SQA Advanced Unit specification: general information for centres

Unit title: Troubleshooting Computing Problems

Unit code: HP1V 47

Superclass: CA

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Version: 01

Unit purpose

This unit is designed to provide candidates with the skills required to develop a possible solution to a computing problem in the context of computer networking, software development or technical support. Candidates will learn how to investigate the problem, plan and implement a solution, test and amend it until the problem is resolved and document each step taken to solve the problem.

On completion of the unit the candidate should be able to:

1 investigate a computing problem.
2 plan and implement a solution to a computing problem.
3 document the steps taken to resolve a computing problem.
4 review and evaluate the steps taken to resolve a computing problem.

Recommended prior knowledge and skills

Access to this unit is at the discretion of the centre, but it would be beneficial if candidates possessed problem solving Core Skill at SCQF level 4 and practical experience or appreciation of the types of problems encountered while using computer systems and software. A logical approach to problem solving would be an advantage.

Credit points and level

1 SQA credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Core Skills

Achievement of this unit gives automatic certification of the following:

Complete Core Skill *Problem Solving* at SCQF level 6

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 is a core unit for the SQA Advanced Certificate in Computing and for various Computing SQA Advanced Diplomas, and is aimed at introducing candidates to the skills required to solve common problems encountered whilst working with computers. The unit may also be studied on a standalone basis by a candidate with an interest in solving computing problems.

The assessment exemplar for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable instrument of assessment. Centres wishing to develop their own assessments should refer to the assessment exemplar to ensure a comparable standard. Assessment exemplars are available on SQA's secure website.

Unit specification: statement of standards

Unit title: Troubleshooting Computing Problems

The sections of the unit stating the outcomes, Knowledge and/or Skills, and evidence requirements are mandatory.

Please refer to *Knowledge and/or Skills for the Unit* and *Evidence requirements for the unit* after the outcomes.

Outcome 1
Investigate a computing problem.

Knowledge and/or Skills
- Approaches to problem solving
- Test strategies and techniques
- Problem solving tools and techniques

Outcome 2
Plan and implement a solution to a computing problem.

Knowledge and/or Skills
- Planning a solution
- Implementing a solution
- Testing the solution

Outcome 3
Document the steps taken to resolve a computing problem.

Knowledge and/or Skills
- Documenting the investigation
- Documenting the solution
- Documenting the testing

Outcome 4
Review and evaluate the steps taken to resolve a computing problem.

Knowledge and/or Skills
- Reviewing and evaluating the problem-solving process
- Drawing conclusions regarding the effectiveness of the problem-solving process
- Making recommendations for use in future troubleshooting situations

Evidence requirements for the unit

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- investigate a computing problem by:
  — identifying the symptoms, area affected and any recently applied changes
  — assess their relevance to the problem
  — developing and justifying an approach to resolve the problem

- plan and implement a solution to a computing problem by:
  — identifying the sequence of steps required to resolve problem
  — identifying and obtaining resources
  — deciding how the task will be managed

- document the steps taken to resolve a computing problem.
  — documenting the investigation
  — documenting the solution
  — documenting the testing

- review and evaluate the steps taken to solve a computing problem.
  — reviewing and evaluating the problem-solving process
  — drawing conclusions regarding the effectiveness of the problem-solving process
  — making recommendations

The candidate will be presented with a problem which they should investigate. The problem should be drawn from one or more of the following areas: networking, software development, technical support. It is not necessary that each area has equal weighting. Candidates will be required to submit evidence that they have approached the diagnosis in a logical manner and have completed relevant documentation and evaluation.

The evidence should take the form of a report of approximately 1,000 words covering three areas:

- Investigating the problem
- Planning, implementing and testing a solution
- Reviewing and evaluating the steps taken to resolve the problem

Where appropriate it should include documentation such as error logs, test logs, etc.

The report should be completed in unsupervised conditions and may be presented in any appropriate format, eg written, audio, video, blog, wiki, etc. Assessors should make checks to ensure that the report is the candidate's own work.

Unit specification: support notes

Unit title: Troubleshooting Computing Problems

This part of the unit specification is offered as guidance. The support notes 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. This time should be allocated as follows:

Outcome 1 — 10 hours
Outcome 2 — 10 hours
Outcome 3 — 10 hours
Outcome 4 — 10 hours

Guidance on the content and context for this unit

A logical approach to the solution and documentation of problems encountered in computing should be encouraged. The complexity of the problems may range from simple to fairly complex tasks. Problems may be encountered in the work place, home, educational institution or whilst studying other Units within the framework such as the core units of *Introduction to Software Development, Computer Systems Fundamentals* and *Team Working in Computing*.

As this is a single credit unit, the candidate will have insufficient time to investigate and develop solutions to multiple problems across the different disciplines. A range of approaches to problem solving should be covered. Opportunities for co-operative working may arise.

Candidates should be aware of various tools to help in developing a solution. For example a flowchart to solve a hardware problem, a faults database, debugging tools, desk checking a piece of code, packet tracer for network analysis and manufacturers' online resources.

The approach adopted may vary depending on the type of problem to be solved. For example, if there is a hardware problem where data passing from one component to another is suspect, then either the first or the second component could be substituted. An alternative method might include introducing a piece of test equipment into the data path. For a programming problem, desk checking might be used, or black box or white box testing carried out. Networking problems can often be resolved by the systematic use of utilities.

Documentation detailing the solution should be in a form appropriate to the problem presented, for example a suitably annotated test log.

The candidate should be encouraged to ensure that sufficient diagnosis and testing has been carried out and a robust solution has been developed. It may be possible to pass the unit without fully solving the problem if the candidate has made sufficient progress towards finding a solution.

On completion the candidate should review and evaluate the steps taken to resolve the problem, draw conclusions regarding the effectiveness of the problem solving process and make recommendations for use in future troubleshooting situations.

Guidance on the delivery of this unit

Delivery should focus on the troubleshooting process, and not on the production of the report which should only take a fairly short time, especially if the investigation, planning and implementation are documented while the process is ongoing.

Staff may present the candidate with partially solved problems and accompanying documentation and allow the candidate to complete the task to allow the candidate to gain confidence in their approach to diagnosing and providing solutions to problems prior to developing a complete solution themselves. It can be useful for candidates to maintain a logbook of the problems they have encountered as this may prove useful in solving future problems.

Outcome 1

Candidates should be aware that problem solving should be carried out in a systematic manner – it should not be carried out in a haphazard fashion. Approaches such as linear and half-split should be discussed. Candidates should describe their overall approach to resolving the problem. References should be made to the order of testing to describe an efficient and logical troubleshooting method.

A sequence of steps similar to the following may be adapted for use in different situations:

- Identify the symptoms of the problem
- Identify the area affected
- Identify any recently-applied changes
- Identify the most likely source of the problem
- Implement the solution
- Test the solution
- Analyse the possible effects of the solution
- Document everything throughout the process

Many candidates may fail to realise the importance of documentation when troubleshooting, so it is important that this is stressed. Documentation may range from eliciting an initial fault report from a customer, through completion of a fault report sheet to completing a summary of the fault and its solution. This documentation may become part of a resource database of faults that can assist in solving future problems.

Candidates cannot be expected to know every fault that can occur on a computer system. Manufacturers' documentation and resources such as Internet forums can have a role to play in the troubleshooting process and may result in significant time savings. Candidates should be made aware of this and realise that it is accepted practice in industry.

Outcome 2

Candidates should be aware that implementing the solution to a problem is a three stage process, consisting of planning, implementing and testing. For example, if a networking problem was found to be due to a faulty NIC, the planning stage may consist of determining and sourcing a suitable replacement. The implementing stage might consist of physically installing the NIC in accordance with relevant health and safety procedures. The testing stage may consist of checking that data is being transferred correctly and at acceptable speeds.

If a newly-installed device fails to operate correctly due to a driver problem the planning stage may consist of determining and locating the correct driver. The implementing stage might consist of installing the driver and the testing stage might consist of checking that the device is now operating correctly and that there is no negative impact on other devices.

If a program which has been operating for some time suddenly fails then the planning stage may consist of determining any unexpected values or combinations in the input data. The implementing stage may consist of applying changes to the source code and recompiling. The testing stage may consist of ensuring that the program now runs correctly and that there is no adverse impact on any other part of the program.

Outcome 3

Candidates should be aware that three types of documentation are generally required: documenting the investigation, documenting the solution and documenting the testing. Each step in the investigation should be clearly documented, including details of each diagnostic procedure attempted and the Outcome of the procedure. Documentation of the solution should included details of any components replaced, code changes made, settings changed etc, and where relevant, procedures for carrying these out. Testing documentation should include details of all tests carried out and the results of these, eg for a programming problem this could include test data sets, test plans and test logs.

Outcome 4

When the problem has been solved candidates should review and evaluate the steps taken to resolve it and draw conclusions regarding the effectiveness of the problem solving process. They should make recommendations for use in future troubleshooting situations, for example, use of alternative problem solving approaches

Guidance on the assessment of this unit

Wherever possible, candidates should be given the opportunity to investigate and solve a real-world problem. However, if this is not feasible, lecturer-generated problems may be used, eg program code with errors introduced deliberately, misconfigured networks, incorrect drivers, etc.

Online and distance learning

This unit could be delivered by distance or online learning. It should be noted that this type of delivery may require addition scheduling and planning by the centre to arrange supervision of assessment completion and authenticity of evidence produced by candidates.

Opportunities for the use of 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 candidate evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003).*

Opportunities for developing Core Skills

This unit has the Core Skill of *Problem Solving* embedded in it. This means that when candidates achieve the unit, their Core Skills profile will also be updated to show that they have achieved *Problem Solving* at SCQF level 6.

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.

History of changes

Version	Description of change	Date

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for candidates

Unit title: Troubleshooting Computing Problems

This unit is designed to provide you with the skills required to develop a possible solution to a computing problem in the context of computer networking, software development or technical support. You will learn how to investigate the problem, plan and implement a solution, test and amend it until the problem is resolved and document each step taken to solve the problem.

On completion of the unit you should be able to:

1 Investigate a computing problem.
2 Plan and implement a solution to a computing problem.
3 Document the steps taken to resolve a computing problem.
4 Review and evaluate the steps taken to resolve a computing problem.

In the first section you will learn how to investigate a computing problem. This will cover approaches to problem solving, test strategies and techniques and problem solving tools and techniques.

In the second section you will learn how to plan and implement a solution to a computing problem. This will cover planning a solution, implementing a solution and testing the solution.

In the third section you will learn how to document the steps taken to resolve a computing problem. This will include documenting the investigation, documenting the solution and documenting the testing.

For assessment purposes you will be presented with a problem to investigate. The problem will be drawn from one or more of the following areas: networking, software development, technical support. You will be required to submit evidence that you have approached the diagnosis in a logical manner and have completed relevant documentation. Your evidence should take the form of a report of approximately 1,000 words covering three areas:

- Investigating the problem
- Planning, implementing and testing a solution
- Reviewing and evaluating the steps taken to resolve the problem

Where appropriate it should include documentation such as error logs, test logs etc. The report may be presented in any appropriate format, eg written, audio, video, blog, wiki, etc.

On successful completion of the unit you will achieve the *Problem Solving* Core Skill at SCQF level 6 also.