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## Geometry, Proof and Systems of Equations (Advanced Higher) Unit

**SCQF:** level 7 (8 SCQF credit points)

**Unit code:** to be advised

### Unit outline

The general aim of the Unit is to develop advanced knowledge and skills that involve geometry, number and algebra, and to examine the close relationship between them. Learners will develop skills in logical thinking. The Outcomes cover matrices, vectors, solving systems of equations, the geometry of complex numbers, as well as processes of rigorous proof.

Learners who complete this Unit will be able to:

- 1 Use mathematical operational skills linked to geometry, proof and systems of equations
- 2 Use mathematical reasoning skills linked to geometry, proof and systems of equations

This Unit is a mandatory Unit of the Advanced Higher Mathematics Course and is also available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes*, which provide advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in *Unit Assessment Support*.

The *Course Assessment Specification* for the Advanced Higher Mathematics Course gives further mandatory information on Course coverage for learners taking this Unit as part of the Advanced Higher Mathematics Course.

## Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- ◆ Higher Mathematics Course or relevant component Units

## 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. For further information please refer to the *Unit Support Notes*.

# Standards

## Outcomes and assessment standards

### Outcome 1

The learner will:

**1 Use mathematical operational skills linked to geometry, proof and systems of equations by:**

- 1.1 Applying algebraic skills to matrices and systems of equations
- 1.2 Applying algebraic and geometric skills to vectors
- 1.3 Applying geometric skills to complex numbers
- 1.4 Applying algebraic skills to number theory
- 1.5 Applying algebraic and geometric skills to methods of proof

### Outcome 2

The learner will:

**2 Use mathematical reasoning skills linked to geometry, proof and systems of equations by:**

- 2.1 Interpreting situations where mathematics can be used and applying a range of valid strategies
- 2.2 Explaining solutions and/or relating them to context

## Evidence Requirements for the Unit

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. They should ensure there is sufficient evidence of competence in algebraic, geometrical and reasoning skills from the Outcomes and Assessment Standards to allow a judgement to be made that the learner has achieved the Unit.

Assessors should use their professional judgement when giving learners credit for an appropriate degree of accuracy. This may mean giving credit for incomplete solutions or numerically incorrect solutions which show correct methodology, therefore demonstrating required knowledge and understanding of the algebraic and geometrical processes involved.

Evidence may be presented for individual Outcomes or it may be gathered for the Unit as a whole through integrating assessment in a single activity. If the latter approach is used, it must be clear how the evidence covers each Outcome.

A calculator or equivalent technologies may be used.

For this Unit, learners will be required to produce evidence as follows.

For **Outcome 1**, learners will be required to provide evidence for each of the Assessment Standards by drawing on the following:

**Algebraic Skills (1.1)**

- ◆ Using Gaussian elimination to solve a 3x3 system of linear equations.
- ◆ Performing matrix operations of addition, subtraction and multiplication.
- ◆ Calculating the determinant of a matrix.
- ◆ Finding the inverse of a matrix.
- ◆ Using 2 x 2 matrices to carry out geometric transformations in the plane.

**Algebraic and Geometric Skills (1.2)**

- ◆ Calculating a vector product.
- ◆ Finding the equation of a line in three dimensions.
- ◆ Finding the equation of a plane.

**Geometric Skills (1.3)**

- ◆ Converting complex numbers between Cartesian and polar forms.
- ◆ Plotting a complex number on an Argand diagram.

**Algebraic Skills (1.4)**

- ◆ Using Euclid's algorithm to find the greatest common divisor of two positive integers.

**Algebraic and Geometric Skills (1.5)**

- ◆ Disproving a conjecture by providing a counter-example.
- ◆ Using indirect proof.

For **Outcome 2**, evidence of reasoning skills can be collected separately or combined with evidence for Outcome 1.

Exemplification of assessment is provided in *Unit Assessment Support*. Advice and guidance on possible approaches to assessment is provided in the *Unit Support Notes*.

## **Development of skills for learning, skills for life and skills for work**

It is expected that learners will develop broad, generic skills through this Unit. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Unit where there are appropriate opportunities.

### **2 Numeracy**

- 2.1 Number processes
- 2.2 Money, time and measurement
- 2.3 Information handling

### **5 Thinking skills**

- 5.3 Applying
- 5.4 Analysing and evaluating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills should be at the same SCQF level as the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the *Unit Support Notes*.

# Administrative information

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**Published:** April 2013 (version 1.0)

**Superclass:** to be advised

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## History of changes to National Unit Specification

Version	Description of change	Authorised by	Date

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Note: readers are advised to check SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk) to ensure they are using the most up-to-date version of the Unit Specification.