



Mathematics: Relationships and Calculus (Higher) Unit

SCQF: level 6 (6 SCQF credit points)

Unit code: H4LD 76

Unit outline

The general aim of this Unit is to develop knowledge and skills that involve solving equations and to introduce both differential calculus and integral calculus. The Outcomes cover aspects of algebra, trigonometry, calculus and also skills in mathematical reasoning and modelling.

Learners who complete this Unit will be able to:

- 1 Use mathematical operational skills linked to relationships and calculus
- 2 Use mathematical reasoning skills linked to relationships and calculus

This Unit is a mandatory Unit of the 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 packs.

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

- ◆ National 5 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 relationships and calculus by:

- 1.1 Applying algebraic skills to solve equations
- 1.2 Applying trigonometric skills to solve equations
- 1.3 Applying calculus skills of differentiation
- 1.4 Applying calculus skills of integration

Outcome 2

The learner will:

2 Use mathematical reasoning skills linked to relationships and calculus by:

- 2.1 Interpreting a situation where mathematics can be used and identifying a valid strategy
- 2.2 Explaining a solution and, where appropriate, relating it 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, trigonometric, calculus 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, trigonometric and calculus 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 assessment standard linked to expressions and functions by drawing on the following:

Algebraic skills — factorising a cubic polynomial expression with unitary x^3 coefficient; solving cubic polynomial equations with unitary x^3 coefficient; given the nature of the roots of an equation, use the discriminant to find an unknown

Trigonometric skills — solve trigonometric equations in degrees, including those involving trigonometric formulae or identities, in a given interval

Calculus skills — differentiating an algebraic function which is, or can be simplified to, an expression in powers of x ; differentiating $k \sin x$, $k \cos x$; determining the equation of a tangent to a curve at a given point by differentiation; integrating an algebraic function which is, or can be, simplified to an expression of powers of x ; integrating functions of the form $f(x) = (x + q)^n$, $n \neq -1$; integrating functions of the form $f(x) = p \cos x$ and $f(x) = p \sin x$; calculating definite integrals of polynomial functions with integer limits.

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

Assessment Standards 2.1 and 2.2 are transferable across the Course.

Exemplification of assessment is provided in Unit assessment support packs.

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

Additional Information

Symbols, terms and sets:

the symbols: \in , \notin , $\{ \}$

the terms: set, subset, empty set, member, element

the conventions for representing sets, namely:

\mathbb{N} , the set of natural numbers, $\{1, 2, 3, \dots\}$

\mathbb{W} , the set of whole numbers, $\{0, 1, 2, 3, \dots\}$

\mathbb{Z} , the set of integers

\mathbb{Q} , the set of rational numbers

\mathbb{R} , the set of real numbers

The content listed above is not examinable but candidates are expected to be able to understand its use.

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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Superclass: RB

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
2.0	<p>Page 3 – In Assessment Standard 2, the words ‘where appropriate’ replace ‘and/or’</p> <p>Page 4 – under Evidence Requirements, Algebraic skills now include the polynomial sub-skill that has been brought into Relationships and Calculus from Expressions and Functions. The Log sub-skill has been removed from this Unit and moved to Expressions and Functions.</p> <p>Page 4 - ‘calculating definite integrals of polynomial functions with integer limits’ has been added to Calculus skills</p> <p>Page 4 – information has been added on the transferability of Assessment Standards in Outcome 2 across the Course</p> <p>Page 4 – additional information has been added on symbols, terms and sets</p>	Qualifications Development Manager	April 2014

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

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