Higher
Course Assessment
Specification

Higher Mathematics Course Assessment Specification

Valid from August 2014

This edition: April 2012, version 1.0

Please refer to the note of changes at the end of this Course Assessment Specification for details of changes from previous version (where applicable).

Course outline

Course title: Higher Mathematics

SCQF level: 6 (24 SCQF credit points)

Course code: to be advised

Course assessment code: to be advised

The purpose of the Course Assessment Specification is to ensure consistent and transparent assessment year on year. It describes the structure of the Course assessment and the mandatory skills, knowledge and understanding that will be assessed.

Course assessment structure

Component 1 — question paper: Paper 1 (Non-Calculator)	60 marks
Component 2 — question paper: Paper 2	70 marks

This Course includes six SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course.

Equality and inclusion

This Course Assessment Specification has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled learners and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: www.sqa.org.uk/sqa/14977.html.

Guidance on inclusive approaches to delivery and assessment of this Course is provided in the *Course Support Notes*.

Assessment

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. Course assessment will provide the basis for grading attainment in the Course award.

Course assessment

SQA will produce and give instructions for the production and conduct of Course assessments based on the information provided in this document.

Added value

The purpose of the Course assessment is to assess added value of the Course as well as confirming attainment in the Course and providing a grade. The added value for the Course will address the key purposes and aims of the Course, as defined in the Course rationale. It will do this by addressing one or more of breadth, challenge, or application.

In this Course assessment, added value will focus on the following:

- breadth — drawing on knowledge and skills from across the Course
- challenge — requiring greater depth or extension of knowledge and skills
- application — requiring application of knowledge and skills in practical or theoretical contexts as appropriate

This added value consists of:

- the development of mathematical operational skills beyond the minimum competence required for the Units
- the integration of mathematical operational skills developed across the Units
- the development of mathematical reasoning skills beyond the minimum competence required for the Units
- the application of skills without the aid of a calculator in order to demonstrate that the candidate has an underlying grasp of mathematical concepts and processes

To achieve success in the Course, learners must show that they can apply knowledge and skills acquired across the Course to unseen situations.

There are two question papers, requiring learners to demonstrate aspects of breadth, challenge and application in mathematical contexts. In one of the question papers, the use of a calculator will be permitted. Learners will apply breadth and depth of knowledge and skills from across the Units to answer appropriately challenging questions.

Grading

Course assessment will provide the basis for grading attainment in the Course award.

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

A learner's overall grade will be determined by their performance across the Course assessment.

Grade description for C
For the award of Grade C, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated successful performance in relation to the mandatory skills, knowledge and understanding for the Course.

Grade description for A
For the award of Grade A, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated a consistently high level of performance in relation to the mandatory skills, knowledge and understanding for the Course.

Credit
To take account of the extended range of learning and teaching approaches, remediation, consolidation of learning and integration needed for preparation for external assessment, six SCQF credit points are available in Courses at National 5 and Higher, and eight SCQF credit points in Courses at Advanced Higher. These points will be awarded when a grade D or better is achieved.

Structure and coverage of the Course assessment

The Course assessment will consist of two Components: a question paper titled 'Non-Calculator', and a question paper titled 'Calculator'.

Component 1 — question paper: Paper 1 (Non-Calculator)
The purpose of this question paper is to assess mathematical skills without the aid of a calculator.

This question paper will give learners, without the aid of a calculator, an opportunity to apply numerical, algebraic, geometric, trigonometric, calculus, and reasoning skills specified in the table provided in the 'Further mandatory information on Course coverage' section at the end of this Course Assessment Specification.

These skills are those in which the candidate is required to show an understanding of underlying processes. They will involve the ability to use these skills within mathematical contexts in cases where a calculator may compromise the assessment of this understanding, such as in solving equations or working with indices, surds and logarithms.

The question paper: Paper 1 (Non-Calculator) will have 60 marks.

This question paper will consist of short and extended response questions.

Component 2 — question paper: Paper 2
The purpose of this question paper is to assess mathematical skills. A calculator may be used.

This question paper will give learners an opportunity to apply numerical, algebraic, geometric, trigonometric, calculus, and reasoning skills specified in the table provided in the 'Further mandatory information on Course coverage' section at the end of this Course Assessment Specification.

These skills are those which may be facilitated by the use of a calculator, allowing more opportunity for application and reasoning. This would typically involve situations where more complex calculations would be required to solve problems.

The question paper: Paper 2 will have 70 marks.

This question paper will consist of short and extended response questions.

Setting, conducting and marking of assessment

Question paper — Paper 1 (Non-Calculator)

This question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Learners will complete this in 1 hour 10 minutes.

Question paper — Paper 2

This question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Learners will complete this in 1 hour 30 minutes.

Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the Higher Mathematics Course. Course assessment will involve sampling the skills, knowledge and understanding.

Algebraic and trigonometric skills The learner will use algebraic and trigonometric skills and apply them in context	
Manipulating algebraic expressions	Factorising a cubic or quartic polynomial expression Simplifying a numerical expression using the laws of logarithms and exponents
Manipulating trigonometric expressions	Application of: ♦ the addition or double angle formulae ♦ trigonometric identities Convert $a\cos x + b\sin x$ to $k\cos(x \pm \alpha)$ or $k\sin(x \pm \alpha)$, $k > 0$
Identifying and sketching related functions	Identifying or sketching a function after a transformation of the form $kf(x)$, $f(kx)$, $f(x)+k$, $f(x+k)$ or a combination of these Sketch $y = f'(x)$ given the graph of $y = f(x)$ Sketching the inverse of a logarithmic or an exponential function Completing the square in a quadratic expression where the coefficient of x^2 is non-unitary
Determining composite and inverse functions	Determining a composite function given $f(x)$ and $g(x)$, where $f(x)$, $g(x)$ can be trigonometric, logarithmic, exponential or algebraic functions Determining $f^{-1}(x)$ of linear functions
Solving algebraic equations	Solving a cubic or quartic polynomial equation Given the nature of the roots of an equation, use the discriminant to find an unknown

	Solving a logarithmic or exponential equation Finding the coordinates of the point(s) of the intersection of a straight line and a curve or of two curves
Solving trigonometric equations	Solving trigonometric equations in degrees or radians including those involving the wave function or trigonometric formulae or identities, in a given interval

Geometric skills The learner will use geometric skills and apply them in context	
Determining vector connections	Determining the resultant of vector pathways in three dimensions Working with collinearity Determining the coordinates of an internal division point of a line
Working with vectors	Using the scalar product Using unit vectors $\mathbf{i}$, $\mathbf{j}$, $\mathbf{k}$ as a basis

Calculus skills The learner will use calculus skills and apply them in context	
Differentiating functions	Differentiating an algebraic function which is, or can be simplified to, an expression in powers of x Differentiating $k\sin x$, $k\cos x$ Differentiating a composite function using the chain rule
Using differentiation to investigate the nature and properties of functions	Determining the equation of a tangent to a curve at a given point by differentiation Determining where a function is strictly increasing/decreasing Sketching the graph of an algebraic function by determining stationary points and intersections with the axes
Integrating functions	Integrating an algebraic function which is, or can be, simplified to an expression of powers of x

	Integrating functions of the form $f(x) = (x+q)^n$ n not equal to -1 Integrating functions of the form $f(x) = p\cos x$ and $f(x) = p\sin x$ Integrating functions of the form $f(x) = (px+q)^n$ n not equal to -1 Integrating functions of the form $f(x) = p\cos(qx+r)$ and $p\sin(qx+r)$ Solving differential equations of the form $\frac{dy}{dx} = f(x)$
Using integration to calculate definite integrals	Calculating definite integrals of functions with limits which are integers, radians, surds or fractions
Applying differential calculus	Determining the optimal solution for a given problem Solving problems using rate of change
Applying integral calculus	Finding the area between a curve and the x-axis Finding the area between a straight line and a curve or two curves Determine and use a function from a given rate of change and initial conditions

Algebraic and geometric skills The learner will use algebraic and geometric skills and apply them in context	
Applying algebraic skills to rectilinear shapes	Finding the equation of a line parallel to and a line perpendicular to a given line Using $m = \tan\theta$ to calculate a gradient or angle Using properties of medians, altitudes and perpendicular bisectors in problems involving the equation of a line and intersection of lines
Applying algebraic skills to circles and graphs	Determining and using the equation of a circle

	Using properties of tangency in the solution of a problem Determining the intersection of circles or a line and a circle
Modelling situations using sequences	Determining a recurrence relation from given information Using a recurrence relation to calculate a required term Finding and interpreting the limit of a sequence, where it exists

Reasoning skills The learner will use mathematical reasoning skills (these can be used in combination or separately)	
Interpreting a situation where mathematics can be used and identifying a strategy	Can be attached to any operational skills to require analysis of a situation
Explaining a solution and/or relating it to context	Can be attached to any operational skills to require explanation of the solution given

Administrative information

Published: April 2012 (version 1.0)

Superclass: to be advised

History of changes to Course Assessment Specification

Course details	Version	Description of change	Authorised by	Date