National Unit Specification

General information

Unit title: Computing Foundations (SCQF level 5)

Unit code: J8DW 45

Superclass: CB

Publication date: July 2024

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

The purpose of this unit is to provide learners with a broad overview of fundamental computing concepts. It is designed to give learners a summary of key areas rather than an in-depth understanding of each one. The unit focuses on essential knowledge and understanding required as a foundation for further study. It is assumed that learners are familiar with digital technology prior to commencing this unit. No previous experience of computing science is assumed.

Learners will develop their knowledge and understanding of computer architecture, logical operators, data storage, software, networking, data science, and emerging technologies including artificial intelligence.

This unit is intended for all learners as no previous knowledge or experience is required. It is particularly relevant to learners with a vocational interest in computing and information technology (IT).

On completion of this unit, learners will have the knowledge and skills required to progress onto more focused study and specialisation in areas of interest, such as part of the National Progression Award in Computing Technologies.

Learners may wish to progress to J8DW 46 Computing Foundations at SCQF Level 6.

National Unit Specification: General information (continued)

Unit title: Computing Foundations (SCQF level 5)

Outcomes

On successful completion of the unit the learner will be able to:

1. Describe the principles of computer hardware and systems.
2. Interpret computer programs.
3. Demonstrate knowledge and understanding of computer networks.
4. Describe the significance of data in today's society.
5. Describe emerging digital technologies in society.

Credit points and level

1 National Unit credit at Scottish Credit and Qualifications Framework (SCQF) level 5: (6 SCQF credit points at SCQF level 5)

Recommended entry to the unit

Entry is at the discretion of the centre. No previous knowledge or experience is required, however, learners with basic computer literacy and familiarity with common digital devices will find the content more accessible.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes for this unit specification.

There is no automatic certification of Core Skills or Core Skill components in this unit.

Context for delivery

If this unit is delivered as part of a group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

This unit is the second unit in a family of units relating to computing foundations.

The target cohort is school and college learners. The unit may also be of interest to adult learners who wish to develop computing and digital skills prior to undertaking further studies.

National Unit Specification: General information (continued)

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The Assessment Support Pack (ASP) for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website: Internal Assessment Support Materials (www.sqa.org.uk/internal assessment support materials).

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website:
SQA Assessment Arrangements (www.sqa.org.uk/assessmentarrangements).

National Unit Specification: Statement of standards

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Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Outcome 1

Describe the principles of computer hardware and systems.

Performance criteria

(a) Describe computer hardware architecture, including central processing unit (CPU), buses, main memory and storage, and measures of performance.
(b) Describe logical operators including AND, OR, and NOT.
(c) Describe storage of data including units of storage, 8-bit binary conversion and storing text, and measures of storage.
(d) Describe the role of operating systems.

Outcome 2

Interpret given programs.

Performance criteria

(a) Describe basic data types and program constructs.
(b) Predict the output of a given program.
(c) Run and investigate a given program.
(d) Modify a given program.

Outcome 3

Demonstrate knowledge and understanding of computer networks.

Performance criteria

(a) Describe advantages of a computer network.
(b) Compare Local Area Networks (LANs) and Wide Area Networks (WANs).
(c) Describe how the internet works including IP addresses and DNS.
(d) Describe network security features including firewalls, authentication and encryption.

National Unit Specification: Statement of standards (continued)

Unit title: Computing Foundations (SCQF level 5)

Outcome 4

Describe the significance of data in today's society.

Performance criteria

(a) Describe the role and growth of data in society.
(b) Describe the advantages of using data.
(c) Describe ethical considerations when sharing data.
(d) Describe measures to keep personal data secure.

Outcome 5

Describe emerging digital technologies in society.

Performance criteria

(a) Describe examples of emerging digital technologies including artificial intelligence.
(b) Describe applications of emerging digital technologies in society.
(c) Describe the benefits of emerging digital technologies to society.
(d) Describe the societal impact of emerging digital technologies, including artificial intelligence, on society.

Evidence requirements for this unit

Evidence is required to demonstrate that learners have achieved all outcomes and performance criteria.

Learners must provide **knowledge** evidence.

Learners must provide evidence for all outcomes and all performance criteria. Minimal evidence, required to infer competence, is acceptable. At least two computer programs must be interpreted. At least two emerging digital technologies must be described, one of which must be artificial intelligence.

Evidence may be produced in lightly controlled conditions over an extended period of time.

Sampling is permissible when testing is used. The sampling frame must include questions relating to every outcome (but not every performance criterion within each outcome). The sampling frame must include questions on artificial intelligence. Testing must be carried out in controlled conditions in terms of location, time and supervision. At this level, selected (or short) response questions are permissible.

National Unit Specification: Statement of standards (continued)

Unit title: Computing Foundations (SCQF level 5)

The SCQF level of this unit (level 5) provides additional context on the nature of the required evidence and the associated standards. This unit focuses on breadth of knowledge rather than depth of knowledge and this should be reflected in the evidence. Appropriate level descriptors should be used when making judgements about the evidence.

When evidence is produced in loosely controlled conditions it must be authenticated. The guide to assessment provides further advice on methods of authentication.

The support notes section of this specification provides specific examples of instruments of assessment that will generate the required evidence.

National Unit Support Notes

Unit title: Computing Foundations (SCQF level 5)

Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

The purpose of this unit is to introduce learners to broad computing concepts, providing an introductory understanding in key areas of hardware, software, networking, data science, and emerging technologies.

It acts as a pivotal introductory unit for the National Progression Award in Computing Technologies, aligning seamlessly with the broader curriculum and setting the stage for more advanced computing units. Emphasising essential computing skills, this unit accommodates learners at the introductory stage. It establishes an initial understanding of computing, fostering engagement and developing fundamental academic abilities. It aims to instil confidence in learners, providing a solid foundation for progression within the series and beyond. Upon completion of this unit learners will have acquired a well-rounded understanding of computing essentials, preparing them for more advanced units within the Computing series.

In outcome 1 the learner will develop knowledge and understanding of computer hardware and systems. This includes:

- Knowledge of the functions of the central processing unit (CPU), including the control unit, the arithmetic and logic unit (ALU) and registers.
- Knowledge of the functions of the address bus, control bus and data bus.
- Knowledge of the functions of main memory and backing storage.
- Knowledge of logical operator truth tables including AND, OR, and NOT.
- Knowledge of how to convert units of storage and 8-bit binary conversions.
- Knowledge of how extended ASCII is stored and binary to ASCII conversion.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 5)

In outcome 2 the learner will develop knowledge and understanding of computer software. This includes:

- Knowledge of data types including integer, floating-point, and string.
- Knowledge of variables including the use of meaningful names.
- Knowledge of the implementation of inputs and outputs.
- Knowledge of the implementation of calculations, including addition, subtraction, multiplication, greater than and less than comparators.
- Knowledge of conditional selection including "IF" and "ELSE" statements.
- Knowledge of how to predict the output of a given program.
- Knowledge of how to run and investigate a given program.
- Knowledge of how to modify a given program.

Outcome 2 can be completed using any appropriate programming language. The programming language may be block-based, text-based, or macros.

In outcome 3, the learner will develop knowledge and understanding of computer networks. This includes:

- Knowledge of how networks are created through multiple computers to communicate and share resources.
- Knowledge of bus, ring, star and mesh network topologies.
- Knowledge of local area networks (LANs) and wide area networks (WANs).
- Knowledge of how the internet facilitates communication: email, messaging, video calls, and social media interactions.
- Knowledge of how the internet facilitates information access: online resources, news, entertainment, and educational materials.
- Knowledge of IPv4 address identification and how DNS is involved in both source and destination.
- Knowledge of why firewalls are used.
- Knowledge of authentication methods including username, password and two-factor authentication.
- Knowledge of why encryption is used.

In outcome 4, the learner will develop knowledge and understanding of data science. This includes:

- Knowledge of data-driven decision making (DDDM) and healthcare advancement using big data.
- Knowledge of how data helps informed decision making and predictive analysis.
- Knowledge of ethical concerns around data sharing, privacy, and security.
- Knowledge of the use of strong passwords, two-factor authentication, and anti-virus software.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 5)

In outcome 5, the learner will develop knowledge and understanding of emerging technologies. This includes:

- Knowledge of the role of an emerging technology in society.
- Knowledge of two advantages that emerging technology brings.
- Knowledge of two disadvantages that emerging technology brings.

A summary of the knowledge and skills covered in this unit is detailed below.

Knowledge	Skills
- Hardware and Systems: - Computer Architecture: - CPU and Buses - Main memory - Backing storage - Logical Operators: - AND, OR, NOT - Data storage: - Units of storage - Number systems (8-bit binary) - Storing text - Software: - Data types - Variables - Inputs and outputs - Calculations - Conditional Selection - Networking: - Overview of computer networks - Types of networks - Importance of networks in daily life - Internet - Network security - Data science: - Introduction to data science - Big data - Data ethics and privacy - Emerging Technologies: - Artificial intelligence - Internet of things - Augmented reality	- Curiosity - Computational thinking - Application of knowledge - Digital citizenship - Programming skills: - Predict - Run - Investigate - Modify - Digital literacy - Critical thinking - Sense-making - Focusing - Integrity

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 5)

Guidance on approaches to delivery of this unit

Outcomes are best delivered in sequence; however, centres are welcome to approach this qualification in a holistic manner, completing the outcomes in whatever order they find appropriate.

The following distribution of time is suggested.

Outcome 1: 8 hours
Outcome 2: 8 hours
Outcome 3: 8 hours
Outcome 4: 8 hours
Outcome 5: 8 hours

Tasks should be designed to take a learner-centred, participative, and practical approach. It is encouraged to use examples that are familiar and relevant to learners. The programs provided for outcome 2 should have an engaging context and be of suitable complexity.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

A traditional approach to assessment might involve the use of a test (for all Evidence Requirements). The test could take the form of a selected response test, comprising 25 questions, with minimum pass mark of 60%. The test would be undertaken in closed book, supervised and timed conditions.

An alternative approach to assessment could involve the use of a portfolio, which would be assembled during the life of the unit. If this approach is taken, evidence for all performance criteria would be required.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 5)

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at SQA e-Assessment. (www.sqa.org.uk/Guide to best practice.pdf).

Opportunities for developing Core and other essential skills

Opportunities for developing Core and other essential skills: This unit provides opportunities to develop Core Skills, particularly Information and Communication Technology (ICT) and Numeracy (at SCQF level 5).

This unit immerses learners in the diverse facets of computer science, cultivating essential skills for holistic comprehension and application. Throughout the course, learners will engage in:

- **Curiosity:** Fostering an inquisitive mindset, learners will explore computer architecture, logical operators, data science, and emerging technologies, instigating an ongoing curiosity-driven exploration.
- **Computational Thinking:** Developing systematic problem-solving skills, learners will tackle complex issues, applying computational thinking to dissect problems into manageable components.
- **Application of Knowledge:** Bridging theory and practice, learners will apply newfound knowledge to real-world scenarios, ensuring practical relevance and competency.
- **Digital Citizenship:** Emphasising ethical conduct in the digital realm, learners will cultivate responsible practices, promoting integrity, and digital citizenship.
- **Programming Skills:** From prediction to modification, learners will advance their programming skills, fostering the ability to confidently predict, run, investigate, and modify code.
- **Digital Literacy:** Enhancing digital proficiency, learners will gain competence in navigating digital tools and technologies.
- **Numeracy:** is seamlessly integrated, requiring learners to analyse and interpret numerical data inherent in computational processes, further sharpening their competencies in mathematical applications.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 5)

Throughout the unit, learners will be encouraged to demonstrate critical thinking, sense-making, and focus, ensuring a robust foundation in computer science. The unit aims to empower learners, instilling confidence in their ability to engage with and contribute to the ever-evolving landscape of technology.

History of changes to unit

Version	Description of change	Date

Additional copies of this unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Business Development and Customer Support team, telephone 0303 333 0330.

Unit template: February 2024

General information for learners

Unit title: Computing Foundations (SCQF level 5)

This section will help you decide whether this is the unit for you by explaining what the unit is about, what you should know or be able to do before you start, what you will need to do during the unit and opportunities for further learning and employment.

This unit provides a basic introduction to computing foundations. It has 5 outcomes covering hardware and systems, software, networking, data science and emerging technologies.

In outcome 1 you will learn about computer hardware and systems. This would include understanding some detail of computer architecture, (CPU, Buses, memory and backing storage), AND, NOT and OR logical operators, data storage including units of storage and binary, storing of text using ASCII.

In outcome 2 you will learn about computer software by predicting the output, running, investigating, and modifying existing computer programs. This would support developing programming knowledge that includes basic programming constructs covering data types, variables, inputs and outputs, calculations and Conditional selection.

In outcome 3 you will learn about computer networks. This would include an overview of computer networks, types of networks, the importance of them in daily life, an introduction to how the Internet communicates between devices on the internet, and network security features.

In outcome 4, you will explore the world of data science, focusing on how data-driven decisions and advancements in healthcare are powered by big data. You'll learn how data guides informed decision-making and predictive analysis. Moreover, you'll explore the ethical considerations around sharing data, privacy, and security. To keep data safe, you'll discover best practices like creating strong passwords, setting up two-factor authentication, and using anti-virus software.

In outcome 5, you'll embark on a journey to explore exciting emerging technologies like artificial intelligence, augmented reality, and the Internet of Things, among others. You'll explore their impact on society, understanding both their benefits and drawbacks. You'll gain insights into how these technologies shape our world and identify two advantages and two disadvantages linked to their use. Get ready to discover the role of emerging technologies and their effects on our lives!

General information for learners (continued)

Unit title: Computing Foundations (SCQF level 5)

Knowledge	Skills
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