

JANUARY 2018

GCSE Subject Level Conditions and Requirements for Computer Science

For qualifications examined in 2019, 2020 and 2021

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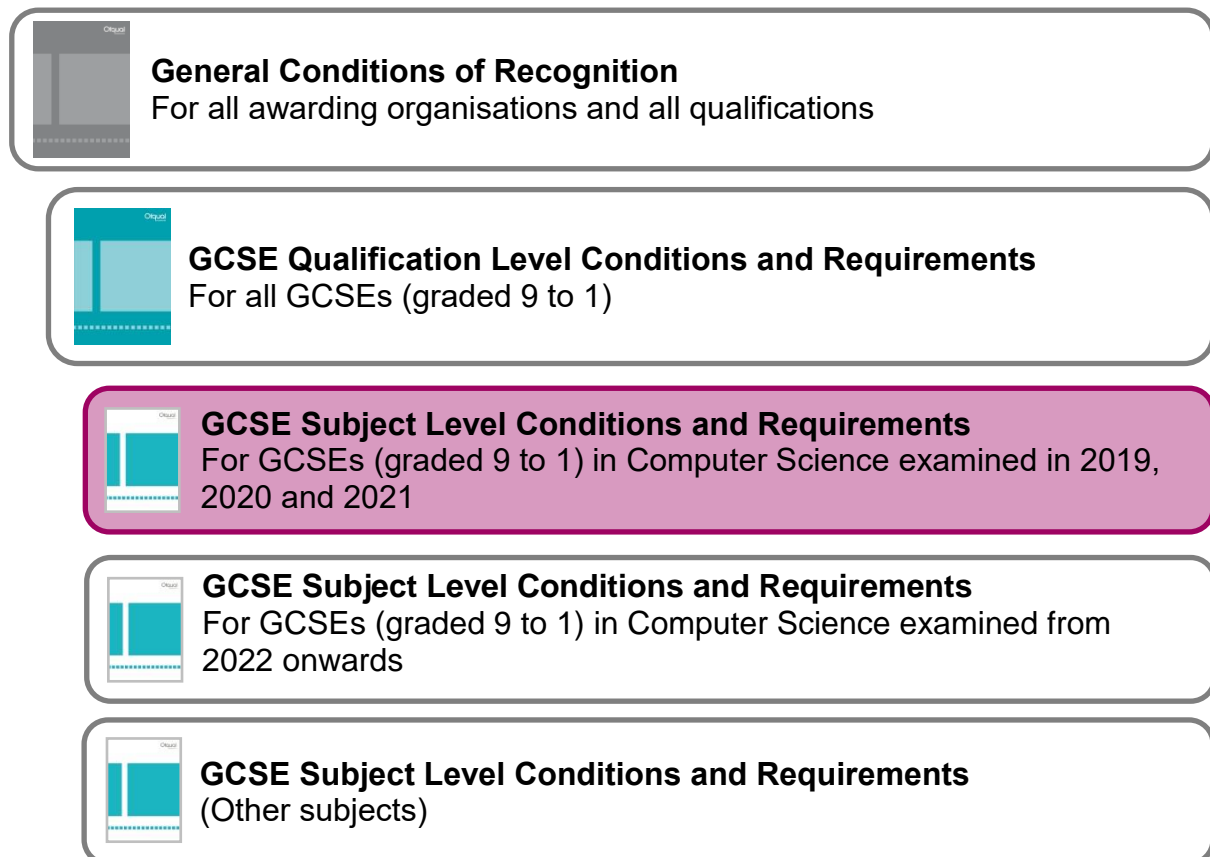
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Introduction

About this document

This document (highlighted in the figure below) is part of a suite of documents which sets out the regulatory requirements for awarding organisations offering GCSE qualifications (graded from 9 to 1).



We have developed these requirements with the intention that GCSE qualifications (graded from 9 to 1) should fulfil the following purposes:

- To provide evidence of students' achievements against demanding and fulfilling content;
- To provide a strong foundation for further academic and vocational study and for employment; and
- To provide (if required) a basis for schools and colleges to be held accountable for the performance of all of their students.

Requirements set out in this document

This document sets out GCSE Subject Level Conditions for Computer Science. These conditions came into effect at 12.01am on 15 January 2018.

It also sets out our requirements in relation to:

- assessment objectives – awarding organisations must comply with these requirements under Condition GCSE(Computer Science)1.2;
- the programming project - awarding organisations must comply with these requirements under Condition GCSE(Computer Science)3.3.

Appendix 1 reproduces the requirements in relation to subject content for GCSE Computer Science,¹ as published by the Department for Education. Awarding organisations must comply with these requirements under Condition GCSE(Computer Science)1.1.

With respect to all GCSE Qualifications (graded from 9 to 1) in Computer Science, awarding organisations must also comply with:

- our *General Conditions of Recognition*,² which apply to all awarding organisations and qualifications;
- our GCSE Qualification Level Conditions;³ and
- all relevant Regulatory Documents.⁴

Application of this document

We have revised our *GCSE Subject Level Conditions and Requirements for Computer Science* document since it was originally published (see Appendix 2 for details), most recently in February 2019.

This (January 2018) version came into effect at 12.01 am on 15 January 2018, and remains in force for all GCSE qualifications (graded from 9 to 1) in Computer Science examined in 2019, 2020 or 2021 only.

For GCSE qualifications (graded from 9 to 1) in Computer Science examined in or after 2022, the Conditions and requirements specified in this document no longer apply. For those qualifications, awarding organisations must instead comply with the

¹ www.gov.uk/government/publications/gcse-computer-science

² www.gov.uk/government/publications/general-conditions-of-recognition

³ www.gov.uk/government/publications/gcse-9-to-1-qualification-level-conditions

⁴ www.gov.uk/government/publications/regulatory-documents-list

February 2019 version of *GCSE Subject Level Conditions and Requirements for Computer Science*⁵, which came into force on Monday 18 February 2019.

Summary of requirements

| Subject Level Conditions | |
|---|--|
| GCSE(Computer Science)1 | Compliance with content requirements |
| GCSE(Computer Science)2 | Assessment |
| GCSE(Computer Science)3 | Programming Project |

| Assessment objectives |
|---|
| Assessment objectives – GCSE Qualifications in Computer Science |

| Programming project requirements |
|---|
| Requirements in relation to the programming project for GCSE Qualifications in Computer Science |

| Appendix 1 – Subject content (published by Department for Education) |
|--|
| Computer Science: GCSE subject content |

⁵ <https://www.gov.uk/government/publications/gcse-9-to-1-subject-level-conditions-and-requirements-for-computer-science>

Subject Level Conditions

GCSE Subject Level Conditions for Computer Science

Condition

GCSE(Computer Science)1

GCSE(Computer Science)1.1

Compliance with content requirements

In respect of each GCSE Qualification in Computer Science which it makes available, or proposes to make available, an awarding organisation must –

comply with the requirements relating to that qualification set out in the document published by the Secretary of State entitled 'Computer science GCSE subject content',⁶ document reference DFE-00701-2014,

have regard to any recommendations or guidelines relating to that qualification set out in that document, and

interpret that document in accordance with any requirements, and having regard to any guidance, which may be published by Ofqual and revised from time to time.

GCSE(Computer Science)1.2

In respect of each GCSE Qualification in Computer Science which it makes available, or proposes to make available, an awarding organisation must comply with any requirements, and have regard to any guidance, relating to the objectives to be met by any assessment for that qualification which may be published by Ofqual and revised from time to time.

⁶ www.gov.uk/government/publications/gcse-computer-science

| <i>Condition</i> | <i>Assessment</i> |
|------------------|-------------------|
|------------------|-------------------|

| | |
|----------------------------|----------|
| GCSE (Computer Science)2.1 | Not used |
|----------------------------|----------|

| | |
|----------------------------|----------|
| GCSE (Computer Science)2.2 | Not used |
|----------------------------|----------|

| | |
|---------------------------|----------|
| GCSE(Computer Science)2.3 | Not used |
|---------------------------|----------|

**Condition
GCSE(Computer
Science)3**

Programming Project

GCSE(Computer Science)3.1

In respect of each assessment cycle for a GCSE Qualification in Computer Science which it makes available, an awarding organisation must –

(a) require each Centre to provide a programming project statement to the awarding organisation, and

(b) treat any failure by a Centre to provide a programming project statement to the awarding organisation in a timely manner as malpractice and/or maladministration (under General Condition A8 (*Malpractice and maladministration*)).

GCSE(Computer Science)3.2

For the purposes of this condition, a 'programming project statement' is a true and accurate written statement made by a Centre to an awarding organisation which confirms that it has taken reasonable steps to secure that each Learner to which that Centre has delivered the assessments to be taken in a particular assessment cycle for a GCSE Qualification in Computer Science which the awarding organisation makes available –

(a) has had the opportunity to undertake the programming project and has had 20 hours set aside in the timetable to allow them to undertake the project, and

(b) that their written accounts of their programming project represent their individual work, cover each part of the project and reference any resources used or support given.

GCSE(Computer Science)3.3

An awarding organisation must ensure that in respect of each GCSE Qualification in Computer Science which it makes available it complies with any requirements, and has regard to any guidance, concerning the programming project, which may be published by Ofqual and revised from time to time.

Assessment objectives

Assessment objectives – GCSE Qualifications in Computer Science

Condition GCSE(Computer Science)1.2 allows us to specify requirements relating to the objectives to be met by any assessment for all GCSE Qualifications in Computer Science.

The assessment objectives set out below constitute requirements for the purposes of Condition GCSE(Computer Science)1.2. Awarding organisations must comply with these requirements in relation to all GCSE Qualifications in Computer Science they make available or propose to make available.

| | Objective | Weighting |
|------------|---|-----------|
| AO1 | Demonstrate knowledge and understanding of the key concepts and principles of computer science. | 35 – 40% |
| AO2 | Apply knowledge and understanding of key concepts and principles of computer science. | 45 – 50% |
| AO3 | Analyse problems in computational terms: <ul style="list-style-type: none">■ to make reasoned judgements■ to design, program, evaluate and refine solutions. | 15 – 20% |

Requirements for the programming project

Requirements in relation to the programming project for GCSE Qualifications in Computer Science

Condition GCSE(Computer Science)3.3 allows us to specify requirements and guidance in relation to the programming project for GCSE Qualifications in Computer Science.

We set out our requirements for the purposes of Condition GCSE(Computer Science)3.3 below.

Programming languages

For each GCSE Qualification in Computer Science which it makes available, or proposes to make available, an awarding organisation must ensure that –

- (a) it sets out in the specification for that qualification the programming language(s) which Learners are permitted to use for the purposes of the programming project,
- (b) each such programming language is a high-level programming language that has a textual program definition, and
- (c) it justifies its choice of permitted programming language(s) in its assessment strategy for the qualification.

Programming Projects

An awarding organisation must ensure that each programming project –

- (a) is designed and set on the basis that it should be completed by each Learner during 20 hours set aside in the timetable,
- (b) is designed and set to be taken under conditions specified by the awarding organisation, including, in particular, conditions which support the Centre in ensuring that the evidence generated by each Learner can be Authenticated, and
- (c) requires each Learner to undertake a single project which leads to the generation of the following evidence –
 - (i) a program designed, written, tested and refined by the Learner, either to a specification or to solve a problem, using one or more of the programming languages specified by the awarding organisation, and
 - (ii) a written report.

A programming project for a GCSE Qualification in Computer Science may be set –

- (a) by the awarding organisation, or
- (b) by a Centre.

In any event, the awarding organisation must demonstrate to Ofqual's satisfaction in its assessment strategy that –

- (a) it has taken all reasonable steps to identify the risk of any Adverse Effect which may result from its approach to setting the programming project, and
- (b) where such a risk is identified, it has taken all reasonable steps to prevent that Adverse Effect or, where it cannot be prevented, to mitigate that Adverse Effect.

Subject content (published by Department
for Education)



Department
for Education

Computer science

GCSE subject content

January 2015

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The content for computer science GCSEs

Introduction

1. The GCSE subject content sets out the knowledge, understanding and skills common to all GCSE specifications in a given subject. Together with the assessment objectives it provides the framework within which the awarding organisations create the detail of their specifications, so ensuring progression from key stage 3 national curriculum requirements and the possibilities for development into A level.

Subject aims and learning outcomes

2. All specifications in computer science must build on the knowledge, understanding and skills established through the computer science elements of the programme of study for computing at key stage 3, satisfy the computer science elements of computing at key stage 4 and enable students to progress into further learning and/or employment.

3. GCSE specifications in computer science should enable students to:

- understand and apply the fundamental principles and concepts of computer science, including abstraction, decomposition, logic, algorithms, and data representation
- analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs
- think creatively, innovatively, analytically, logically and critically
- understand the components that make up digital systems, and how they communicate with one another and with other systems
- understand the impacts of digital technology to the individual and to wider society
- apply mathematical skills relevant to computer science

Subject content

Knowledge and understanding

4. GCSE specifications must require students to develop a knowledge and understanding of the fundamentals of computer science and programming including:

- standard algorithms, including binary search and merge sort
- following and writing algorithms to solve problems including
 - sequence, selection and iteration
 - input, processing and output
- how particular programs and algorithms work
- the concept of data type, including integer, Boolean, real, character and string, and data structures, including records and one- and two-dimensional arrays
- representation of numbers in binary and hexadecimal; conversion between these and decimal; binary addition and shifts
- representation of text, sound, and graphics inside computers
- Boolean logic using AND, OR and NOT, combinations of these, and the application of logical operators in appropriate truth tables to solve problems
- the purpose and functionality of systems software, including the operating system and utility software
- characteristics of systems architectures, including
 - CPU architecture, including Von Neumann and the role of the components of the CPU in the fetch-execute cycle
 - main and contemporary secondary storage and ways of storing data on devices including magnetic, optical and solid state
 - data capacity and calculation of data capacity requirements
 - hardware components and embedded systems
- networks and the importance of:
 - connectivity, both wired and wireless
 - types of network
 - common network topologies
 - network security
 - the concept of networking protocols, including Ethernet, Wi-Fi, TCP/IP, HTTP, HTTPS, FTP and email protocols
 - layers

- cyber security: forms of attack (based on technical weaknesses and behaviour), methods of identifying vulnerabilities, and ways to protect software systems (during design, creation, testing, and use)
- the ethical, legal and environmental impacts of digital technology on wider society, including issues of privacy and cyber security
- characteristics and purpose of different levels of programming language, including low-level language

Skills

5. GCSE specifications must require students to develop the following skills:
- take a systematic approach to problem solving including the use of decomposition and abstraction, and make use of conventions including pseudo code and flowcharts
 - design, write, test and refine programs, using one or more high-level programming language with a textual program definition, either to a specification or to solve a problem
 - use appropriate security techniques, including validation and authentication
 - evaluate the fitness for purpose of algorithms in meeting requirements efficiently using logical reasoning and test data¹
 - use abstraction effectively
 - to model selected aspects of the external world in a program
 - to appropriately structure programs into modular parts with clear, well-documented interfaces
 - apply computing-related mathematics

¹ Formal comparisons of algorithmic efficiency are not required



Department
for Education

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Appendix 2 – Revisions to this document

The table below sets out all revisions to this document since it was first published, and the dates on which those revisions came into force.

| Revision | Date in force |
|---|---------------|
| Published revised Conditions and requirements for qualifications examined in or after 2022: <ul style="list-style-type: none">■ Condition GCSE(Computer Science)2 (new)■ Condition GCSE(Computer Science)3 (replaced)■ Assessment objectives (amended)■ Assessment requirements (new)■ Requirements for the programming project (removed) | February 2019 |
| <ul style="list-style-type: none">■ Condition GCSE(Computer Science)2 (removed)■ Condition GCSE(Computer Science)■ Assessment objectives (amended)■ Assessment requirements (removed)■ Requirements for the programming project (new) | January 2018 |
| First published | May 2015 |



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