National Unit Specification: general information

UNIT Mathematics 3 (Higher)

NUMBER D323 12

COURSE Mathematics (Higher)

SUMMARY

Mathematics 3 (H) comprises outcomes in algebra, geometry, trigonometry and elementary calculus at Higher level. It is a mandatory unit of the Higher Mathematics Course

OUTCOMES

1 Use vectors in three dimensions.
2 Use further differentiation and integration.
3 Use properties of logarithmic and exponential functions.
4 Apply further trigonometric relationships.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained:

- *Mathematics 2 (H)*
- equivalent.

Administrative Information

Superclass: RB

Publication date: May 2007

Source: Scottish Qualifications Authority

Version: 05

National Unit Specification: general information (cont)

UNIT Mathematics 3 (Higher)

CREDIT VALUE

1 credit at Higher (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.*

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	None
Core skills components for the unit	Critical Thinking H Using Number H

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Mathematics 3 (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Use vectors in three dimensions.

Performance criteria

a) Determine whether three points with given coordinates are collinear.
b) Determine the coordinates of the point which divides the join of two given points internally in a given numerical ratio.
c) Use the scalar product.

OUTCOME 2

Use further differentiation and integration.

Performance criteria

a) Differentiate $k \sin x$, $k \cos x$.
b) Differentiate using the function of a function rule.
c) Integrate functions of the form $f(x) = (x + q)^n$, n rational except for -1, $f(x) = p \cos x$ and $f(x) = p \sin x$.

OUTCOME 3

Use properties of logarithmic and exponential functions.

Performance criteria

a) Simplify a numerical expression using the laws of logarithms.
b) Solve simple logarithmic and exponential equations.

OUTCOME 4

Apply further trigonometric relationships.

Performance criteria

a) Express $a \cos \theta + b \sin \theta$ in the form $r \cos (\theta \pm \alpha)$ or $r \sin (\theta \pm \alpha)$.

Evidence requirements

Although there are various ways of demonstrating achievement of the outcomes, evidence would normally be presented in the form of a closed book test under controlled conditions. Examples of such tests are contained in the National Assessment Bank.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Unit Specification: support notes

UNIT Mathematics 3 (Higher)

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.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Each mathematics unit at Higher level aims to build upon and extend candidates' mathematical knowledge and skills. This optional unit is designed to continue the study of mathematics in the areas of algebra, geometry, trigonometry and calculus, and to provide a basis for the study of more advanced mathematics and applied mathematics.

Within this unit, the coordinate geometry of *Mathematics 1(H)* and *Mathematics* 2(H) is broadened into a three dimensional context with the introduction of vector notation and applications. Calculus is further extended to include differentiation and integration of the sine and cosine functions and the rules for integrating and differentiating composite functions. The exponential and logarithmic functions introduced graphically in *Mathematics 1(H)* are used in applications, and further trigonometry is studied in the context of the wave function.

The increasing degree of importance of mathematical rigour and the ability to use precise and concise mathematical language as candidates progress in mathematics assumes a particular importance at this stage. Candidates working at this level are expected to acquire a competence and a confidence in applying mathematical techniques, manipulating symbolic expressions and communicating with mathematical correctness in the solution of problems. It is important, therefore, that, within this unit, appropriate attention is given to the acquisition of such expertise whilst extending the candidate's 'toolkit' of knowledge and skills.

The recommended content for this unit can be found in the course specification. The *detailed content* section provides illustrative examples to indicate the depth of treatment required to achieve a unit pass and advice on teaching approaches.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Where appropriate, mathematical topics should be taught and skills in applying mathematics developed through real-life contexts. Candidates should be encouraged throughout this unit to make efficient use of the arithmetical, mathematical and graphical features of calculators as well as basic non-calculator skills. Candidates should be aware of the limitations of the technology and always apply the strategy of checking.

Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, attention should be drawn to relevant checking procedures throughout the mathematical process. There are various checking procedures which could be used:

- relating to a context – 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order.

Further advice on learning and teaching approaches is contained within the Subject Guide for Mathematics.

National Unit Specification: support notes (cont)

UNIT Mathematics 3 (Higher)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment for this unit will normally be in the form of a closed book test. Such tests should be carried out under supervision and it is recommended that candidates attempt an assessment designed to assess all the outcomes within the unit. Successful achievement of the unit is demonstrated by candidates achieving the thresholds of attainment specified for all outcomes in the unit. Candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained. Further advice on assessment and retesting is contained within the National Assessment Bank.

It is expected that candidates will be able to achieve the algebraic, trigonometric and calculus performance criteria of the unit without the use of computer software or sophisticated calculators.

In assessments, candidates are required to show their working in carrying out these algorithms and processes.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.