# National Unit Specification

## General information

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

**Unit code:** J51A 45

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| **Superclass:** | CA |
| **Publication date:** | December 2020 |
| **Source:** | Scottish Qualifications Authority |
| **Version:** | 02 |

## Unit purpose

The purpose of this unit is to introduce learners to the range of fundamental hardware components that comprise a basic computer system and additional hardware peripherals, and how these can be installed, maintained, secured, and upgraded safely.

This is a non-specialist introductory unit intended for learners with an interest in the installation and maintenance of computer hardware. This unit is mandatory in the National Progression Award in Computer Networks at SCQF level 5. However, it may be delivered on a standalone basis.

Learners will cover the fundamentals of identifying, installing and maintaining hardware and associated peripherals that form part of a computer system. Learners will also cover the procedures associated with upgrading and securing computer hardware and peripherals and how this can be carried out within a safe working environment using appropriate equipment.

On completion of this unit, learners may progress to specific networking and/or other computing and IT related units at SCQF level 6 and 7.

## Outcomes

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

1 Identify a range of hardware components used to build computer systems.
2 Install and configure computer systems using a range of hardware components and peripherals.
3 Maintain computer system hardware components.

## National Unit Specification: General information (cont)

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

## Credit points and level

1 National Unit credit at SCQF level 5: (6 SCQF credit points at SCQF level 5)

## Recommended entry to the unit

Entry to this unit is at the discretion of the centre. Learners should possess basic digital literacy and IT skills and have a basic awareness of computer systems and hardware. This may be evidenced by possession of relevant Computing and/or ICT skills at SCQF level 4 or above.

## Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Core Skill component        Critical Thinking at SCQF level 5
                                       Accessing Information at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the support notes of this unit specification.

## 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 part of the National Progression Award in Computer Networks at SCQF level 5. As such, it may be delivered alongside other component units such as J51B 45 *Computing: Install and Maintain Computer Software* and J519 45 *Computing: Computer Networking Fundamentals*. In this circumstance, teaching, learning and assessment may take place on a holistic basis for all three units. Please see the support notes section of this document for further details.

## 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 **www.sqa.org.uk/assessmentarrangements**.

## National Unit Specification: Statement of standards

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

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

Identify a range of hardware components used to build computer systems.

**Performance criteria**

(a) Identify various types of cables and connectors
(b) Identify different types of system motherboards and associated components
(c) Identify a range of storage devices
(d) Identify the range and use of computer peripherals
(e) Identify basic networking components
(f) Identify appropriate safe installation procedures

# Outcome 2

Install and configure computer systems using a range of hardware components and peripherals.

**Performance criteria**

(a) Install and configure a motherboard and associated components
(b) Install and configure storage devices
(c) Install and configure peripherals
(d) Install and configure networking components
(e) Undertake appropriate safety procedures for installation

# Outcome 3

Maintain computer system hardware components.

**Performance criteria**

(a) Perform troubleshooting on installed components and peripherals
(b) Secure physical components of the installed system
(c) Secure additional storage and peripherals
(d) Perform upgrade procedures on hardware components
(e) Undertake appropriate safety procedures for upgrades

# National Unit Specification: Statement of standards (cont)

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

**Evidence requirements for this unit**

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

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

The evidence requirements for this unit will consist of two types of evidence: **knowledge evidence** and **product evidence**.

The **knowledge evidence** will relate to outcome 1 and all associated performance criteria. It may take any appropriate format. The evidence may be written or oral or a combination of these. Evidence may be captured, stored, and presented in a range of media and formats. Particular consideration should be given to digital formats and the use of multimedia. The focus of the knowledge evidence is breadth, not depth, so the amount of evidence should be the minimum consistent with the performance criteria. It may be produced with access to reference materials over the life of the unit.

Sampling of knowledge is permissible in certain contexts, such as when traditional testing is used to generate the evidence. When sampling is used, the sampling frame must be broad enough to ensure that every outcome is covered. In this case, the test must be carried out under controlled, supervised, and timed conditions, without access to reference materials.

The **product evidence** will relate to outcome 2 and outcome 3 and their associated performance criteria. Product evidence will take the form of the installation, configuration, and maintenance of a computer system. Evidence that demonstrates effective troubleshooting has taken place and that the system has been upgraded and secured must also be produced. Learners must demonstrate safe working practices whilst completing these steps and when handling hardware and/or electronic components.

Whenever possible, evidence should be a naturally occurring by-product of teaching and learning. However, it must be produced by the learner. Authentication must be used where this is uncertain.

There are no time limitations on the production of evidence. The evidence may be produced at any time during the life of the unit.

The SCQF level of this unit provides additional context on the nature of the required evidence and the associated standards. The level descriptors should be used (explicitly or implicitly) when making judgements about the evidence.

The *Guidelines on Approaches to Assessment* (see the support notes section of this specification) provide specific examples of instruments of assessment.

# National Unit Support Notes

**Unit title:** Computing: Install and Maintain Computer Hardware (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 overall aim of this unit is to develop knowledge and skills of learners in the theoretical and practical aspects associated with the installation and maintenance of computer hardware. Emphasis is also placed on safe working procedures, whilst taking security into consideration.

The context for the unit is based upon the hardware installation and maintenance of small to medium-sized computer systems, that exist as part of a home network or small office environment. A range of hardware devices and peripherals, typically found and installed within these environments, need maintained and secured on a routine basis as well as configured to be part of a wider computer network.

As this unit is delivered as part of the NPA in Computer Networks, there is the potential for the f teaching, learning and assessment to be integrated across the component units of the NPA.

This unit should ideally be delivered alongside *Computing: Install and Maintain Computer Software*, as this provides learners with the opportunity to install an operating system and software onto the system that is being installed, configured and maintained as part of this assessment.

**Outcome 1**

The focus for outcome 1 is the identification of the range of different components that are used to build computer systems, as well as associated peripherals, including networking components. The learner should identify the different types of cables available for attaching devices and peripherals, for example SATA (or IDE), USB and network cables.

Focus should then shift to the actual system components, with the motherboard being the central component, along with CPU, RAM, and GPU. Particular consideration should then be given to the storage medium for the system, as well as to internal and external drives and drive technology, for example, magnetic disk, solid state and solid-state hybrid and all associated connectors.

Learners should be exposed to the peripherals that will be attached to the system, for example screens and printers.

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## National Unit Support Notes (cont)

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

At the end of this outcome, the learner should ideally have a plan and inventory of hardware devices and peripherals that will comprise the new system and details of how the new system will attach to a network (if at all). Care should also be taken at this stage to identify safe working procedures, for example a suitable lab/workshop environment for building PCs, as well as considerations for problems associated with anti-static and power supply units.

### Outcome 2

In outcome 2 the learner will take their planning (from outcome 1) and apply it to the installation of a computer system, for example a PC or a server-based system. Hardware components identified in outcome 1 should be installed and configured using appropriate tools and methods, whilst ensuring that proper grounding procedures are being adhered to (eg anti-static wrist straps). Installation should start with the core components for the system, for example CPU, memory, graphics processing unit and sound. Appropriate internal storage mechanisms should also be identified and prepared for the installation of an operating system. External storage can also be identified at this stage. Any peripherals to be used as part of the system should also be installed, for example monitor(s), keyboards/mice, and printers. If the system is likely to exist as part of a network, network cards or wireless devices should be attached. Care should be taken when attaching the power supply unit as well as internal components to minimise hazard of electric shock.

If this unit is being delivered along with J51B 45 *Computing: Install and Maintain Computer Software*, then learners at this point may wish to install an operating system in preparation for outcome 3.

### Outcome 3

Once all components are installed, learners continue with outcome 3, where they troubleshoot, upgrade, maintain and secure the newly installed system. This should begin with testing the core components with Power On Self-Test (POST) procedures to ensure operation of attached devices. Basic Input/Output System (BIOS) post-installation configuration may also take place, for example, to enable virtualisation and to implement security features, for example BIOS password.

If an operating system has been installed during outcome 2, learners may wish to configure an IP address and attach the system to a network. This will allow learners to check for driver updates as well as implement additional security features, such as encryption for external storage. As with the previous outcomes, learners must ensure that appropriate safety steps are being taken whilst working on the system. Finally, learners must ensure that appropriate physical security has been implemented such as devices being properly attached as well as perhaps the addition of anti-theft features, eg locks.

## Guidance on approaches to delivery of this unit

A practical hands-on approach to learning should be adopted to engage learners and exemplify key concepts. However, all practical activities in outcomes 2 and 3 should be underpinned with appropriate knowledge from outcome 1 before learners commence these activities, hence outcomes should ideally be delivered in sequential order.

## National Unit Support Notes (cont)

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

Learning should be a mix of tutor-led and learner-led learning. It is anticipated that some initial introduction and explanation will be required for each outcome. However, there is significant scope for learners to research and explore the topics once this initial seeding has taken place. Tutors should expect some independent learning to take place and support students with this where appropriate. Some elements may require more tutor exposition, perhaps supported using video resources as well as worked examples.

Learners should ideally have access to a practical lab environment for outcomes 2 and 3, where they can access PC building facilities with appropriate safety features and tools, in order to gain the hands-on experience of building a computer system. The environment should ideally have networking facilities, for example cabled and/or wireless infrastructure, in order to join a computer system to a network.

How the centre wishes to deliver each of the outcomes is at their discretion. The time distribution of each of the three outcomes should however ideally be as follows:

♦ Outcome 1: 10 hours
♦ Outcome 2: 15 hours
♦ Outcome 3: 15 hours

The biggest proportion of time should be dedicated to outcomes 2 and 3, which focus on the more significant practical aspects of computer hardware.

Throughout this unit, learner activities should relate to their personal or vocational interests. Learners should be encouraged to become confident with as wide a range of hardware technologies as possible.

## 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 would comprise a multiple-choice test for knowledge evidence (outcome 1) and a practical assignment for the product evidence (outcomes 2 and 3).

The multiple-choice assessment should ideally take place towards the end of unit. The test could consist of a number of selected response questions, chosen from across all outcomes and their performance criteria. To ensure adequate coverage, all performance criteria should be tested. For example, a multiple-choice test, consisting of 25 items, each with four options, could be used. In this case, the pass mark would be 15 out of 25 (60%). The test would be timed (45 mins) and carried out under controlled closed-book conditions, without access to reference material. Where re-assessment is required it should contain a significantly different sample selected from the range of mandatory content (at least 10% difference).

**Unit title:**     Computing: Install and Maintain Computer Hardware
                    (SCQF level 5)

It is recommended that a holistic approach is taken to product evidence, and that outcomes 2 and 3 are assessed as a single practical project undertaken over a designated period of time. This could be achieved by a learner following one brief/task through all the stages of the planning and installation of a computer system based on given requirements. The brief/task should be supplied by the assessor and need not be overly complex. It should give the learner the opportunity to plan and build a small computer system that covers all of the evidence required for outcomes 2 and 3. The supplied brief/task can cover a range of contexts, for example the development of a computer system (PC or server) for a small home office or for a more formal office environment. There may also be opportunities to develop the task in the context of enterprise, employability or citizenship skills.

As this unit is delivered as part of the NPA Computer Networks, the supplied task may be of a wider remit in order to include assessment from J51B 34 *Computing: Install and Maintain Computer Software* and J519 34 *Computing: Computer Networking Fundamentals*.

An assessor observation checklist could be used to record that the assessment tasks for all the outcomes have been undertaken successfully by the learner. An assessor should sign and date each learner's checklist.

More contemporary approaches to assessment include the use of a web log or the creation of a portfolio. The web log would record learning over the life of the unit. Practical work could be recorded on the blog in a variety of ways. The completed blog would have to satisfy all performance criteria. The blog would be assessed on a pass/fail basis using a checklist. Alternatively, a portfolio could be used as a repository for the identifications required in outcome 1, and the output from learners' practical work in outcome 2 and outcome 3. The completed portfolio would have to satisfy all performance criteria. The portfolio would be assessed on a pass/fail basis using a checklist.

Formative assessment can be used to assess learners' knowledge at various stages in the unit. An ideal time to gauge their knowledge would be at the end of each outcome. This assessment could be delivered through an item bank of selected response questions, providing feedback to learners (when appropriate).

Authentication may take various forms including, but not limited to, oral questioning and plagiarism checks. Where evidence is generated under loosely controlled conditions (for example out of class) then a statement of authenticity should be provided by the learner to verify the work as their own.

## 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 **www.sqa.org.uk/e-assessment**.

## National Unit Support Notes (cont)

**Unit title:** Computing: Install and Maintain Computer Hardware (SCQF level 5)

## Opportunities for developing Core and other essential skills

This unit provides opportunities to develop the Core Skills of *Problem Solving* and *Information and Communication Technology*.

This unit will also provide opportunities for leaners to develop skills in Digital Literacy due to the variety of software that they may use. Enterprise, employability, and citizenship could also be incorporated depending on the nature of the task/brief.

The Critical Thinking component of Problem Solving and Accessing Information component of Information and Communication Technology at SCQF level 5 are embedded in this unit. When a learner achieves these units, their Core Skills profile will also be updated to include these components.

## History of changes to unit

| Version | Description of change | Date |
|---------|----------------------|------|
| 02 | Core Skills Components Critical Thinking and Accessing Information at SCQF level 5 embedded. | 09/12/20 |
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Unit template: 200617

# General information for learners

## Unit title: Computing: Install and Maintain Computer Hardware (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 will introduce you to the basic theoretical and practical elements that comprise the installation, configuration and maintenance of computer hardware. You will learn about the fundamental aspects of computer hardware and the underpinning theoretical knowledge. This knowledge will be taken and applied to practical aspects of computer hardware installation, for example, different types of cables and connectors, core PC components like CPUs and RAM as well as drive technology and PC peripherals. You will learn to install, configure, and maintain computer hardware in a variety of contexts, for example a small office or home network.

The unit comprises three outcomes:

1    Identify a range of hardware components used to build computer systems.
2    Install and configure computer systems using a range of hardware components and peripherals.
3    Maintain computer system hardware components.

The first outcome comprises the theoretical aspects of computer hardware and provides the opportunity for your knowledge skills to be assessed using a variety of methods, for example, multiple-choice tests.

Outcomes 2 and 3 will be assessed using practical means, for example, building a computer system from a given brief/task where you will have the opportunity to develop skills and gain hands-on experience using a variety of devices.

Depending on the context of the brief/task, you will also have the opportunity to develop enterprise and employability skills along with citizenship skills.

No prior experience is needed for this unit; however, it would be beneficial if you had general IT and basic digital literacy skills, as well as awareness of computer networks and the Internet.

On completion of this unit, you may progress to, networking, computing and IT based subjects at SCQF level 6 and above. This unit also serves as an entry point into vendor-based qualifications such as Cisco Networking Essentials and CompTIA qualifications such as A+ and Network+.

This unit will provide opportunities to develop the Core Skills of *Problem Solving* and *Information and Communication Technology*.

The Critical Thinking component of Problem Solving and Accessing Information component of Information and Communication Technology at SCQF level 5 are embedded in this unit. When a learner achieves these units, their Core Skills profile will also be updated to include these components