National 4
Added Value
Unit Specification

Mathematics: Test (National 4)

SCQF: level 4 (6 SCQF credit points)

Unit code: H22H 74

Unit outline

This is the Added Value Unit of the National 4 Mathematics Course. The general aim of this Unit is to enable the learner to provide evidence of added value for the National 4 Mathematics Course through the successful completion of a test which will allow the learner to demonstrate breadth and challenge.

Breadth and challenge will be demonstrated through the use and integration of mathematical ideas and strategies linked to straightforward mathematical expressions, formulae and relationships. This will include the application of algebraic, geometric, trigonometric, statistical and reasoning skills. Numerical skills underpin all aspects of the Course and the ability to use these without the aid of a calculator will also be assessed.

Learners who complete this Unit will be able to:

1 Apply mathematical skills in straightforward contexts

This Unit is a mandatory Unit of the National 4 Mathematics Course, and is also available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Course Support Notes*, which provide advice and guidance on delivery and assessment approaches. Exemplification of the standards in this Unit is given *in Unit Assessment Support*.

Recommended entry

Entry to this Unit is at the discretion of the centre. It is recommended that the learner should be in the process of completing, or have completed, the following Units in the National 4 Mathematics Course:

- Mathematics: Expressions and Formulae (National 4)
- Mathematics: Relationships (National 4)
- Numeracy (National 4)

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 *Course Support Notes.*

Standards

Outcomes and assessment standards

Outcome 1

The learner will:

1 Apply mathematical skills in straightforward contexts by:

1.1 Using operational and reasoning skills to determine solutions in mathematical or real-life situations

Evidence Requirements for the Unit

This Unit will be assessed through controlled assessment which meets the Evidence Requirements below.

The assessment method for this Unit will be a test in which the learner will have opportunities to demonstrate skills acquired in the Course and use skills in a wider range of situations and sometimes in integrated ways. The knowledge and skills to be tested are selected from within the Course.

The test is:

- set by centres within the SQA guidelines described below
- conducted under a high degree of supervision and control

Evidence will be internally marked by centre staff in line with SQA guidelines.

All assessment is subject to quality assurance by SQA.

Setting the assessment
The test will be set by centres within the following guidelines:

The test will consist of two parts, in one of which a calculator may be used. The test should have between 43 and 47 marks in total, 7 to 9 of which should be for reasoning.

Part 1:
This will consist of short response questions, based on a selection of knowledge and skills developed in the Course.

In this part a calculator must not be used. The questions should be able to be completed in 20 minutes. This part should have 14 to 16 marks, some of which should be for mathematical reasoning.

Part 2:
This will consist of short and extended response questions based on a selection of knowledge and skills developed in the Course.

In this part a calculator can be used. The questions should be able to be completed in 40 minutes. This part should have 29 to 31 marks, some of which should be for mathematical reasoning.

The questions for parts 1 and 2 should be in an appropriate context and will be drawn from the list of skills in Table 1 below:

Table 1

Applying algebraic skills to manipulating expressions and working with formulae	
♦ Using the distributive law in an expression with a numerical common factor to produce a sum of terms	EF 1.1.1
♦ Factorising a sum of terms with a numerical common factor	EF 1.1.2
♦ Simplifying an expression which has more than one variable	EF 1.1.3
♦ Evaluating an expression or a formulae which has more than one variable	EF 1.1.4
♦ Extending a straightforward number or diagrammatic pattern and determining its formula	EF 1.1.5
♦ Calculating the gradient of a straight line from horizontal and vertical distance	EF 1.1.6
Applying geometric skills to circumference, area and volume	
♦ Calculating the circumference and area of a circle	EF 1.2.1
♦ Calculating the area of a parallelogram, kite, trapezium	EF 1.2.2
♦ Investigating the surface of a prism	EF 1.2.3
♦ Calculating the volume of a prism	EF 1.2.4
♦ Using rotational symmetry	EF 1.2.5
Applying statistical skills to representing and analysing data and to probability	
♦ Constructing a frequency table with class intervals from raw data	EF 1.3.1
♦ Determining statistics of a data set	EF 1.3.2
♦ Interpreting calculated statistics	EF 1.3.3
♦ Representing raw data in a pie chart	EF 1.3.4
♦ Using probability	EF 1.3.5
Applying algebraic skills to linear equations	
♦ Drawing and recognising a graph of a linear equation	R 1.1.1
♦ Solving linear equations	R 1.1.2
♦ Changing the subject of a formula	R 1.1.3
Applying geometric skills to sides and angles of shapes	
♦ Using Pythagoras' theorem	R 1.2.1
♦ Using a fractional scale factor to enlarge or reduce a shape	R 1.2.2
♦ Using parallel lines, symmetry and circle properties to calculate angles	R 1.2.3

Applying trigonometric skills to right-angled triangles	
♦ Calculating a side in a right-angled triangle	R 1.3.1
♦ Calculating an angle in a right-angled triangle	R 1.3.2
Applying statistical skills to representing data	
♦ Constructing a scattergraph	R 1.4.1
♦ Drawing and applying a best-fitting straight line	R 1.4.2
Applying numerical skills to solve straightforward real-life problems involving money/time/measurement	
♦ Selecting and using appropriate numerical notion and units	N 1.1
♦ Selecting and carrying out calculations	N 1.2
♦ Reading measurements using a straightforward scale on an instrument	N 1.3
♦ Interpreting the measurements and the results of calculations to make decisions	N 1.4
♦ Explaining decisions based on the results of measurements or calculations	N 1.5
Interpreting graphical data and situations involving probability to solve straightforward real-life problems involving money/time/ measurement	
♦ Extracting and interpreting data from straightforward graphical forms	N 2.1
♦ Making and explaining decisions based on the interpretation of data	N 2.2
♦ Making and explaining decisions based on probability	N 2.3

Conducting the assessment
The test will be conducted under a high degree of supervision and control.

This will take the form of: supervised, closed book conditions.

Judging the evidence
Evidence will be internally marked and verified by centre staff in line with SQA guidelines.

All assessment is subject to quality assurance by SQA.

To be awarded this Unit the learner must demonstrate competence across the test as a whole.

Re-assessment
In relation to Unit assessment, SQA's guidance on re-assessment for Units applies.

In this case, for re-assessment purposes, learners will be required to re-sit another version of the whole test.

Further information is provided in the exemplification of assessment in *Unit Assessment Support*. Advice and guidance on possible approaches to assessment is provided in the *Course Support Notes.*

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

Please refer to the *Course Specification* for information about skills for learning, skills for life and skills for work.

Further mandatory information on Course coverage for the National 4 Mathematics Course

The following gives details of mandatory skills, knowledge and understanding for the National 4 Mathematics Course. Assessment of this Added Value Unit will involve selecting appropriate skills, knowledge and understanding from those listed below, in line with the Evidence Requirements above. This list of skills, knowledge and understanding also provides the basis for the assessment of all the Units in the Course.

Section A: Mandatory content for Added Value Unit

Applying algebraic skills to manipulating expressions and working with formulae	♦ Using the distributive law in an expression with a numerical common factor to produce a sum of terms ♦ Factorising a sum of terms with a numerical common factor ♦ Simplifying an expression which has more than one variable ♦ Evaluating an expression or a formulae which has more than one variable ♦ Extending a straightforward number or diagrammatic pattern and determining its formula ♦ Calculating the gradient of a straight line from horizontal and vertical distances
Applying geometric skills to circumference, area and volume	♦ Calculating the circumference and area of a circle ♦ Calculating the area of a parallelogram, kite, trapezium ♦ Investigating the surface of a prism ♦ Calculating the volume of a prism ♦ Using rotational symmetry
Applying statistical skills to representing and analysing data and to probability	♦ Constructing a frequency table with class intervals from raw data ♦ Determining statistics of a data set ♦ Interpreting calculated statistics ♦ Representing raw data in a pie chart ♦ Using probability
Applying algebraic skills to linear equations	♦ Drawing and recognising a graph of a linear equation ♦ Solving linear equations ♦ Changing the subject of a formula
Applying geometric skills to sides and angles of shapes	♦ Using Pythagoras' theorem ♦ Using a fractional scale factor to enlarge or reduce a shape ♦ Using parallel lines, symmetry and circle properties to calculate angles
Applying trigonometric skills to right-angled triangles	♦ Calculating a side in a right-angled triangle ♦ Calculating an angle in a right-angled triangle

Applying statistical skills to representing data	♦ Constructing a scattergraph ♦ Drawing and applying a best-fitting straight line
Applying numerical skills to solve straightforward real-life problems involving money/time/ measurement	♦ Selecting and using appropriate numerical notation and units ♦ Selecting and carrying out calculations ♦ Reading measurements using a straightforward scale on an instrument ♦ Interpreting the measurements and the results of calculations to make decisions ♦ Explaining decisions based on the results of measurements or calculations
Interpret graphical data and situations involving probability to solve straightforward real-life problems involving money/time/measurement	♦ Extracting and interpreting data from straightforward graphical forms ♦ Making and explaining decisions based on the interpretation of data ♦ Making and explaining decisions based on probability
Reasoning skills	♦ Identifying a valid strategy or explaining a solution

Section B: Mandatory content for Units

Mathematics: Expressions and Formulae (National 4)	
Mathematical Operational Skills	
Applying algebraic skills to manipulating expressions and working with formulae	
Skill	**Explanation**
Using the distributive law in an expression with a numerical common factor to produce a sum of terms	$3(4x+2)$ $5(a-2c)$
Factorising a sum of terms with a numerical common factor	$7x+21$ $24y-9$
Simplifying an expression which has more than one variable	$3a+4b-a+6b$
Evaluating an expression or a formulae which has more than one variable	Evaluate linear expressions for given integer values $4w+6t-3k$
Extending a straightforward number or diagrammatic pattern and determining its formula	Straightforward sequences such as 4, 7, 10, 13, … Patterns in diagram format Evaluate the determined formula for a given variable value
Calculating the gradient of a straight line from horizontal and vertical distances	Vertical distance over horizontal distance
Applying geometric skills to circumference, area and volume	
Skill	**Explanation**
Calculating the circumference and area of a circle	Given radius or diameter
Calculating the area of a parallelogram, kite, trapezium	Approached as composite shapes, eg by splitting into triangles
Investigating the surface of a prism	♦ know face, vertex, edge ♦ draw nets ♦ calculate surface area
Calculating the volume of a prism	Triangular prism, cylinder, other prisms given the area of the base
Using rotational symmetry	With straightforward shapes

Applying statistical skills to representing and analysing data and to probability	
Skill	**Explanation**
Constructing a frequency table with class intervals from raw data	Using ungrouped data
Determining statistics of a data set	♦ mean ♦ median ♦ mode ♦ range
Interpreting calculated statistics	Using mean, median, mode, range to compare data sets
Representing raw data in a pie chart	Calculation of sector angles for given categories
Using probability	♦ calculation of probability ♦ interpret probability in the context of risk
Mathematical reasoning skills	
Interpreting a situation where mathematics can be used and identifying a valid strategy	Can be attached to a skill of Outcome 1 to require analysis of a situation
Explaining a solution and/or relating it to context	Can be attached to a skill of Outcome 1 to require explanation of the solution given

Mathematics: Relationships (National 4)	
Mathematical operational skills	
Applying algebraic skills to linear equations	
Skill	**Explanation**
Drawing and recognising a graph of a linear equation	Draw a graph of values for chosen values of x For $y = mx + c$, know the meaning of m and c Recognise and use $y = a$, $x = b$
Solving linear equations	$ax + b = c$ $ax + b = cx + d$ Where a, b, c, d are integers
Changing the subject of a formula	Change the subject of the formulae: $G = x + a$ to x $h = \frac{v}{n}$ to v $E = 3w - k$ to w

Applying geometric skills to sides and angles of shapes	
Skill	Explanation
Using Pythagoras' theorem	given measurements given coordinates
Using a fractional scale factor to enlarge or reduce a shape	Non-regular rectilinear shape
Using parallel lines, symmetry and circle properties to calculate angles	Combination of angle properties associated with: ♦ intersecting and parallel lines ♦ triangles and quadrilaterals Circles: ♦ angle in a semi-circle ♦ relationship between tangent and radius
Applying trigonometric skills to right-angled triangles	
Skill	**Explanation**
Calculating a side in a right-angled triangle	Given a side and an angle
Calculating an angle in a right-angled triangle	Given two sides
Applying statistical skills to representing data	
Skill	**Explanation**
Constructing a scattergraph	Given a set of data
Drawing and applying a best-fitting straight line	The line should have roughly the same number of data points on either side Use the line of best fit to estimate one variable, given the other
Mathematical reasoning skills	
Interpreting a situation where mathematics can be used and identifying a valid strategy	Can be attached to a skill of Outcome 1 to require analysis of a situation
Explaining a solution and/or relating it to context	Can be attached to a skill of Outcome 1 to require explanation of the solution given

Numeracy (National 4)	
Numerical Outcome The learner will use numerical skills to solve given, straightforward real-life problems involving money/time/measurement	
Assessment Standard	**Explanation of Standard**
1.1 Selecting and using appropriate numerical notation and units	Numerical notation should include: =, +, –, ×, ÷, /, <, >, ( ), %, decimal point Units should include: — money (pounds and pence) — time (months, weeks, days, hours, minutes, seconds) — measurement of length (millimetre, centimetre, metre, kilometre, mile); weight (gram, kilogram); volume (millilitre, litre) and temperature (Celsius or Fahrenheit)
1.2 Selecting and carrying out calculations	♦ add and subtract whole numbers including negative numbers ♦ multiply whole numbers of any size, with up to four-digit whole numbers ♦ divide whole numbers of any size, by a single digit whole number or by 10 or 100 ♦ round answers to the nearest significant figure or two decimal places ♦ find simple percentages and fractions of shapes and quantities, eg 50%, 10%, 20%, 25%, 33⅓%; ½, ⅓, ¼, 1/10, ⅕ ♦ calculate percentage increase and decrease ♦ convert equivalences between common fractions, decimals and percentages ♦ calculate rate: eg miles per hour or number of texts per month ♦ calculate distance given speed and time ♦ calculate time intervals using the 12- and 24-hour clock ♦ calculate volume (cube and cuboid), area (rectangle and square) and perimeter (shapes with straight lines) ♦ calculate ratio and direct proportion
1.3 Reading measurements using a straightforward scale on an instrument	♦ use measuring instruments with straightforward scales to measure length, weight, volume and temperature ♦ read scales to the nearest marked, unnumbered division with a functional degree of accuracy

1.4	Interpreting the measurements and the results of calculations to make decisions	♦ use appropriate checking methods, eg check sums and estimation ♦ interpret results of measurements involving time, length, weight, volume and temperature ♦ recognise the inter-relationship between units in the same family, eg mm/cm, cm/m, g/kg, and ml/l ♦ use vocabulary associated with measurement to make comparisons for length, weight, volume and temperature
1.5	Explaining decisions based on the results of measurements and calculations	♦ give reasons for decisions based on the results of calculations
Graphical data Outcome The learner will interpret graphical data and situations involving probability to solve given, straightforward real-life problems involving money/time/measurement.		
2.1	Extracting and interpreting data from at least two different straightforward graphical forms	Straightforward graphical forms should include: ♦ a table with at least four categories of information ♦ a chart where the values are given or where the scale is obvious, eg pie ♦ a graph where the scale is obvious, eg bar, pie, scatter or line graph ♦ a diagram, eg stem and leaf, map or plan
2.2	Making and explaining decisions based on the interpretation of data from straightforward graphical forms	♦ make decisions based on observations of patterns and trends in data ♦ make decisions based on calculations involving data ♦ make decisions based on reading scales in straightforward graphical forms ♦ offer reasons for the decisions made based on the interpretation of data
2.3	Making and explaining decisions based on probability	♦ recognise patterns and trends and use these to state the probability of an event happening ♦ make predictions and use these predictions to make decisions

Administrative information

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Superclass: RB

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
1.1	Typographical error corrected.	Qualifications Development Manager	June 2013
1.2	Additional information included in the 'Evidence Requirements for this Unit' section. Structure and content of 'Further mandatory information on Course coverage' section amended.	Qualifications Manager	June 2014