GCE AS and A Level Subject Criteria for Computing

Contents

The criteria

Introduction

AS and A level subject criteria set out the knowledge, understanding, skills and assessment objectives common to all AS and A level specifications in a given subject.

They provide the framework within which the awarding body creates the detail of the specification.

Aims and objectives

1. All specifications in Computing should encourage learners to develop a broad range of skills and knowledge of computing as a basis for progression into further learning, including progression from AS to A2, and/or employment in computing-related fields.

2. A level specifications in Computing should encourage learners to develop:

    ■ the capacity for thinking creatively, innovatively, analytically, logically and critically;

    ■ an understanding of the organisation of computer systems including software, hardware, data, communications and people;

    ■ the ability to apply skills, knowledge and understanding of computing, including programming, in a range of contexts to solve problems;

    ■ project- and time-management skills;

    ■ the capacity to see relationships between different aspects of the subject and perceive their field of study in a broader perspective;

    ■ an understanding of the consequences of uses of computing, including social, legal, ethical and other issues;

    ■ an awareness of emerging technologies and an appreciation of their potential impact on society.

Subject content

3. AS specifications in Computing should require learners to develop knowledge and understanding of computer systems and the principles of computing (including programming), and how these are applied to the solution of problems.

4. A level specifications should require an additional understanding of systematic methods such as the use of algorithms and test strategies, the maintenance of computer systems and the skills associated with documenting solutions.

5. A level specifications should also require learners to develop further the skills associated with applying this knowledge and understanding to producing computer-based solutions to real problems.

Knowledge and understanding

6. AS and A level specifications should require learners to develop a knowledge and understanding of the following topics. AS specifications must address each of the sections in a balanced way but need not make explicit requirements for every item.

Hardware and communications

- The characteristics of contemporary processors, input, output and storage devices.

- The need for and means of connection between hardware components of a computer system.

- The characteristics of networks and the importance of networking protocols and standards.

- Possible future developments.

Software

- The need for and functions of systems software.

- The fundamentals of programming techniques.

- The need for and attributes of different types of software.

- Data types, data structures and algorithms.

- The need for and characteristics of a variety of programming paradigms.

- The criteria for selecting appropriate software for particular purposes.

- The systematic approach to problem solving using computers.

Applications and effects

- The purpose and characteristics of a range of computing applications, including the Internet.

- The data, processing, and communication requirements of computer systems.

- The user interface.

- The systems development life cycle.

- The consequences of current uses of computing including economic, social, legal and ethical issues.

Information

- The organisation and structuring of data and information to facilitate its effective use.

- The methods of capturing, selecting, exchanging and managing data to produce information for a particular purpose.

Skills

7. AS and A level specifications should require learners to develop skills in the following topics. AS specifications must address each of the sections in a balanced way but need not make explicit requirements for every item.

Analysis

- Evaluate the possible need for development of a computer-based solution to a problem.

- Judge the feasibility of a computer-based solution to a problem.

- Derive the user, data and processing requirements of a system, including a consideration of the human aspects and physical environment.

- Specify and document the data and processing requirements for a computer-based solution to a problem.

Design

- Specify and document, using appropriate systematic methods:

  □ the functions of the parts of a system;

  □ the interrelationships between the various parts of a system;

  □ the selection of an appropriate hardware and software configuration;

  □ the method of solving the problem including, where appropriate, evaluation of alternative proposals;

  □ the algorithms, data types, data structures and other requirements of the solution;

  □ the method of testing the solution and the selection of test data; and

  □ the effectiveness of the proposed solution in meeting the requirements of the problem.

Implementation

- Select appropriate software and hardware, and techniques for their use.

- Implement the design.

- Carry out testing.

- Develop technical and user documentation.

Evaluation

- Evaluate the methods used to obtain a solution.

- Evaluate solutions against the specification and on the basis of effectiveness, usability and maintainability.

Assessment objectives

8. AS and A level specifications have the same assessment objectives. In A level specifications, the assessment objectives related to the skills of analysing, designing, implementing, testing and evaluating systems are given a higher weighting because of the increased emphasis on learners developing their own computer-based solutions to real problems.

9. Knowledge, understanding and skills in GCE AS/A level Computing are closely linked. Specifications should require that learners demonstrate the following assessment objectives in the context of the content and skills prescribed.

10. In each assessment scheme, the assessment objectives are to be weighted as follows.

Assessment objectives		Weighting		
		AS level	**A2 level**	**A level**
AO1	**Knowledge and understanding** Describe and explain the purpose and characteristics of a range of computing applications and show an understanding of the characteristics of computer systems (hardware, software and communication) that allow effective solutions to be achieved Describe and explain the need for and the use of various forms of data organisation and processing to support the requirements of a computer-based solution Describe and explain the systematic development of high-quality solutions to problems and the techniques for implementing such solutions, including the use of a programming language Comment critically on the consequences of current uses of computing, including economic, social, legal and ethical issues	55–70%	30–45%	42.5–57.5%
AO2	**Skills** Analyse a problem and identify the parts that are appropriate for a computer-based solution Select, justify and apply appropriate techniques and principles to develop data structures and algorithms for the	30–45%	55–70%	42.5–57.5%

solution of problems			
Design, implement and document an effective solution using appropriate hardware and software, including the use of a programming language			

11.   The assessment objectives apply to the whole specification.

Scheme of assessment

12.   All AS specifications in Computing may have a maximum weighting of 40 per cent for internal assessment

13.   All A level specifications must have internal assessment with a weighting of between 15 and 40 per cent. No more than 40 per cent of the A2 may be internally assessed.

14.   Specifications must make clear how reliability and fairness are secured in internal assessment, by setting out requirements that ensure the robustness of each stage of the internal assessment, i.e.:

- the specific skills to be assessed;

- setting of tasks;

- extent of supervision in carrying out of tasks;

- conditions under which assessment takes place;

- marking of the assessment and internal standardising procedures; and

- any moderation process.

15.   Assessment in AS specifications in Computing should:

- allow learners to demonstrate their knowledge and understanding of computer systems and how they are analysed, designed, implemented, tested and evaluated;

- include at least one piece of work addressing a problem at an appropriate level which allows learners to demonstrate at least two of the skills of analysing, designing, implementing, testing and evaluating systems.

16. In addition, assessment in A level specifications in Computing should require learners to undertake one substantial piece of work over an extended period of time which:

   ■ allows learners to demonstrate their knowledge and understanding of computer systems, the principles of computing, and their skills at analysing, designing, implementing, testing and evaluating systems supports;

   ■ illustrates the practical application of the principles of problem solving using computers, as set out in the criteria, and enables the learner to demonstrate the techniques of system documentation and system development.

17. This work should complement the assessment carried out in the examination and should be presented as a written report.

Synoptic assessment

18. Synoptic assessment should be included at A2 and draw on assessment objectives and be designed to test learners' understanding of the connections between different elements of the subject.

19. Synoptic assessment in computing should require learners to make connections between different areas of computing represented in the specification. In particular, learners should be required to draw on their knowledge and understanding of information, software, hardware and communications when demonstrating the skills associated with analysis, design, implementation and evaluation of computer-based systems; for example applying knowledge and understanding of the methods of organising and structuring information when designing a system.

We wish to make our publications widely accessible. Please contact us if you have any specific accessibility requirements.

First published by the Office of Qualifications and Examinations Regulation in 2011

Any enquiries regarding this publication should be sent to us at:

Office of Qualifications and Examinations Regulation

Spring Place	2nd Floor
Coventry Business Park	Glendinning House
Herald Avenue	6 Murray Street
Coventry CV5 6UB	Belfast BT1 6DN
Telephone	0300 303 3344
Textphone	0300 303 3345
Helpline	0300 303 3346