



National Unit Specification

General information

Unit title: Computing Foundations (SCQF level 6)

Unit code: J8DW 46

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 the 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.

Learners should be familiar with computing technology before undertaking this unit, which could be evidenced by possession of an appropriate National Qualification at SCQF level 5. Alternatively, learners may have completed J8DW 45 Computing Foundations at SCQF level 5.

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

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 to them or progress to qualifications at SCQF level 7.

National Unit Specification: General information (continued)

Unit title: Computing Foundations (SCQF level 6)

Outcomes

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

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

Credit points and level

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

Recommended entry to the unit

Entry is at the discretion of the centre. Previous knowledge and experience of computing is recommended. This could be evidenced by possession of Computing Foundations (or similar) at SCQF level 5 or National 5 Computing Science. Direct entry to this unit may be possible for suitably motivated and experienced individuals.

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 third 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)

Unit title: Computing Foundations (SCQF level 6)

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](http://www.sqa.org.uk/internal-assessment-support-materials) ([www.sqa.org.uk/internal assessment support materials](http://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](http://www.sqa.org.uk/assessmentarrangements) (www.sqa.org.uk/assessmentarrangements).

National Unit Specification: Statement of standards

Unit title: Computing Foundations (SCQF level 6)

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

Demonstrate knowledge and understanding of computer hardware and systems.

Performance criteria

- (a) Describe computer hardware architecture, including the central processing unit (CPU) (control unit, ALU, registers, DMA), buses (Address, Control, Data), main memory, backing storage, and volatile vs non-volatile storage, and measures of performance.
- (b) Describe logical operators including AND, OR, NOT and XOR.
- (c) Describe the storage of data, including units of storage, 8-bit binary addition and conversion, storage of text and graphics, and measures of storage.
- (d) Describe the role of operating systems.

Outcome 2

Interpret given programs.

Performance criteria

- (a) Describe 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), Wide Area Networks (WANs) and Personal Area Networks (PANs).
- (c) Explain the principles of how the internet works including IP addresses, DNS and the role of ISPs (Internet Service Providers).
- (d) Explain network security features including firewalls, authentication and encryption.
- (e) Explain the function of Virtual Private Networks (VPNs).

National Unit Specification: Statement of standards (continued)

Unit title: Computing Foundations (SCQF level 6)

Outcome 4

Explain the significance of data in today's society.

Performance criteria

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

Outcome 5

Explain the role of emerging technologies in society.

Performance criteria

- (a) Explain the characteristics of emerging digital technologies.
- (b) Describe the applications of emerging digital technologies in society.
- (c) Explain the benefits of emerging digital technologies to society.
- (d) Explain the societal impact of emerging digital technologies, including artificial intelligence, on society including employment and privacy.

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 three emerging digital technologies must be explained, 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 question(s) on artificial intelligence. Testing must be carried out in controlled conditions in terms of location, time and supervision. At this level, constructed response (or extended response) questions should be used.

National Unit Specification: Statement of standards (continued)

Unit title: Computing Foundations (SCQF level 6)

The SCQF level of this unit (level 6) 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 6)

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 evidence generated should demonstrate:

- Knowledge of the functions of the (CPU) Including control unit, ALU and registers and benefits of Direct Memory Access (DMA).
- Knowledge of the functions of the Address Bus, Control Bus, and Data Bus, including consideration of bus width.
- Knowledge of the functions of main memory, backing storage and the intricate relationship between volatile and non-volatile storage.
- Knowledge of logical operator truth tables including AND, OR, NOT and XOR.
- Knowledge of how to convert units of storage, 8-bit binary conversions and addition of 8-bit binary numbers.
- Knowledge of the storage of coloured bitmaps, extended ASCII, including the reciprocal conversion between binary and ASCII.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 6)

In outcome 2, the evidence generated should demonstrate:

- Knowledge of data types including Integer (int), Floating-point (float), string (str) and Boolean (bool).
- Knowledge of Variables, naming conventions and value assignment.
- Knowledge of Inputs and outputs
- Knowledge of Calculations including addition, subtraction, multiplication, comparison calculations like greater than or equal to and less than or equal to.
- Knowledge of Conditional Selection including “IF”, and “Else” statements
- Knowledge of repetition in the form of a “For loop” or equivalent
- 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.

In outcome 3, the evidence generated should demonstrate:

- Knowledge of how networks are created through multiple computers to communicate and share resources.
- Knowledge of network topologies (Bus, Ring, Mesh, Star,).
- Knowledge of network types LAN’s and WAN’s and Personal Area Networks (PANs).
- Knowledge of how the internet facilitates Communication: email, messaging, video calls, and social media interactions.
- Knowledge of how the internet facilitates Information Access: Enables access to online resources, news, entertainment, and educational materials.
- Knowledge of IPV4 address identification, understanding the roles of DNS in terms of domain name resolution, and recognising the impact of your internet service provider on the network infrastructure.
- Knowledge of why firewalls are used including, Inbound rules, outbound rules and Port filtering.
- Knowledge of authentication methods including Username, password, Two-Factor authentication and biometrics.
- Knowledge of encryption using Caesar Cipher including the benefits of using encryption.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 6)

In outcome 4, the evidence generated should demonstrate:

- Knowledge of Data Driven Decision Making, healthcare advancement and social impact using big data.
- Knowledge of how data helps Informed Decision Making, Predictive Analysis and Performance Monitoring.
- Knowledge of ethical concerns around sharing, privacy, security and bias.
- Knowledge of using Strong Passwords, Two-Factor Authentication, behavioural authentication and anti-virus software.

In outcome 5, the evidence generated should demonstrate:

- Knowledge of the role of two emerging technology in society.
- Knowledge of three advantages that emerging technologies bring, must be in context of the two identified above.
- Knowledge of three disadvantages that emerging technologies bring, must be in context of the two identified above.

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 6)

| Knowledge | Skills |
|--|--|
| <ul style="list-style-type: none"> • Hardware and Systems: <ul style="list-style-type: none"> ○ Computer Architecture: <ul style="list-style-type: none"> ○ CPU and Buses ○ Main memory ○ Backing storage ○ Logical Operators: <ul style="list-style-type: none"> ○ AND, OR, NOT, XOR ○ Data storage: <ul style="list-style-type: none"> ○ Units of storage ○ Number systems (8-bit binary addition) ○ Storing text and graphics ○ Operating systems • Software: <ul style="list-style-type: none"> ○ Data types ○ Variables ○ Inputs and outputs ○ Calculations ○ Conditional Selection ○ Repetition • Networking: <ul style="list-style-type: none"> ○ Overview of computer networks ○ Types of networks ○ Importance of networks in daily life ○ Internet ○ Network security ○ Virtual Private Networks (VPNs) • Data science: <ul style="list-style-type: none"> ○ Introduction to data science ○ Big data ○ Data ethics and privacy • Emerging Technologies: <ul style="list-style-type: none"> ○ Artificial intelligence ○ Internet of things ○ Blockchain | <ul style="list-style-type: none"> • Curiosity • Computational thinking • Application of knowledge • Digital citizenship • Programming skills: <ul style="list-style-type: none"> ○ Predict ○ Run ○ Investigate ○ Modify • Digital literacy • Critical thinking • Sense-making • Focusing • Integrity |

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 6)

Guidance on approaches to delivery of this unit

Outcomes are best delivered in sequence. Tasks should be designed to take a learner-centred, participative, and practical approach. It is encouraged to use examples of computer hardware that are familiar to learners. Outcome 2's provided programs should have an engaging context and be of suitable complexity for level 6 learners.

Centres can approach this qualification in a holistic manner, completing the outcomes in whatever order they find appropriate.

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 30 questions, with minimum pass mark of 60%. The test would be undertaken in 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.

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](http://www.sqa.org.uk/SQA_e-Assessment). ([www.sqa.org.uk/Guide to best practice.pdf](http://www.sqa.org.uk/Guide%20to%20best%20practice.pdf)).

National Unit Support Notes (continued)

Unit title: Computing Foundations (SCQF level 6)

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 6).

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.

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 |
|---------|-----------------------|------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

© Scottish Qualifications Authority 2024

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

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 6)

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 core introduction to computing fundamentals. It has five 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, OR and XOR logical operators, data storage including units of storage, binary including addition calculations, storing colour bitmap graphics and 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 conditional selection and repetition.

In outcome 3 you will learn in some detail about computer networks. This would include an overview of computer networks, three types of networks, the importance of them in daily life, an synthesis to how the internet communicates between devices on the internet, and network security features including Virtual Private Networks .

In outcome 4, you'll explore data science's applications in various fields, including its role in decision-making and healthcare, as well as its societal impact. You'll learn how data aids decision-making and predictive analysis, while also understanding ethical considerations like data sharing and privacy. Additionally, you'll gain practical skills in data security, such as setting strong passwords and using anti-virus software, to ensure data protection and uphold ethical standards.

In outcome 5, you'll explore the exciting world of cutting-edge technologies such as artificial intelligence, the Internet of Things, and Blockchain. As a group we'll explore how these new technologies are changing our society. You'll get to pick two technologies to focus on, and we'll examine how each one impacts our world. Throughout our journey, we'll look at both the benefits and drawbacks of these technologies. By studying specific examples, you'll gain a deeper understanding of how they influence our lives. we will discover the fascinating ways these innovations shape our society!

General information for learners

Unit title: Computing Foundations (SCQF level 6)

| Knowledge | Skills |
|--|--|
| <ul style="list-style-type: none"> • Hardware and Systems: <ul style="list-style-type: none"> ○ Computer Architecture: <ul style="list-style-type: none"> ○ CPU and Buses ○ Main memory ○ Backing storage ○ Logical Operators: <ul style="list-style-type: none"> ○ AND, OR, NOT, XOR ○ Data storage: <ul style="list-style-type: none"> ○ Units of storage ○ Number systems (8-bit binary addition) ○ Storing text and graphics ○ Operating Systems • Software: <ul style="list-style-type: none"> ○ Data types ○ Variables ○ Inputs and outputs ○ Calculations ○ Conditional Selection ○ Repetition • Networking: <ul style="list-style-type: none"> ○ Overview of computer networks ○ Types of networks ○ Importance of networks in daily life ○ Internet ○ Network security ○ Virtual Private Networks (VPNs) • Data science: <ul style="list-style-type: none"> ○ Introduction to data science ○ Big data ○ Data ethics and privacy • Emerging Technologies: <ul style="list-style-type: none"> ○ Artificial intelligence ○ Internet of things ○ Blockchain | <ul style="list-style-type: none"> • Curiosity • Computational thinking • Application of knowledge • Digital citizenship • Programming skills: <ul style="list-style-type: none"> ○ Predict ○ Run ○ Investigate ○ Modify • Digital literacy • Critical thinking • Sense-making • Focusing • Integrity |