

## SQA Advanced Unit Specification

### General information for centres

**Unit title:** Software Development: Event Driven Programming

**Unit code:** HR8L 48

**Unit purpose:** This Unit is designed to develop a broad knowledge of the concepts, principles, boundaries and scope of software development using an event driven programming language. These will be reinforced by developing the practical skills required in using the structures and features of an event driven event driven programming language in the creation of software solutions to problems. It forms part of an SQA Advanced Computing programme, although it can also be used as a stand-alone Unit by candidates wishing to acquire and develop programming skills using an event driven programming language.

On completion of this Unit, the candidate should be able to:

1. Use programming techniques to develop program modules.
2. Implement a solution from design.
3. Test the completed product.
4. Create technical and user documentation.

**Credit value:** 2 SQA Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8\*)

*\*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.*

**Recommended prior knowledge and skills:** Access to this Unit will be at the discretion of the Centre, however it is recommended that candidates should have achieved the core skill of Problem Solving at SCQF level 4 before taking this Unit. It is also recommended that candidates have prior experience of using computer systems or studied a programming language at NQ level. This may be evidenced by possession of SQA Advanced Unit HP6L 47: *Information Technology: Applications Software 1*. However, it is expected that a candidate is either studying this Unit in conjunction with or following the completion of the SQA Advanced Unit HR74 47 *Computing: Planning*. Alternatively, candidates should have considerable practical work experience and some appreciation of the role of program design and implementation.

**Core skills:** There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

## SQA Advanced 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.

**Assessment:** The Unit must be assessed by means of a single project covering all four Outcomes with the exception of part of Outcome 2, which is closed book. The achievement requirements are inherent in the evidence requirements. Assessors must assure themselves of the authenticity of each candidate's submission.

All outcomes are open book with the exception of part of Outcome 2.

Some of the evidence requirements may be produced using e-assessment. This may take the form of e-testing (for knowledge and understanding) and/or e-portfolios (for practical abilities). There is no requirement for you to seek prior approval if you wish to use e-assessment for either of these purposes so long as the normal standards for validity and reliability are observed. Please see the following SQA publications for further information on e-assessment: (i) "SQA Guidelines on Online Assessment for Further Education" (March 2003) and (ii) "Assessment and Quality Assurance in Open and Distance Learning" (Feb. 2001).

If a centre is presenting the closed book part of Outcome 2 online the following assessment methods, where appropriate, may be selected –

- ◆ Multiple choice
- ◆ Drag and drop
- ◆ Multiple response
- ◆ Mix and match
- ◆ A combination of the above

It is expected that the questions will be of the multiple choice variety. Centres may consider the use of alternative questions types, particularly if using Computer Assisted Assessment approaches. However, care should be taken that the questions are valid and at an appropriate level. The use of simple true/false question responses is unlikely to achieve this.

**Note – Credit transfer should not be given between the outcomes in the following SQA Advanced Units:**

HP2L 48: Software Development: Object Oriented Programming

HR8L 48: Software Development: Event Driven Programming

HR6X 47: Software Development: Applications Development

HR9L 48: Software Development: Developing for the World Wide Web

### Unit specification: statement of standards

**Unit title:** Software Development: Event Driven Programming

**Unit code:** HR8L 48

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

### Outcome 1

Use programming techniques to develop program modules

#### Knowledge and Skills

- ◆ Declaring and initialising variables
- ◆ Using operators and predefined functions
- ◆ Using standard input/output commands
- ◆ Implementing control structures
- ◆ Using parameter passing mechanism to transfer values between modules
- ◆ Defining data structures
- ◆ Accessing and manipulating data structures and input/output file operations

#### Evidence Requirements

The design to be implemented is either derived in the SQA Advanced Unit HR74 47 *Computing: Planning* or provided by the assessor. The candidate will implement selected data structures and control structures depending upon the design.

Achievement in this Outcome will be evidenced by the production of code modules. The coding must encompass all of the above features, and must meet the given design specifications using at least one example of each of the features listed below. The evidence must demonstrate the appropriate use and implementation of these features to meet the requirements of both the given project brief and the problem specifications.

Specifically, the following features **must** be demonstrated in the candidate's program listing:

- ◆ Variables are appropriately defined, declared and initialised
- ◆ Arithmetic or logical operators are correctly used
- ◆ Appropriate mathematical, character, or date (or time) functions are correctly used
- ◆ Control structures, sequence, selection and iteration are correctly used
- ◆ Appropriate parameter passing is correctly used
- ◆ Modules are internally documented to organisational standards
- ◆ Appropriate error and contingency handling requirements are correctly used.

## SQA Advanced Unit Specification

The data structures used should include standard and user-defined types.

This assessment is open book.

Assessors must assure themselves of the authenticity of each candidate's submission.

### Outcome 2

Implement a solution from design

#### Knowledge and Skills

- ◆ Identify language components from the design
- ◆ Use tools and techniques to create software modules
- ◆ Implement error handling
- ◆ Demonstrate an understanding of programming techniques and concepts within an event driven environment

#### Evidence requirements

Each candidate will undertake **two separate** assessment tasks to cover the evidence required.

##### Outcome 2 - Assessment Part 1

Each candidate will need evidence to show that s/he can, with reference to the design supplied or produced, implement the completed solution. The tools and techniques available within the event driven programming language should be utilised. A candidate's response can be judged to be satisfactory where the evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Supply programming code
- ◆ Implement all required software components and data structures

In the assessment the candidate will be required to produce documentation based on the derived specification. The documentation may be supplemented by additional evidence to ensure coverage of all aspects of the evidence requirements. The format of the documentation must follow organisational standards as defined by the Centre and is a part of the mandatory evidence requirements for this Unit.

This assessment is open book.

## SQA Advanced Unit Specification

### Outcome 2 - Assessment Part 2

Evidence for all the knowledge and/or skills in this Outcome will be assessed using a representative sample of 20 questions covering programming techniques and concepts. These questions can be presented from the following:

- ◆ Multiple choice
- ◆ Drag and drop (online delivery only)
- ◆ Multiple response
- ◆ Mix and match
- ◆ A combination of the above

The questions presented must change on **each** assessment occasion.

Assessors must ensure that **all questions** should be at SCQF Level 8.

Assessment must be undertaken in supervised conditions and is closed book. A candidate should complete this assessment within one hour. Candidates may not bring to the assessment event any notes, textbooks, handouts or other material.

Candidates must answer at 60% of the questions correctly.

Assessors must assure themselves of the authenticity of each candidate's submission.

### **Assessment guidelines**

#### Outcome - Assessment Part 1

The achievement requirements are inherent in the evidence requirements.

#### Outcome - Assessment Part 2

There is an opportunity for a candidate to be assessed online subject to meeting the prescribed assessment conditions.

If a centre is presenting this assessment online the following assessment methods, where appropriate, may be selected:

- ◆ Multiple choice
- ◆ Drag and drop
- ◆ Multiple response
- ◆ Mix and match
- ◆ A combination of the above

### Outcome 3

Test the completed product

#### Knowledge and Skills

- ◆ Implementing a test plan using a defined strategy
- ◆ Maintaining a test documentation
- ◆ Evaluating results of test runs
- ◆ Amending coding as necessary

#### Evidence Requirements

The test plan to be implemented is either derived in the SQA Advanced Unit HR74 47 *Computing: Planning* or provided by the assessor. This Outcome will be assessed by the production of completed test documentation recording both the expected results of the test data and the actual results. The bank of test data should be sufficient to thoroughly test the implemented solution in scope and range.

The candidate will be expected to record and evaluate the results of the test runs. Where there are discrepancies between the expected results and the actual results, the coding must be amended and corrected accordingly.

Since the implemented solution should meet the requirements of the project brief, the candidate must produce a complete and error-free program solution to meet the project brief and problem specifications.

This assessment is open book.

Assessors must assure themselves of the authenticity of each candidate's submission.

## **SQA Advanced Unit Specification**

### **Outcome 4**

Create technical and user documentation

#### **Knowledge and skills**

- ◆ Preparing technical documents
- ◆ Preparing user documents

#### **Evidence requirements**

This Outcome will be evidenced by the candidate producing two documents as follows:

- ◆ Technical Manual containing
  1. The project brief
  2. Specification document
  3. Design document
  4. Program code listing
  5. Test documents
- ◆ User Manual containing
  1. Installation requirements and guide
  2. User guide procedures for start-up and use of the software and which includes a list of error messages and their resolution

This assessment is open book.

Assessors must assure themselves of the authenticity of each candidate's submission.

## SQA Advanced Unit Specification

### Administrative Information

<b>Unit code:</b>	HR8L 48
<b>Unit title:</b>	Software Development: Event Driven Programming
<b>Superclass category:</b>	CB
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### SQA Advanced Unit specification: support notes

**Unit title:** Software Development: Event Driven Programming

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 80 hours.

#### Guidance on the content and context for this Unit

This Unit is intended as an introduction to the basic principles and procedures involved in developing robust, reliable, efficient and maintainable software using a recognised structured event driven methodology. Its aim is to acquire competence in the development of software solutions using the program language syntax and constructs required to reinforce software development. The concepts of good practice, such as internal documentation, should be stressed throughout. The Unit should provide a foundation of good programming skills on which the more advanced programming Units such as – SQA Advanced Unit *Software Development: Array Data Structures* followed by any of the following *Software Development: Linked Data Structures*, or *Software Development: Object Oriented Collections*, or *Software Development: Advanced Programming*.

It forms part of an SQA Advanced Computing group award programme and should be delivered within the context of the group award. It can also be delivered as a stand-alone Unit by candidates wishing to acquire, and develop, programming skills using an event driven programming language.

As an introductory Unit in programming on an SQA Advanced group award, the context and examples used should be both relatively simple and within the context of the candidate's vocational experience. This would permit the candidate to concentrate more on the programming techniques involved, rather than trying to understand the initial problem.

By the end of the Unit, the candidate should have achieved a good foundation in the skills required for developing reliable, robust and efficient program designs solve business problems using an event driven programming language.

It is likely that the Unit will be delivered in the first year of a full-time SQA Advanced Computing group award.

The Unit is capable of being delivered on its own, but could also be delivered in conjunction with the SQA Advanced Unit HR74 47 *Computing: Planning*. The stages of the determined design methodology may be presented intermittently with programming principles from this Unit, with simple practical exercises in design techniques being presented and these designs being implemented in the chosen event driven programming language.

For assessment purposes, the implementation should be based on a design. If the Unit is to be delivered in conjunction with the SQA Advanced Unit HR74 47 *Computing: Planning*, then the design will be the product of the assessments for that Unit. If the Unit is being delivered as a stand-alone Unit, then the candidate will be issued with a design for implementation.

## SQA Advanced Unit Specification

The assessor must ensure that candidate evidence is being produced at SCQF Level 8. The implementation of the design requires the candidate to consider and select **in each** of the following areas:

- ◆ appropriate data structures including user-defined data types
- ◆ appropriate data structure manipulation including input, output and linear search
- ◆ sequential file manipulation for input and output

The principles of good practice, such as internal documentation and code indentation, should be included throughout.

After introducing the steps involved in developing a solution to typical problems, candidates should be presented with a series of practical exercises to illustrate the features of the event driven programming language as they are introduced.

Outcome 2 consists of two separate parts, one practical and one closed book. The closed book assessment consists of 20 questions that should cover programming techniques and concepts covered in the implementation of the design.

Regardless of delivery mode, a single and coherent case study approach is recommended for assessment, with the model broken down into identifiable and assessable stages allowing the tutor the opportunity for regular monitoring of the candidate's progress and allowing time for intermittent remediation.

Testing should involve the candidate comparing the expected and the actual results, evaluating the differences and amending the code or design as necessary.

The design and test data required may be the product of SQA Advanced Unit HR74 47 *Computing: Planning* where the two Units are being delivered in conjunction. If this programming Unit is being delivered on a stand-alone basis the design and test data may be supplied by the assessor.

During the learning process, part-completed code modules may be offered to the candidate for completion of the key syntax and language features. Code modules which contain common errors may also be provided for candidates to correct

### Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes. For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

### 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](http://www.sqa.org.uk/assessmentarrangements).

### General information for candidates

#### **Unit title:** Software Development: Event Driven Programming

In this Unit, you will acquire the knowledge and learn the skills necessary to enable you to develop software from a design.

To achieve this, you will use a range of tools that will assist you in developing your ideas towards robust, reliable and efficient software.

This will involve the following areas of learning.

- ◆ Using the features of an event driven programming language, you will implement a software solution from a design. You will learn how to apply a structured methodology to help you to implement working software, which meets the user's needs. Your understanding and grasp of these skills and techniques will be reinforced throughout with practical exercises.
- ◆ Using a test plan, you will test your software to ensure it works correctly and meets the user requirements. You will be required to amend any errors in your code in order to achieve a robust, reliable and efficient working program.
- ◆ Create technical and user manuals.

Within Outcome 2 you will be required to answer a number of questions in a closed book assessment situation.