	**Publisher**
M Wisechussen J Snell A Scales	GNVQ Intermediate Information and Communication Technology (2000) (ISBN 0 435 45598 2)	Heinmann

Written for vocational courses but contains much that would be useful.

| S Doyle | Information Systems for You (Third Edition 2000) (ISBN 0 748 76375 9) | Nelson Thornes |

Covers most of the syllabus and is, at the time of writing, up to date.

| I Ithurralde and A Ramkaran | This is IT2 (1999) (ISBN 0 907 67971 4) | Hodder and Stoughton |

Covers the use of computers and software applications.

| Tim Roderick and Geoff Rushbrook | ICT for GCSE (2002) (ISBN 0 198 32816 8) | Oxford University Press |

| | The British Computer Society Glossary of Computing Terms (Ninth Edition 2000) (ISBN 0582 36 9673) | Longman |

Will be used by London Examinations as the reference for terms, definitions and symbols used in question papers and in candidates' responses.

| | The British Computer Society – An IT Glossary for Schools | Longman |

A more accessible glossary for students.