



Qualifications and
Curriculum Authority



Llywodraeth Cynulliad Cymru
Welsh Assembly Government



GCE AS and A level subject criteria for computing

September 2006

QCA/06/2844

Contents

1. Introduction	3
2. Aims	3
3. Subject content	4
4. Key skills	6
5. Assessment objectives	7
6. Scheme of assessment	9

1. Introduction

- 1.1 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.

Subject criteria are intended to:

- help ensure consistent and comparable standards in the same subject across the awarding bodies
- define the relationship between the AS and A level specifications, with the AS as a subset of the A level
- ensure that the rigour of A level is maintained
- help higher education institutions and employers know what has been studied and assessed.

Any specification that contains significant elements of the subject computing must be consistent with the relevant parts of these subject criteria.

2. Aims

- 2.1 All specifications in computing should encourage students 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.

A level specifications in computing should encourage students 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.

3. Subject content

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

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

Knowledge and understanding

- 3.2 AS and A level specifications should require students 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

3.3 AS and A level specifications should require students 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
 - 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.

4. Key skills

4.1 AS and A level specifications in computing should provide opportunities for developing and generating evidence for assessing relevant key skills from the list below. Where appropriate these opportunities should be directly cross-referenced, at specified level(s), to the key skills standards, which may be found on the QCA website (www.qca.org.uk).

- Application of number
- Communication
- Improving own learning and performance
- Information and communication technology
- Problem solving
- Working with others

5. Assessment objectives

- 5.1 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 students developing their own computer-based solutions to real problems.
- 5.2 Knowledge, understanding and skills in computing are closely linked. Specifications should require that students demonstrate the following assessment objectives in the context of the content and skills prescribed.

AO1 Knowledge and understanding

Candidates should be able to:

- 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.

AO2 Skills

Candidates should be able to:

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

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

Weightings			
	AS	A2	A level
AO1	55–70%	30–45%	42.5–57.5%
AO2	30–45%	55–70%	42.5–57.5%

The assessment objectives apply to the whole specification.

6. Scheme of assessment

- 6.1 All AS specifications in computing may have a maximum weighting of 40 per cent for internal assessment
- 6.2 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.
- 6.3 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, ie:
- 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
 - any moderation process.
- 6.4 Assessment in AS specifications in computing should:
- allow candidates 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 candidates to demonstrate at least two of the skills of analysing, designing, implementing, testing and evaluating systems.

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

- allows candidates to demonstrate their knowledge and understanding of computer systems and the principles of computing, and their skills at analysing, designing, implementing, testing and evaluating systems
- supports and illustrates the practical application of the principles of problem solving using computers, as set out in the criteria, and enables the candidate to demonstrate the techniques of system documentation and system development.

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

Synoptic assessment

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

Synoptic assessment in computing should require candidates to make connections between different areas of computing represented in the specification. In particular, candidates 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.

Quality of written communication

- 6.6 AS and A level specifications will be required to assess the candidates' quality of written communication in accordance with the guidance document produced by QCA.