

# National Added Value Unit Specification



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**Unit title:** Mathematics Test (National 4)

**SCQF:** level 4 (6 SCQF credit points)

**Unit code:** to be advised

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## Unit outline

This is the Added Value Unit of the Mathematics (National 4) Course. The general aim of this Unit is to assess the skills developed within the Mathematics (National 4) Course. It will also assess the ability to perform numerical calculations without the aid of a calculator. Evidence for this Unit will be generated through successful achievement in 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 manipulation of abstract terms, simplification of expressions, evaluation of formulae, solving equations and analysing graphs. This will include the application of algebraic, geometric, trigonometric, statistical and reasoning skills. Numerical skills underpin all aspects of the Course.

Learners who complete this Unit will be able to:

- 1 Apply mathematical skills in straightforward contexts

This Unit is a mandatory Unit of the Mathematics (National 4) 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 assessment in this Unit is given in the *National Assessment Resource*.

## 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 Mathematics (National 4) 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*.

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# Standards

## Outcomes and assessment standards

### Outcome 1

The learner will:

#### 1 Apply mathematical skills in straightforward contexts by:

- 1.1 Using numeracy and statistics to determine solutions and analyse data without the use of a calculator
- 1.2 Using algebra, geometry and trigonometry in mathematical and real-life contexts
- 1.3 Using reasoning skills to solve problems

## Evidence Requirements for the Unit

This Added Value Unit is assessed internally by the teacher/lecturer.

All learners should be provided with a clear outline of the assessment, including when and how they will be assessed.

Evidence for this Unit will be generated through a test in which the learner will draw on, extend and apply skills developed in:

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

The test, which will assess a selection of knowledge and skills acquired in the Course, will offer opportunities to use skills in a wider scope of situations and sometimes in integrated ways. The knowledge and skills to be tested are selected from within the Course. The test will consist of two parts, in one of which a calculator may be used. Both parts of the test will be conducted under closed book conditions.

The first part will consist of short response questions, based on a selection of knowledge and skills developed in the Course, each of which require the use of number processes in contextualised situations.

The questions should be in an appropriate context and cover the following:

- ◆ use of whole number percentages
- ◆ calculation of the mean of a data set; the mean should require division of a whole number by a single-digit whole number and rounding of the answer to two decimal places
- ◆ calculating a non-unitary fraction of a quantity
- ◆ adding two decimal numbers and then subtracting from the result
- ◆ multiplying a decimal number by a whole number

One of these questions should require interpretation of the text and explanation of the result. In this part a calculator must not be used. The questions should be able to be completed in 20 minutes.

The second part will consist of short and extended response questions based on a selection of knowledge and skills developed in the Course.

The questions should be in an appropriate context and cover the following:

- ◆ solving a linear equation requiring simplification
- ◆ solving a problem using area or volume
- ◆ comparing data sets using calculation or determination of statistics
- ◆ creating and then using a formula
- ◆ using the relationship involving speed, distance and time, where the time is given or calculated as hours and minutes.
- ◆ use of Pythagoras' theorem in a problem
- ◆ use of trigonometry to calculate a side or angle of a right-angled triangle
- ◆ solving a problem involving shape and co-ordinates

In this part a calculator can be used. The questions should be able to be completed in 40 minutes.

Evidence is required that the candidate has passed both parts of the test.

Further information is provided in the exemplification of assessment in the *National Assessment Resource*. 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.

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## Further mandatory information on Course coverage for the Mathematics (National 4) Course

The following gives details of mandatory skills, knowledge and understanding for the Mathematics (National 4) 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

Assessment Standard	Explanation of Standard
1.1 Using numeracy and statistics to determine solutions without the use of a calculator	<ul style="list-style-type: none"> <li>◆ rounding solutions to a given number of decimal places</li> <li>◆ calculating whole number percentages of quantities (single-digit percentages, multiples of 10%, multiples of 20%, multiples of 25%, 50%)</li> <li>◆ calculation of the mean of a data set requiring rounding</li> <li>◆ calculating simple fractions of quantities</li> <li>◆ adding two decimal numbers (some with a differing number of decimal places) and then subtracting from the result</li> <li>◆ multiplying a decimal number by a single-digit whole number</li> </ul>
1.2 Using algebra, geometry and trigonometry in mathematical and real-life contexts	<ul style="list-style-type: none"> <li>◆ linear equations which require the use of the distributive law and simplification</li> <li>◆ problems using area (circle, parallelogram, kite, trapezium), surface area (prism) or volume (prism) (R)</li> <li>◆ creating and then using a formula (this can be from a numerical or diagrammatical sequence) (R)</li> <li>◆ calculations involving speed, distance and time, where the time is given or calculated as hours and minutes</li> <li>◆ using Pythagoras' theorem in problem situations (R)</li> <li>◆ using trigonometry to calculate a side or angle of a right-angled triangle</li> <li>◆ solving problems involving the completion of a described shape using co-ordinates spread over at least three quadrants (R)</li> </ul>
1.3 Using reasoning skills to solve problems	<ul style="list-style-type: none"> <li>◆ included in explanations marked (R) in 1.2</li> <li>◆ can be included in any part of 1.1</li> </ul>

## Section B: Mandatory content for Units

<b>Mathematics: Expressions and Formulae (National 4)</b>	
<b>Algebraic Outcome</b> <i>The learner will be able to use these algebraic skills and apply them in context.</i>	
<b>Assessment Standard</b>	<b>Explanation of Standard</b>
1.1 Using the distributive law in an expression with a numerical common factor to produce a sum of terms	$3(4x + 2)$ $5(a + 2c)$
1.2 Factorising a sum of terms with a numerical common factor	$7x - 21$ $21x - 9$
1.3 Simplifying an expression which has more than one variable	$3a + 4b - a + 6b$
1.4 Evaluating an expression or a formulae which has more than one variable	Evaluate linear expressions for given variables $4w + 6t - 3k$
1.5 Extending a straightforward number or diagrammatic pattern	4, 7, 10, 13, ... 4, 9, 16, 25, ... Fibonacci sequence Triangular numbers Patterns using regular or common shapes
1.6 Determining a formula from information or a diagrammatic pattern	From patterns in diagram format (eg posts and fence rails, tables and chairs)  Evaluate the formula for a given variable
<b>Geometric Outcome</b> <i>The learner will be able to use these geometric skills and apply them in context.</i>	
2.1 Calculating the circumference and area of a circle	Given radius or diameter
2.2 Calculating the area of a parallelogram, kite, trapezium	Composite shape of triangles
2.3 Investigating the surface of a prism	<ul style="list-style-type: none"> <li>◆ know face, vertex, edge</li> <li>◆ draw nets</li> <li>◆ calculate surface area</li> </ul>
2.4 Calculating the volume of a prism	Triangular prism, cylinder, other prisms given the area of the base
2.5 Investigating the gradient of a straight line	<ul style="list-style-type: none"> <li>◆ vertical distance over horizontal distance</li> <li>◆ positive and negative gradients</li> <li>◆ parallel lines have equal gradient</li> </ul>
2.6 Using rotational symmetry	With straightforward linear shapes

<b>Statistical Outcome</b>	
<i>The learner will be able to use these statistical skills and apply them in context.</i>	
3.1 Constructing a frequency table	Using ungrouped data
3.2 Determining statistics of a data set	<ul style="list-style-type: none"> <li>◆ mean</li> <li>◆ median</li> <li>◆ mode</li> <li>◆ range</li> </ul>
3.3 Interpreting calculated statistics	Using mean, median, mode, range to compare data sets
3.4 Representing data in a diagram	<ul style="list-style-type: none"> <li>◆ pie chart</li> <li>◆ bar graph</li> </ul>
3.5 Using probability	<ul style="list-style-type: none"> <li>◆ calculation of probability as straightforward ratio</li> <li>◆ interpret probability in the context of risk</li> </ul>
<b>Reasoning Outcome</b>	
<i>The learner will be able to use mathematical reasoning skills. (These Assessment Standards can be used in combination or separately.)</i>	
4.1 Interpreting a situation where mathematics can be used	Can be attached to any Assessment Standard in the other Outcomes to require analysis of a situation
4.2 Identifying a valid strategy	Can be attached to any other Assessment Standard in the other Outcomes to require problem solving skills
4.3 Explaining a solution and relating it to context	Can be attached to any other Assessment Standard to require explanation of the solution given

<b>Mathematics: Relationships (National 4)</b>	
<b>Algebraic Outcome</b>	
<i>The learner will be able to use these algebraic skills and apply them in context.</i>	
<b>Assessment Standard</b>	<b>Explanation of Standard</b>
1.1 Drawing and recognising a graph of a linear equation	<p>Draw using a table of values or chosen values of <math>x</math></p> <p>For <math>y = mx + c</math>, know the meaning of <math>m</math> and <math>c</math></p> <p>Recognise and use <math>y = a</math>, <math>x = b</math></p>
1.2 Solving linear equations	$ax + b = c$ $ax + b = cx + d$
1.3 Changing the subject of a formula	<p>Change the subject of the formulae to <math>x</math>:</p> <ul style="list-style-type: none"> <li>◆ <math>G = x + a</math></li> <li>◆ <math>T = x/c</math></li> <li>◆ <math>E = wx + k</math></li> </ul>

<b>Geometric Outcome</b> <i>The learner will be able to use these geometric skills and apply them in context.</i>	
2.1 Using Pythagoras' theorem	<ul style="list-style-type: none"> <li>◆ given measurements</li> <li>◆ given co-ordinates</li> </ul>
2.2 Using a scale factor to enlarge or reduce a shape	Linear, non-rectangular shape
2.3 Using properties of shapes and parallel lines	Triangles, quadrilaterals and circles Parallel lines and a transversal  Using: <ul style="list-style-type: none"> <li>◆ alternate and corresponding angles</li> <li>◆ vertically opposite angles</li> <li>◆ complementary and supplementary angles</li> <li>◆ sum of angles in triangles/quadrilaterals</li> <li>◆ angle in a semi-circle</li> <li>◆ relationship between tangent and radius</li> </ul>
<b>Trigonometric Outcome</b> <i>The learner will be able to use these trigonometric skills and apply them in context.</i>	
3.1 Calculating a side in a right-angled triangle	Given a side and an angle
3.2 Calculating an angle in a right-angled triangle	Given two sides
<b>Statistical Outcome</b> <i>The learner will be able to use these statistical skills and apply them in context.</i>	
4.1 Constructing a scattergraph	Given a set of data
4.2 Drawing and applying a best-fitting straight	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
<b>Reasoning Outcome</b> <i>The learner will be able to use mathematical reasoning skills. (These Assessment Standards can be used in combination or separately.)</i>	
5.1 Interpreting a situation where mathematics can be used	Can be attached to any Assessment Standard in the other Outcomes to require analysis of a situation
5.2 Identifying a valid strategy	Can be attached to any other Assessment Standard in the other Outcomes to require problem solving skills
5.3 Explaining a solution and relating it to context	Can be attached to any other Assessment Standard to require explanation of the solution given

<b>Numeracy (National 4)</b>	
<b>Numerical Outcome</b> <i>The learner will use numerical skills to solve given, straightforward real-life problems involving money/time/measurement</i>	
<b>Assessment Standard</b>	<b>Explanation of Standard</b>
1.1 Selecting and using appropriate numerical notation and units	<ul style="list-style-type: none"> <li>◆ Numerical notation should include: =, +, −, ×, /, ÷, &lt;, &gt;, ( ), %, colon and decimal point</li> <li>◆ Units should include: <ul style="list-style-type: none"> <li>— money (pounds and pence)</li> <li>— time (months, weeks, days, hours, minutes, seconds)</li> <li>— measurement of length (millimetre, centimetre, metre, kilometre, mile); weight (gram, kilogram); volume (millilitre, litre) and temperature (Celsius and Fahrenheit)</li> </ul> </li> </ul>
1.2 Selecting and carrying out calculations involving whole numbers, fractions, decimals, percentages, ratio and proportion	<ul style="list-style-type: none"> <li>◆ add and subtract whole numbers including negative numbers</li> <li>◆ multiply whole numbers of any size, with up to four-digit whole numbers</li> <li>◆ divide whole numbers of any size, by a whole number of up to two digits</li> <li>◆ find whole number remainders</li> <li>◆ round answers to the nearest significant figure or two decimal places</li> <li>◆ find simple percentages and fractions of shapes and quantities, eg 50%, 10%, 20% and 25%, 33<sup>1</sup>/<sub>3</sub>%; <sup>1</sup>/<sub>2</sub>, <sup>1</sup>/<sub>3</sub>, <sup>1</sup>/<sub>4</sub>, 1/10, 1/5</li> <li>◆ calculate percentage increase and decrease</li> <li>◆ convert equivalences between common fractions, decimals and percentages</li> <li>◆ calculate rate: eg miles per hour or number of texts per month</li> <li>◆ calculate distance given speed and time</li> <li>◆ calculate time intervals using the 12- and 24-hour clock</li> <li>◆ calculate volume (cube and cuboid), area (rectangle and square) and perimeter (shapes with straight lines)</li> <li>◆ calculate ratio and direct proportion</li> </ul>
1.3 Reading measurements using a straightforward scale on an instrument	<ul style="list-style-type: none"> <li>◆ use measuring instruments with straightforward scales to measure length, weight, volume and temperature</li> <li>◆ read scales to the nearest marked, unnumbered division with a functional degree of accuracy</li> </ul>

1.4 Interpreting the measurements and the results of calculations to make decisions	<ul style="list-style-type: none"> <li>◆ use appropriate checking methods, eg check sums and estimation</li> <li>◆ interpret results of measurements involving time, length, weight, volume and temperature</li> <li>◆ recognise the inter-relationship between units in the same family, eg mm/cm, cm/m, g/kg, and ml/l</li> <li>◆ use vocabulary associated with measurement to make comparisons for length, weight, volume and temperature</li> </ul>
1.5 Explaining decisions based on the results of calculations	<ul style="list-style-type: none"> <li>◆ give reasons for decisions based on the results of calculations</li> </ul>
<p><b>Graphical data Outcome</b>  <i>The learner will interpret graphical data and situations involving probability to solve given, straightforward real-life problems involving money/time/measurement.</i></p>	
2.1 Extracting and interpreting data from at least two different straightforward graphical forms	<p>Straightforward graphical forms should include:</p> <ul style="list-style-type: none"> <li>◆ a table with at least four categories of information</li> <li>◆ a chart where the values are given or where the scale is obvious, eg pie</li> <li>◆ a graph where the scale is obvious, eg bar, pie, scatter or line graph</li> <li>◆ a diagram, eg stem and leaf, map or plan</li> </ul>
2.2 Making and explaining decisions based on the interpretation of data from straightforward graphical forms	<ul style="list-style-type: none"> <li>◆ make decisions based on observations of patterns and trends in data</li> <li>◆ make decisions based on calculations involving data</li> <li>◆ make decisions based on reading scales in straightforward graphical forms</li> <li>◆ offer reasons for the decisions made based on the interpretation of data</li> </ul>
2.3 Making and explaining decisions based on probability	<ul style="list-style-type: none"> <li>◆ recognise patterns and trends and use these to state the probability of an event happening</li> <li>◆ make predictions and use these predictions to make decisions</li> </ul>

## Administrative information



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**Superclass:** to be advised

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### History of changes

Version	Description of change	Authorised by	Date

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