



## National Unit specification: general information

**Unit title:** Mathematics for Computer Games (SCQF level 6)

**Unit code:** H1NC 12

**Superclass:** RB

**Publication date:** July 2012

**Source:** Scottish Qualifications Authority

**Version:** 01

## Summary

This Unit is intended primarily for candidates who wish to develop their knowledge and understanding of Mathematics at SCQF level 6 with a view to supporting and underpinning their studies in a computer games discipline. The Unit is designed to develop aspects of the candidates' skills in algebra, geometry and calculus and their applications in an appropriate computing context.

## Outcomes

- 1 Demonstrate an understanding of two dimensional matrices.
- 2 Use vectors in two dimensions.
- 3 Demonstrate an understanding of basic calculus.

## Recommended entry

While entry is at the discretion of the centre, candidates would normally be expected to have attained a Mathematics Unit at SCQF level 5 or equivalent.

## Credit points and level

1 National Unit credit at SCQF level 6: 6 SCQF credit points at SCQF level 6\*

*\*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 Access 1 to Doctorates.*

## General information (cont)

**Unit title:** Mathematics for Computer Games (SCQF level 6)

### Core Skills

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

|                      |  |
|----------------------|--|
| Complete Core Skill  | None   |
| Core Skill component | Critical Thinking at SCQF level 5<br>Planning and Organising at SCQF level 4 |

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

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 instrument of assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. ASPs are available on SQA's secure website.

## **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**

Demonstrate an understanding of two dimensional matrices.

#### **Performance Criteria**

- (a) Carry out matrix operations.
- (b) Carry out matrix applications.

### **Outcome 2**

Use vectors in two dimensions.

#### **Performance Criteria**

- (a) Perform algebraic operations on two dimensional vectors.
- (b) Resolve two dimensional vectors graphically.
- (c) Resolve two dimensional vectors algebraically.

### **Outcome 3**

Demonstrate an understanding of basic calculus.

#### **Performance Criteria**

- (a) Differentiate standard functions.
- (b) Carry out indefinite integration on standard functions.
- (c) Evaluate definite integrals of standard functions.

## National Unit specification: statement of standards (cont)

**Unit title:** Mathematics for Computer Games (SCQF level 6)

### Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Evidence should be produced under closed-book, supervised conditions. The evidence may be gathered in a single, end of Unit assessment, on an Outcome by Outcome basis or by a combination of Outcomes.

The total time allowed for assessment should not exceed two hours.

Candidates should be given access to calculators and an appropriate formula sheet. Sufficient working must be shown to demonstrate the method of solution.

Sampling of content may be appropriate, but assessment must be constructed to enable evidence to be produced which demonstrates achievement of all Outcomes and Performance Criteria.

### Outcome 1

- ◆ Calculations involving matrix algebra - at least one of each of the following:
  - Addition
  - Subtraction
  - Multiplication by a scalar.
- ◆ Multiply two matrices.
- ◆ Find the transpose of a matrix.
- ◆ Find the inverse of a matrix.
- ◆ Use matrices to solve a system of simultaneous linear equations with two variables.
- ◆ Use matrices to apply geometric transpositions — at least one of each of the following:
  - Rotation
  - Reflection
  - Dilation.

### Outcome 2

- ◆ Calculations involving vector algebra - at least one of each of the following:
  - Addition
  - Subtraction
  - Multiplication by a scalar.
- ◆ Calculate the magnitude of a vector.
- ◆ Resolve two dimensional vectors graphically - add two vectors graphically to obtain a resultant vector.
- ◆ Resolve two dimensional vectors algebraically - add two vectors to obtain a resultant vector without the use of a scale diagram.

## National Unit specification: statement of standards (cont)

**Unit title:** Mathematics for Computer Games (SCQF level 6)

### Outcome 3

- ◆ Differentiate standard functions - at least one of each of the following:
  - $x^n$
  - $ax^n$
  - $\sin x$
  - $\cos x$
- ◆ Carry out indefinite integration on standard functions - at least one of each of the following:
  - $x^n$
  - $ax^n$
  - $\sin x$
  - $\cos x$
- ◆ Evaluate definite integrals of standard functions - at least one of each of the following:
  - $x^n$
  - $ax^n$
  - $\sin x$
  - $\cos x$

## **National Unit specification: support notes**

### **Unit title: Mathematics for Computer Games (SCQF level 6)**

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.

At present there are no National Occupational Standards that this Unit can be mapped against, however candidates will be working towards industry standards.

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

This Unit aims to build on and extend the candidate's mathematical knowledge and skills. It is envisaged that the content of each Outcome is delivered and assessed with specific reference to the candidate's computing specialism, where appropriate.

#### **Outcome 1**

The first Outcome should provide an understanding of the operation of matrices and their applications in computing. The use of two-dimensional matrices, and their geometric transpositions, in computer games could be demonstrated. The solution of linear equations which represent 2 dimensional vectors and/or planes, using matrices, would lay the foundation for future work in mechanics and the physical environment.

#### **Outcome 2**

This Outcome should provide a basic understanding of vectors and vector operations and their use in computer games. The ability to resolve two vectors, both by using a scale diagram and by applying algebraic techniques, and their use in computing could be emphasised.

#### **Outcome 3**

Differential and integral calculus have broad applications in any physical system. The use of differential calculus to explore stationary points and their nature could assist in constructing curves on the computer screen. Integral calculus can be used to calculate areas under the curve which represent velocity against time. These areas indicate distances travelled by objects such as projectiles. Definite integration can also be used to calculate the areas of objects drawn on the computer screen.

## National Unit specification: support notes (cont)

**Unit title:** Mathematics for Computer Games (SCQF level 6)

### Guidance on learning and teaching approaches for this Unit

Due to the essentially progressive nature of mathematics learning and teaching, every opportunity should be taken to revise and consolidate prior knowledge.

Delivery of the Unit can be an appropriate mixture of lecturer-led/student-centred activities; individual/group work; classroom/computer laboratory assignments.

Candidates should be provided with formative opportunities to enhance skills in recognising and processing significant numerical and graphical information using computing examples and contexts.

They should practise sustained complex calculations and become adept at selecting appropriate graphical and numerical forms of communication.

The ability to carry out effective analysis and representation of data could be enhanced by access to appropriate technology, online resources and support. The use of interpolation and extrapolation in analysis should be encouraged where appropriate.

The sensible and correct use of calculators should be demonstrated and encouraged where appropriate. At the same time, candidates should be guided and encouraged to identify when working without a calculator is more appropriate.

### Guidance on approaches to assessment for this Unit

Candidates could benefit from the incorporation of formative assessments into the learning and teaching process.

Achievement of this Unit requires the Evidence Requirements to be met. These should be met by responses to an appropriate set, or sets, of questions.

Evidence for this Unit may be gathered:

♦ in a single, end-of-Unit assessment

**or**

♦ on an Outcome by Outcome basis

**or**

♦ by a combination of Outcomes

If each Outcome is assessed individually, evidence for all the Performance Criteria in the Outcome will be provided by an assessment taken at a single assessment event lasting no more than one hour, carried out under closed-book conditions.

## **National Unit specification: support notes (cont)**

**Unit title:** Mathematics for Computer Games (SCQF level 6)

If a single, end-of-Unit assessment is used, evidence for all the Performance Criteria in all the Outcomes will be provided by an assessment taken at a single assessment event lasting no more than two hours.

Candidates should be provided with appropriate formula sheets and the use of scientific calculators is permitted. Sufficient working must be shown to demonstrate the method of solution.

An alternative set of questions should be provided where re-assessment is required.

### **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)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

### **Opportunities for developing Core Skills**

This Unit allows the candidate to develop the Core Skill components Using Number and Using Graphical Information at SCQF level 6. Accuracy in analysis and the ability to calculate and present complex numerical and graphical information is an aspect of competence.

This Unit has the Critical Thinking and Planning and Organising components of Problem Solving embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 5 and Planning and Organising at SCQF level 4.

### **Disabled candidates and/or those with additional support needs**

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website [www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements)



## History of changes to Unit

| Version | Description of change | Date |
|---------|-----------------------|------|
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