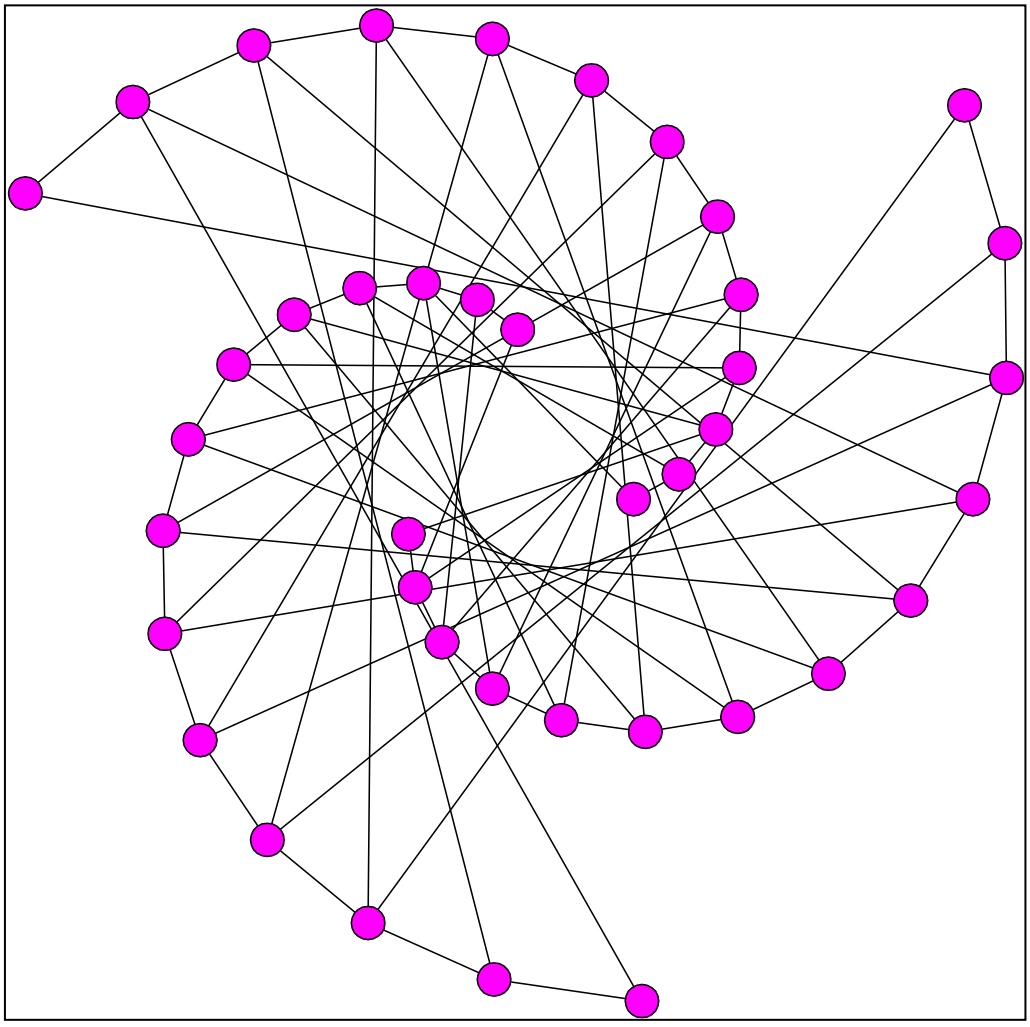
Course Support Notes

National 5 Mathematics Course Support Notes



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

Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 5 Mathematics Course. They are intended for teachers and lecturers who are delivering the Course and its Units. They should be read in conjunction with the *Course Specification*, the *Course Assessment Specification* and the Unit Specifications for the Units in the Course.

General guidance on the Course

Aims

Mathematics is important in everyday life, allowing us to make sense of the world around us and to manage our lives.

Using mathematics enables us to model real-life situations and make connections and informed predictions. It equips us with the skills we need to interpret and analyse information, simplify and solve problems, assess risk and make informed decisions.

The Course aims to:

- motivate and challenge learners by enabling them to select and apply mathematical techniques in a variety of mathematical and real-life situations
- develop confidence in the subject and a positive attitude towards further study in mathematics
- develop skills in manipulation of abstract terms in order to solve problems and to generalise
- allow learners to interpret, communicate and manage information in mathematical form, skills which are vital to scientific and technological research and development
- develop the learner's skills in using mathematical language and to explore mathematical ideas
- develop skills relevant to learning, life and work in an engaging and enjoyable way

Progression into this Course

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills and knowledge required by the following or by equivalent qualifications and/or experience:

- National 4 Mathematics Course

Experiences and outcomes
There is an expectation that learners have overtaken relevant experiences and outcomes.

Skills, knowledge and understanding covered in the Course

This section provides further advice and guidance about skills, knowledge and understanding that could be included in the Course.

Note: teachers and lecturers should refer to the *Course Assessment Specification* for mandatory information about the skills, knowledge and understanding to be covered in this Course.

The following mathematical skills are developed in each of the Course Units. An overview of the Units in which they are developed is shown in the table below:

Mathematical skills	Expressions and Formulae	Relationships	Applications
Use algebraic skills	✓	✓	
Use geometric skills	✓	✓	✓
Use trigonometric skills		✓	✓
Use statistical techniques			✓
Use numerical skills	✓	✓	✓
Interpret a situation which requires the use of mathematics and select an appropriate strategy	✓	✓	✓
Explain a solution and/or relate it to context	✓	✓	✓

The table in Appendix 1 details the skills, knowledge and understanding of the Course and provides some examples of the contexts in which the mathematical skills can be developed.

Progression from this Course

This Course or its Units may provide progression to:

- Higher Mathematics

Mathematics has applications in many subject areas, and skills developed in this Course could support progression in this and other curriculum areas. These skills can also support progression into Skills for Work Courses, National Progression Awards, National Certificate Group Awards, and employment.

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured sequence involving two or more SCQF levels.

It is important that any content in a Course and/or Unit at one particular SCQF level is not repeated if a learner progresses to the next level of the hierarchy. The skills and knowledge should be able to be applied to new content and contexts to enrich the learning experience. This is for centres to manage.

The National 5 Mathematics Course is in a hierarchy with the National 4 Mathematics Course and the Higher Mathematics Course.

National 4 Mathematics	National 5 Mathematics	Higher Mathematics
Expressions and Formulae	Expressions and Formulae	Expressions and Functions
Relationships	Relationships	Relationships and Calculus
Numeracy*	*Applications	Applications
Added Value Unit	Course Assessment	Course Assessment

This hierarchical structure provides progression, aims to provide a mechanism for fall back, and enables learners to be given recognition for their best achievement. For example, achievement of the component Units at Higher without the Course Assessment would provide fall back to the component Units at National 5. The learner would only need to complete the Course Assessment at National 5 to be given credit for the National 5 Course.

Achievement of the component Units at National 5 but not the Course assessment would provide the potential for fall back to Mathematics at National 4.

*The *Applications* Unit at SCQF level 5 by itself does not cover all the skills necessary to achieve the *Numeracy* Unit at National 4. Evidence of all the skills associated with Outcome 2 of the *Numeracy* Unit at SCQF level 4 is not covered by this, or the combination of all Units, in Mathematics at National 5. There are a number of ways of generating this evidence. SQA has provided further guidance on these additional Evidence Requirements for *Numeracy* Units at SCQF levels 4 and 5 which clarify the situation where they are being used in conjunction with the Mathematics Courses at National 4 and National 5. The learner would also need to complete the Added Value Unit to be given credit for the National 4 Course.

Approaches to learning and teaching

The purpose of this section is to provide general advice and guidance on approaches to learning and teaching across the Course.

The overall aim of the Course is to develop a range of mathematical operational and reasoning skills that can be used to solve mathematical and real-life problems. Approaches to learning and teaching should be engaging, with opportunities for personalisation and choice built in where possible.

A rich and supportive learning environment should be provided to enable a learner to achieve the best they can. This could include learning and teaching approaches such as:

- investigative or project-based tasks such as investigating the graphs of quadratic functions, perhaps using calculators or other technologies
- a mix of collaborative and independent tasks which engage learners, for example by encouraging learners to identify gradient and y-intercept values from various forms of the equation of a straight line
- using materials available from service providers and authorities, eg working with real-life plans and drawings, using trigonometric skills to calculate line lengths and angle sizes
- problem solving and critical thinking
- explaining thinking and presenting strategies and solutions to others. Learners may be provided with information which could be used to solve a problem, eg using simultaneous equations. Learners could then discuss their strategies in groups
- effective use of questioning and discussion to engage more learners in explaining their thinking and on testing their understanding of fundamental concepts
- making links across the curriculum to encourage transferability of skills, knowledge and understanding such as in science, technology, social subjects and health and wellbeing, eg liaison with physics on applications of appropriate formulae, such as $F = ma$, $v = u + at$, and $s = ut + \frac{1}{2}at^2$. There should be shared understanding across curriculum areas regarding approaches to changing the subject of a formulae
- using technology where appropriate and to extend experience and confidence

The development of mathematical skills is an active and productive process, building on learners' current knowledge, understanding and capabilities. Existing knowledge should form the starting point for any learning and teaching situation with new knowledge being linked to existing knowledge and built on. Presenting learners with an investigative or practical task is a useful way of allowing learners to appreciate how a new idea relates to their existing knowledge and understanding.

It is important that teachers always use learning and teaching approaches that engage learners, eg by offering choices and making the most of opportunities to set learning in a personal context.'

Questions could be used to ascertain a learner's level of understanding and provide a basis for consolidation or remediation where necessary. Examples of probing questions could include:

1 How did you decide what to do?
2 How did you approach exploring and solving this task or problem?
3 Could this task or problem have been solved in a different way? If yes, what would you have done differently?

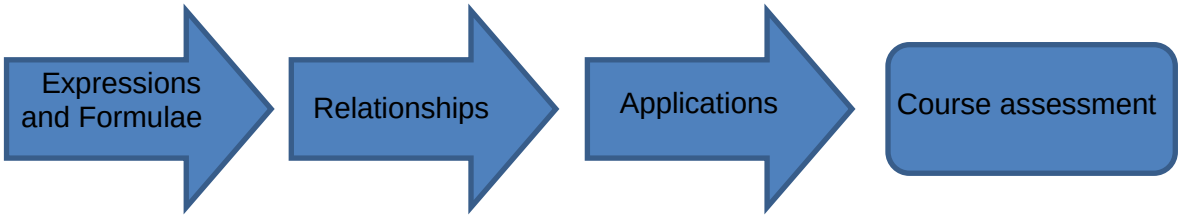
As learners develop concepts in mathematics, they will benefit from continual reinforcement and consolidation to build a foundation for progression.

Sequencing and integration of Units within the Course
Sequencing and integration of the delivery and assessment of the Units within the Course is at the discretion of the centre.

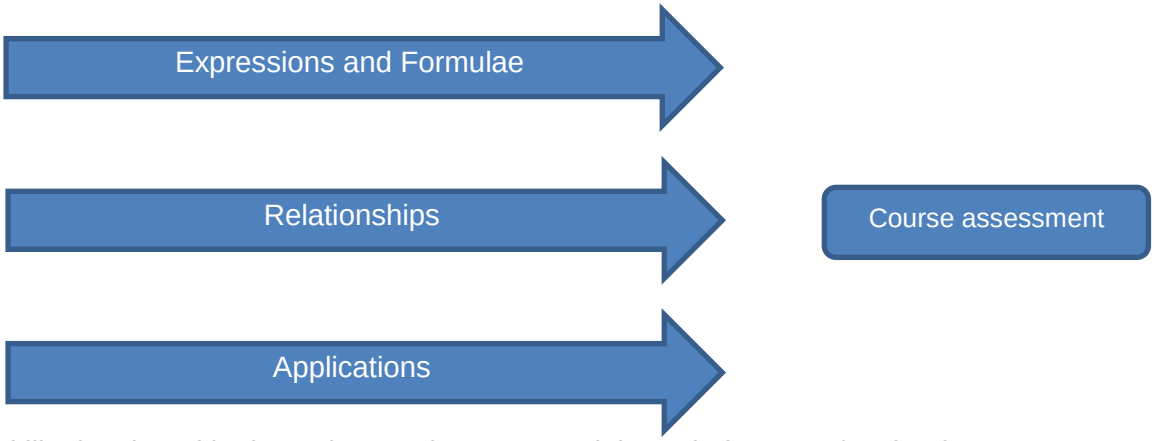
The models which follow exemplify possible approaches which may be adopted. Other combinations are also possible.

In these and other possible models of delivery, the development of numeracy skills should take place naturally in the learning and teaching of these Units. This should be recognised as contributing to the overall numeracy skills of the learner.

Model 1:
This model shows the possibility of delivering the *Expressions and Formulae* Unit, the *Relationships* Unit and the *Applications* Unit sequentially. This sequence would allow for the development of skills associated with expressions and formulae to be applied in relationships, both of which could then be applied and reinforced in the *Applications* Unit. Completion of all three Units would lead on to the Course assessment which draws on the skills, knowledge and understanding from across the Course.



Model 2:
This model shows the possibility of delivering all three Units — *Expressions and Formulae*, *Relationships* and *Applications* — concurrently. This approach would be suitable if learning and teaching is organised by grouping skills, for example, combining algebraic skills, combining geometric or trigonometric skills or combining statistical skills. This model has the potential of maximising the relevance and transferability of learning and teaching. Completion of all three Units leads to the Course assessment which draws on the skills, knowledge and understanding from across the Course.



Skills developed in the Units may be supported through the use of technology such as a calculator or other electronic means. The use of technology is particularly appropriate when this is a naturally occurring feature of the context in which learning is taking place.

Throughout learning and teaching, the ability to process numbers without using a calculator should also be encouraged and developed. Skills associated with mental calculations should be practised and applied wherever possible and appropriate. Learners should be encouraged to develop and improve their skills in completing both written and mental calculations in order to develop a degree of fluency and efficiency. The use of a calculator should complement development of these skills, not replace them.

Developing skills for learning, skills for life and skills for work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Course Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Course where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Course. The following skills for learning, skills for life and skills for work are developed in this Course:

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

It is suggested that opportunities for developing the above skills for learning, skills for life and skills for work are built into learning and teaching wherever possible.

During the delivery of the Course there will also be opportunities for learners to develop their literacy skills and employability skills.

Literacy skills are particularly important as these skills allow learners to access, engage in and understand their learning and to communicate their thoughts, ideas and opinions. This Course will provide learners with the opportunity to develop their literacy skills by analysing real-life contexts and communicating their thinking by presenting mathematical information in a variety of ways. This could include the use of numbers, formulae, diagrams, graphs, symbols and words.

Employability skills are the personal qualities, skills, knowledge, understanding, and attitudes required in changing economic environments. The mathematical operational and reasoning skills developed in this Course aim to enable learners to confidently respond to mathematical situations that can arise in the workplace. It aims to achieve this by providing learners with the opportunity to analyse a situation, decide which mathematical strategies to apply, work through those strategies effectively and make informed decisions based on the results.

Further guidance on the development of skills for life, skills for learning and skills for work can be found in the *Unit Support Notes*.

Approaches to assessment

General guidance on assessment
A wide variety of approaches can be used to assess learners and gather evidence in the National 5 Mathematics Course. The examples given here are not exhaustive.

Assessments must be valid, reliable and fit for purpose for the subject and the level, and should fit with the learning and teaching approaches adopted.

Each assessment should therefore:

- be designed to allow learners to produce evidence to show they have achieved the required skills, knowledge and understanding for the Unit or Outcomes being assessed
- allow consistent judgements to be made by all assessors
- be appropriate for the Outcomes and the Assessment Standards in the Unit

Combining assessment across Units
When the Units are delivered as part of a Course, the assessment of Units can be combined.

The pattern of combined assessment can mirror that for integrated delivery as suggested in models shown in the section on 'Approaches to learning and teaching'.

A combined approach to assessment has the advantage of:

- enriching the assessment process for both learners and teachers/lecturers by bringing together elements of different Units
- avoiding duplication of assessment
- making learning and assessment more coherent and relevant for learners

Suggested approaches to assessment
The skills-based focus of the Course readily lends itself to a variety of approaches to assessment.

The table on the next page gives some suggested approaches to assessment and examples of how they could be used to combine assessment across the Course.

Whatever assessment approach is used, teachers/lecturers are encouraged to ensure that they are in line with guidance provided in the 'Equality and inclusion' section of this document.

Further guidance on approaches to assessment and gathering evidence for the Units can be found in the *Unit Support Notes*.

Exemplification of assessment is provided in Unit assessment support.

Suggested assessment approach	An example of how this approach could be used across the Course
Projects or investigations	An investigation into the dimensions of a shape involving a right-angled triangle could combine the application of numerical (working with surds) and geometric (Pythagoras' theorem) standards from the Expressions and Formulae and Relationships Units. For example, investigating the dimensions of a television screen or working with space diagonals.
Problem solving tasks or activities	Problem solving tasks could be used to combine elements of linear algebra from the Relationships Unit with reasoning skills. For example, learners could be asked to solve contextualised problems requiring the use of linear equations to produce a solution algebraically. In addition, the learner could then be required to explain the meaning of the solution in everyday language.
Short/extended response tests	The use of short answer/extended response tests may be appropriate for the combined assessment of algebraic and numerical skills. Online or paper-based tests could be used, for example, to assess a learner's ability to work with percentages and fractions, to work with algebraic expressions, and to work with the graphs of trigonometric functions.

Gathering evidence
Evidence for assessment purposes could take a variety of forms such as:

- written evidence, including calculations and graphics generated during supervised class work or discrete mathematical tests
- oral evidence arising from discussion between learners and the teacher/lecturer which shows learner ability and understanding across the Assessment Standard
- computer-generated assessment records or printouts from simulations.
- photographs of project or investigative work
- a product which could be a spreadsheet or computer-generated graphic

This list is not exhaustive and other types of evidence are also possible.

Achievement is on a pass/fail basis for the Outcomes. Learners who fail to achieve all of the Assessment Standards within the Outcomes will only need to be re-assessed on those Assessment Standards not achieved. Re-assessment should only follow after further work or remediation has been undertaken. Centres may consider it appropriate to delay re-assessment until further learning has taken place. Opportunities may exist for this by building it into other tasks within or across Units.

Authentication
Assessment should be carried out under supervision.

For guidance on authentication of evidence which is gathered outwith the direct supervision of the teacher/lecturer responsible for the learner, eg outside the school or classroom, refer to SQA's *Guide to Assessment*.

Preparation for Course assessment

Each Course has additional time which may be used at the discretion of the teacher or lecturer to enable learners to prepare for Course assessment. This time may be used near the start of the Course and at various points throughout the Course for consolidation and support. It may also be used for preparation for Unit assessment, and towards the end of the Course, for further integration, revision and preparation and/or gathering evidence for Course assessment.

Information given in the *Course Specification* and the *Course Assessment Specification* about the assessment of added value is mandatory.

Courses from National 4 to Advanced Higher include assessment of added value. At National 5 the added value will be assessed in the Course assessment.

The *Course Assessment Specification* addresses the key purposes and aims of the Course as defined in the Course Rationale.

In this Course, the Course assessment will focus on breadth, challenge and application. The learner will draw on and extend the skills they have learned during the Course. This will be assessed through two question papers: one non-calculator and a second paper in which a calculator can be used. These question papers will offer opportunities to demonstrate the breadth and depth of knowledge and skills acquired from across the other Units.

In preparation for the Course assessment, it is recommended that learners are the given the opportunity to:

- analyse a range of real-life problems and situations involving mathematics
- select and adapt appropriate mathematical skills
- apply mathematical skills with and without the aid of a calculator
- determine solutions
- explain solutions and/or relate them to context
- present mathematical information appropriately

The question papers will assess a selection of knowledge and skills acquired in the Course and will provide opportunities to apply skills in a wide range of situations, some of which may be new to the learner.

Equality and inclusion

At all times, teachers/lecturers should use inclusive approaches to assessment, taking into account the needs and experiences of their learners.

If a learner has a disability affecting their engagement in learning or ability to generate evidence for the Course, centres could offer support.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres are aware of and understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the series of publications on Assessment Arrangements on SQA's website: www.sqa.org.uk/sqa//14977.html.

Appendix 1: Skills, knowledge and understanding with suggested learning and teaching contexts

The following table provides further advice and guidance about skills, knowledge and understanding within the Course.

The first column gives links to the skills contained within the Units.

The second column is the mandatory skills, knowledge and understanding given in the *Course Assessment Specification*. This includes a description of the Unit standard and the added value for Course assessment. In the list below, skills which confirm that learners can meet the minimum competence of the Assessment Standards for the Units are indicated by a diamond bullet point. Those skills marked by an arrow bullet point are beyond minimum competence for the Units, but are part of the added value for the Course assessment.

The third column gives suggested learning and teaching contexts to exemplify possible approaches to learning and teaching. These provide examples of where the different skills could be used in individual activities or pieces of work.

Mathematics (National 5) Expressions and Formulae (EF)		
Operational skills		
1.1 Applying numerical skills to simplify surds/expressions using the laws of indices		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Working with surds	♦ Simplification ➢ Rationalising denominators	Explore the properties of square roots. Exact values are an important method of communication in maths, science and technology.
Simplifying expressions using the laws of indices	♦ Multiplication and division using positive and negative indices including fractions ♦ Calculations using scientific notation ➢ $(ab)^m = a^m b^m$ ➢ $(a^m)^n = a^{mn}$ ➢ $a^{m/n} = \sqrt[n]{a^m}$	Introduce notation and why it is written that way, eg m s^{-1} Emphasise the relationship between fractional indices and surds. Use examples of scientific notation within science and technology. Where possible applying the laws in combination is desirable and this is essential preparation for Higher Maths.
1.2 Applying algebraic skills to manipulate expressions		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Working with algebraic expressions involving expansion of brackets	♦ $a(bx+c)+d(ex+f)$ ♦ $ax(bx+c)$ ♦ $(ax+b)(cx+d)$ ➢ $(ax+b)(cx^2+dx+e)$ where a, b, c, d, e, f are integers	Make connection with geometrical representations. Emphasise systematic approach to expansion of brackets. Learners should be encouraged to expand expressions of the form $(x-2)(x+3)(x+5)$ as this skill is important beyond National 5.
Factorising an algebraic expression	♦ Common factor ♦ Difference of squares $p^2x^2 - a^2$ ➢ Common factor with difference of squares ♦ Trinomials with unitary x^2 coefficient ➢ Trinomials with non-unitary x^2 coefficient	Explore algebraic and numerical uses of difference of squares. Use practical examples including calculation of areas. Emphasise that this is the inverse process to expanding brackets.

Completing the square in a quadratic expression with unitary x^2 coefficient		Connect features of graphs to equations of quadratic functions.
1.3 Applying algebraic skills to algebraic fractions		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Reducing an algebraic fraction to its simplest form	♦ a/b where a,b are of the form $(x+p)^n$ or $(x+p)(x+q)$ ➢ a/b where a,b are of the form $(mx+p)^n$ or $(mx+p)(nx+q)$	Link to factorisation. This could be extended to: Net resistance from two resistors in parallel: convert $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$ to $\frac{R_1R_2}{R_1+R_2}$
Applying one of the four operations to algebraic fractions	♦ $a/b*c/d$ where a, b, c, d can be simple constants or variables. ➢ $a/b*c/d$ where a, b, c, d can be constants, variables or expressions. *can be add, subtract, multiply or divide	
1.4 Applying geometric skills linked to the use of formulae		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Determining the gradient of a straight line, given two points	$m=\frac{y_2-y_1}{x_2-x_1}$	Deduce the formula from coordinate diagram. Link to equation of a straight line and line of best fit. Use context such as rates of change, steepness of slope. Discuss zero gradients when gradient is undefined. Parallel lines have equal gradients. Explore the full range of gradient values, eg by the rotation of a line fixed at the origin.
Calculating the length of arc or the area of a sector of a circle		Deduce formulae from practical approach emphasising fractions. Opportunities to use examples from designing, manufacturing and decorating.
Calculating the volume of a standard solid	♦ sphere, cone, pyramid	Use practical and investigative approaches to confirm formulae. Use combinations of solids including prisms. Opportunities to use examples from designing, manufacturing and packaging.

(Rounding to a given number of significant figures)		Consider effects of rounding and using rounding appropriately. Investigate contexts for different levels of accuracy and precision. Consider the effect of rounding an angle after calculating it using trigonometry. There is a precision limitation if it is rounded to the nearest degree especially as distance increases.
Reasoning skills		
2.1 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.	This should be a mathematical or real-life context problem in which some analysis is required. The learner should be required to choose an appropriate strategy and employ mathematics to the situation. Examples of context: home economics, health and wellbeing, finance (inflation and interest rates), science (energy consumption in the home or car), technology (manufacturing), modern studies (population, statistics)
2.2 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.	The learner should be required to give meaning to the determined solution in everyday language.

Mathematics (National 5) Relationships		
Operational skills		
1.1 Applying algebraic skills to linear equations		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Determining the equation of a straight line, given the gradient	♦ Use the formula $y-b=m(x-a)$ or equivalent to find the equation of a straight line, given one point and the gradient of the line ♦ Use functional notation $f(x)$ ♦ Identify gradient and y-intercept from $y=mx+c$ ➢ Identify gradient and y-intercept from various forms of the equation of a straight line	Use of graphing packages to investigate the equation of a straight line including parallel lines, lines with zero gradient and gradients that are undefined. Use a variety of contexts such as science, finance, commerce, experimental data, population statistics, life expectancy. Discuss importance of functional notation as an alternative mathematical language to Leibnitz notation.
Working with linear equations and inequations	♦ Coefficients are a member of $\mathbb{Z}$ ♦ Solutions are a member of $\mathbb{Q}$ ➢ Coefficients are a member of $\mathbb{Q}$	Real-life limitations should be considered for inequations, eg maximum safe load for a concrete beam of given cross section area
Working with simultaneous equations	♦ Construct from text ♦ Graphical solution ♦ Algebraic solution	Investigate real-life situations such as hiring a car, mobile phone charges, health and fitness. Intersection of paths of moving objects described by equations. Use of graphing packages is encouraged to enable more complex realistic contexts to be investigated.
Changing the subject of a formula	♦ Linear equation ➢ Equation involving a simple square or square root	Contexts using formulae from science, technology, health and wellbeing and finance. $s=ut+\frac{1}{2}at^2$ $E=\frac{1}{2}mv^2$ Further contexts could include situations involving more complex powers and roots, eg determine the radius of a sphere given its volume.

1.2 Applying algebraic skills to graphs of quadratic relationships		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Recognise and determine the equation of a quadratic function from its graph	♦ Equations of the form $y = kx^2$ and $y = (x+p)^2 + q$; $k, p, q \in \mathbb{Z}$ ➢ Also $y = k(x+p)^2 + q$ where $k \in \mathbb{Z}$	Use of graphics software may be beneficial
Sketching a quadratic function	♦ Equations of the form $y = (x-m)(x-n)$ and $y = (x+p)^2 + q$ ➢ Equations of the form $y = (ax-m)(bx-n)$ $y = k(x+p)^2 + q$ where k = 1 or -1 a, b, m, n, p, q are integers. Also $y = k(x+p)^2 + q$ where $k \in \mathbb{Z}$	Graphing packages can be used to investigate the graphs of quadratic functions including zooming in on non-integer solutions of roots.
Identifying features of a quadratic function	♦ Identify nature, coordinates of turning point and the equation of the axis of symmetry of a quadratic of the form $y = k(x+p)^2 + q$ where $k = 1$ or -1 and p, q are integers ➢ Also $y = k(x+p)^2 + q$ where $k \in \mathbb{Z}$	Examples of quadratic functions should include real-life contexts such as projectile motion.
1.3 Applying algebraic skills to quadratic equations		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Solving a quadratic equation which has been factorised	♦ Solving from factorised form ♦ Graphical treatment	Emphasis should be made of the connection between these aspects of quadratic equations. Factorised: $(2x+3)(x-5) = 0$ The solution of $2x^2 - 7x - 15 = 0$ is an integration of skills with

Solving a quadratic equation using the quadratic formula	♦ Solving using the quadratic formula	those of the Expressions and Formula Unit.
Using the discriminant to determine the number of roots	♦ Know and use the discriminant ♦ Determine the number or nature of roots	Use of correct terminology for nature of roots is to be encouraged: real and distinct roots, real and equal roots, and no real roots.
1.4 Applying geometric skills to lengths, angles and similarity		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Applying the Pythagoras' theorem	♦ Using Pythagoras' theorem in complex situations including converse and 3D	Link to three-dimensional coordinates. Contexts such as construction, engineering, home improvement, graphic design can be used. Distance between two points on a coordinate diagram, eg by using the Distance Formula.
Applying the properties of shapes to determine an angle involving at least two steps	♦ Quadrilaterals/triangles/polygons/ circles ➢ Relationship in a circle between the centre, chord and perpendicular bisector	Use of geometry software packages may be beneficial.
Using similarity	♦ Interrelationship of scale — length, area and volume	Link to surds and indices (eg volume to length or length to volume). It is important to develop confidence in handling the closely related ideas of similarity, proportion and ratio. There are many example areas, dilutions and reactions in chemistry, recipe scaling, and power supply, but here the emphasis is on geometric cases, scale plans and engineering diagrams; angles stay the same, distances scale in simple proportion, areas in square proportion, volumes in cubic proportion. Real-life contexts and problem solving approaches such as cost in proportion to volume could be used.
1.5 Applying trigonometric skills to graphs and identities		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Working with the graphs of trigonometric functions	♦ Basic graphs ♦ Amplitude	Use of graphing software packages is encouraged where possible. Real-life contexts should be used including applications in wave

	♦ Vertical translation ♦ Multiple angle ➢ Phase angle	theory. Introduce the quadrant diagram linked to graphs as a possible method of finding further solutions to trigonometric equations. Use the graphs of sine/cosine to increase understanding and use symmetry in these graphs to find further solutions. Consider including software displays involving addition (superposition/interference) of two waves (eg same wavelength, different phase or same phase at origin, slightly different wavelengths).
Working with trigonometric relationships in degrees	♦ Sine, cosine and tangent of angles 0°– 360° ♦ Period ♦ Related angles ♦ Solve basic equations ➢ Identities $\cos^2 x + \sin^2 x = 1$, $\tan x = \frac{\sin x}{\cos x}$	
Reasoning skills		
2.1 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.	This should be a mathematical or real-life context problem in which some analysis is required. The learner should be required to choose an appropriate strategy and employ mathematics to the situation.
2.2 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.	The learner should be required to give meaning to the determined solution in everyday language.

Mathematics (National 5) Applications		
Operational Skills		
1.1 Applying trigonometric skills to triangles which do not have a right angle		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Calculating the area of a triangle using trigonometry	♦ Area = $\frac{1}{2}ab\sin C$	Real-life contexts should be used, such as in navigation and manufacturing.
Using the sine and cosine rules to find a side or angle	♦ Sine rule for side or angle ♦ Cosine rule for side ♦ Cosine rule for angle	
Using bearings with trigonometry	♦ To find a distance or direction	

1.2 Applying geometric skills to vectors		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Working with 2D vectors	♦ Adding or subtracting two-dimensional vectors using directed line segments	Real-life contexts should be used such as: ♦ combination of forces ♦ crossing a stream in a boat ♦ collision of two snooker balls
Working with 3D coordinates	♦ Determining coordinates of a point from a diagram representing a 3D object	
Using vector components	♦ Adding or subtracting two- or three-dimensional vectors using components	
Calculating the magnitude of a vector	♦ Magnitude of a two or three dimensional vector	
1.3 Applying numerical skills to fractions and percentages		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Working with reverse percentages	♦ Use reverse percentages to calculate an original quantity	Use contexts such as finance, modern studies, demographics, science and technology. Health and wellbeing data such as BMI. Given price including VAT, calculate price excluding VAT.
Working with appreciation/depreciation	♦ Appreciation including compound interest ♦ Depreciation	
Working with fractions	♦ Operations and combinations of operations on fractions including mixed numbers ♦ (Addition, subtraction, multiplication, division)	Links to probability, percentages and indices. Use contexts in geometric problems such as fraction of a circle, volume of a cone. Use in finance, science and technology.

1.4 Applying statistical skills to analysing data		
Sub-skills	**Description of Unit standard and added value**	**Suggested learning and teaching contexts**
Comparing data sets using statistics	Compare data sets using calculated/determined: ♦ semi-interquartile range ♦ standard deviation	Use a variety of contexts such as those drawn from science, health and wellbeing, environmental studies, geography, modern studies, economics, current affairs, factory production, failure in use data for automotive components, quality assurance, medical statistics, crime rates, government statistical data (food data/climate data/class data).
Forming a linear model from a given set of data	♦ Determine the equation of a best-fitting straight line on a scattergraph and use it to estimate y given x	Have a supply of examples of real experimental data where a linear model is approximately valid but the data has limited precision. An extension of this could be to use transposition to estimate x given y.
Reasoning skills		
2.1 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	This should be a mathematical or real-life context problem in which some analysis is required. The learner should be required to choose an appropriate strategy and employ mathematics to the situation.
2.2 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	The learner should be required to give meaning to the determined solution in everyday language.

Appendix 2: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications are available on SQA's website at: www.sqa.org.uk/sqa//14977.html.
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment (June 2008)*
- Principles and practice papers for curriculum areas
- *SCQF Handbook: User Guide* (published 2009) and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*

Administrative information

Published: May 2016 (version 1.2)

History of changes to Course Support Notes

Version	Description of change	Authorised by	Date
1.1	Appendix 1: A small number of additions to suggested learning and teaching contexts. Minor amends in first two columns to ensure consistency of wording with *Course Assessment Specification*. Assessment Standards numbered to assist with referencing.	Qualifications Manager	May 2014
1.2	Appendix 1 — Relationships Assessment Standard 1.3 split into the three sub-skills from the Unit Specification; Applications Assessment Standard 1.2 split into the four sub-skills from the Unit Specification; Applications Assessment Standard 1.3 split into the three sub-skills from the Unit Specification.	Qualifications Manager	May 2016

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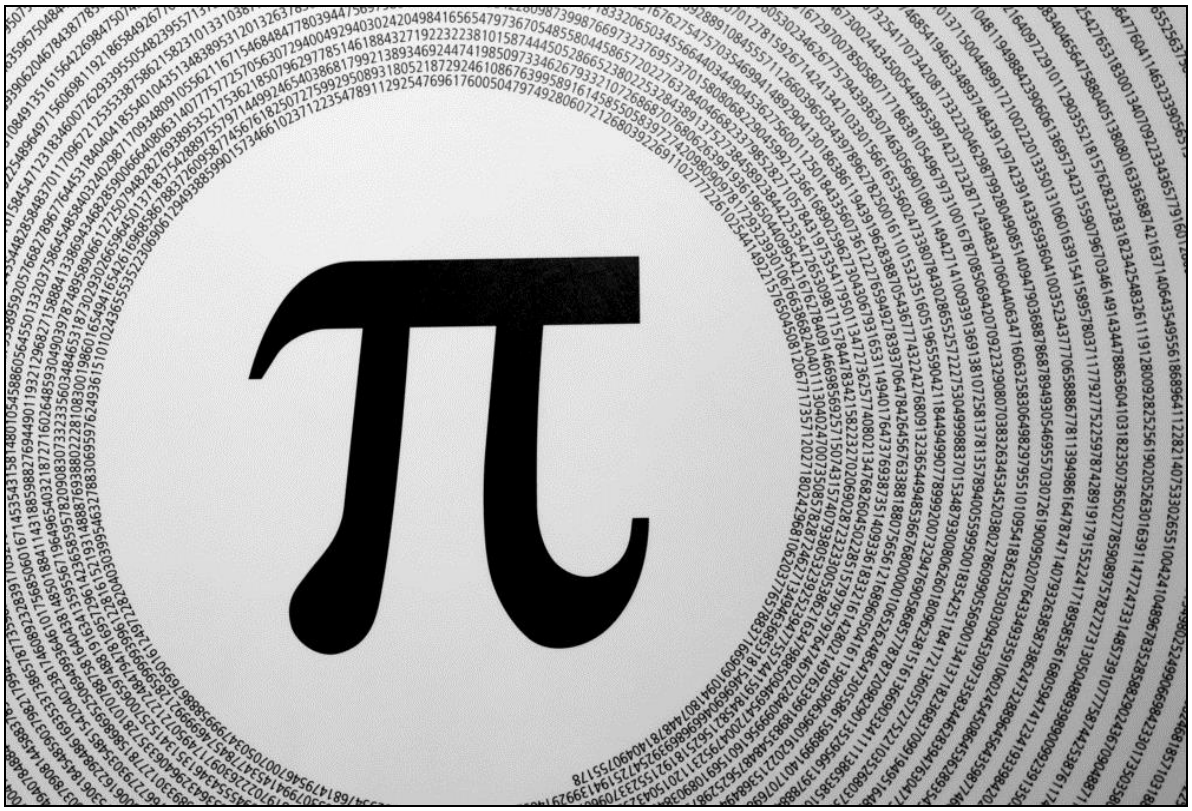
Unit Support Notes

Unit Support Notes — Mathematics: Expressions and Formulae (National 5)



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

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Expressions and Formulae* (National 5) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the Unit Specification
- the Course Specification
- the Course Assessment Specification
- the Course Support Notes
- appropriate assessment support materials

General guidance on the Unit

Aims

The *Expressions and Formulae* (National 5) Unit is a mandatory Unit in the National 5 Mathematics Course. The *Expressions and Formulae* Unit is also available as a free-standing Unit and is designed to meet the needs of a broad range of learners who may choose to study it.

The general aim of this Unit is to develop skills linked to mathematical expressions and formulae. These include the manipulation of abstract terms, the simplification of expressions and the evaluation of formulae. The Outcomes cover aspects of number, algebra, geometry and reasoning.

Progression into this Unit

Entry into 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:

- Mathematics (National 4) Course or its component Units

Prior learning, life and work experiences may also provide an appropriate basis for entry into this Unit. This could include relevant skills, knowledge and understanding and appropriate experiences and outcomes from the Mathematics Curriculum Area.

Centres wishing to establish the suitability of learners without prior qualifications and/or experiences and outcomes may benefit from carrying out a diagnostic review of prior life and work experiences. This approach may be particularly useful for adults returning to education.

Skills, knowledge and understanding covered in the Unit

Information about skills, knowledge and understanding is given in the National 5 Mathematics *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other Units within National 5 Mathematics

Mathematics has applications in many subject areas, and skills developed in this Unit could support progression in this and other curriculum areas. These skills can also support progression into Skills for Work Courses, National Progression Awards, National Certificate Group Awards, and employment.

Approaches to learning and teaching

The purpose of this section is to provide advice and guidance on the sequencing and integration of approaches to learning and teaching for this Unit.

Sequencing
The skills linked to the *Expressions and Formulae* Unit can be delivered sequentially or concurrently. Teachers/lecturers can choose to deliver these in any order. There is no specific amount of time allocated to each. This will often depend on the needs of the learners.

Integration
Combining skills within Units
Outcomes could be integrated by combining the reasoning skills Outcome with any of the skills developed in Outcome 1.

- Expressions could be derived from a mathematical problem before simplification.
- Compound solids could be broken down into simple solids to enable an area to be calculated. This could be enclosed in a design problem.
- Deriving an algebraic fraction from a mathematical situation before simplifying.
- Accuracy in rounding a calculation could be required to be appropriate to the given situation

Combining skills across Units
For centres delivering this Unit as part of the (Mathematics National 5) Course, Outcomes of this Unit may be integrated with Outcomes in the other Units.

- Expressions of this Unit could be combined with equations in the Relationships Unit.
- Gradient of this Unit could be combined with the equation of a straight line in the Relationships Unit.
- Indices of this Unit could be combined with fractions in the Applications Unit.
- Completing the square of this Unit could be combined with sketching a quadratic function in the Relationships Unit.

The National 5 Mathematics *Course Support Notes* provide further advice and guidance on approaches to learning and teaching which apply to all component Units of the Course.

Developing skills for learning, skills for life and skills for work

For this Unit there are significant opportunities to develop the following skills for learning, skills for life and skills for work. Examples of some of these opportunities are described in the table below:

SQA skills for learning, skills for life and skills for work framework definition	Suggested approaches for learning and teaching
Numeracy is the ability to use numbers to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results.	Learners have the opportunity to develop their numerical skills throughout the Unit. For example, by using number to solve mathematical problems involving surds and simplifying expressions using the laws of indices and rounding to a given number of significant figures.
Applying is the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.	Learners have the opportunity to develop their ability to apply skills across the Unit. This could be done by encouraging learners to think about how they are going to tackle given mathematical problems, decide which skills to use and then carry out the processes and/or calculations to complete the task. At National 5, learners could be encouraged to think creatively to adapt strategies to suit the given problem or situation. Learners should be encouraged to show and explain their thinking where appropriate.
Analysing and evaluating This covers the ability to identify and weigh-up the features of a situation or issue and to use your judgement of them in coming to a conclusion. It includes reviewing and considering any potential solutions.	Learners have the opportunity to develop their ability to analyse and evaluate. For example, learners could be encouraged to identify real-life tasks or situations which require the use of mathematics, analyse the situation to decide how it can be tackled and decide what mathematical skills would need to be applied. Learners could also be provided with opportunities to interpret the results of calculations to draw conclusions. These conclusions could be evaluated and used to form the basis of any reasoning to support choices or decisions. Where the opportunity arises, learners could be given the chance to identify and analyse situations involving mathematics which are of personal interest to themselves.

There may also be further opportunities for the development of additional skills for learning, skills for life and skills for work in the delivery of this Unit. These opportunities may vary and are at the discretion of the centre.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice and guidance on approaches to integrating assessment within this Unit.

The *Expressions and Formulae* Unit can be assessed in a variety of ways and could include for example:

- a project or investigation
- problem solving tasks or activities
- short/extended response tests

These approaches are not exhaustive and other possibilities also exist.

The following table gives some examples of how these approaches could be used within the Unit to provide a varied and integrated assessment experience. This approach aims to make the assessment process more coherent and meaningful for learners.

The sequencing and integration of assessment for this Unit could also mirror the models described in the section on 'Approaches to learning and teaching'.

Approach to assessment	Examples of approaches to assessment
Project/ investigation	Learners could be given a project or investigation This could include, for example, an investigation on gradient, exploring positive, negative, zero, fractional values and their graphical representations and possibly connections. The learner could produce a summary of findings.
Problem solving tasks or activities	Learners could be given a discrete task or activity.. This could include, for example, an activity which involves area or volume with perhaps use of surds or rounding. This could be in a context requiring analysis of the problem.
Short/extended response test	Learners could be given a short answer or extended response test. This could include, for example, a test which involves working with surds, simplifying expressions and rounding to a given number of significant figures. It could also require the learner to demonstrate their numerical skills while working with and factorising algebraic expressions, completing the square and reducing an algebraic fraction to its simplest form. This type of assessment could also be used to assess a learner's ability to apply mathematics without the aid of a calculator in preparation for the Course assessment.

It would normally be expected that considerable learning and teaching would have taken place prior to the collection of evidence for assessment purposes.

Further advice and guidance on assessment for the Mathematics Course and its components Units is contained within the *Course Support Notes.*

Exemplification of assessment is provided in Unit assessment support.

When delivering this Unit as part of the National 5 Mathematics Course, reference should be made to the appropriate content statements within the 'Further mandatory information on Course coverage' section in the *Course Assessment Specification*.

Equality and inclusion

Information about equality and inclusion issues related to this and other Units in Mathematics is given in the National 5 Mathematics *Course Support Notes*.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: May 2014 (version 1.0)

History of changes to Unit Support Notes

Version	Description of change	Authorised by	Date

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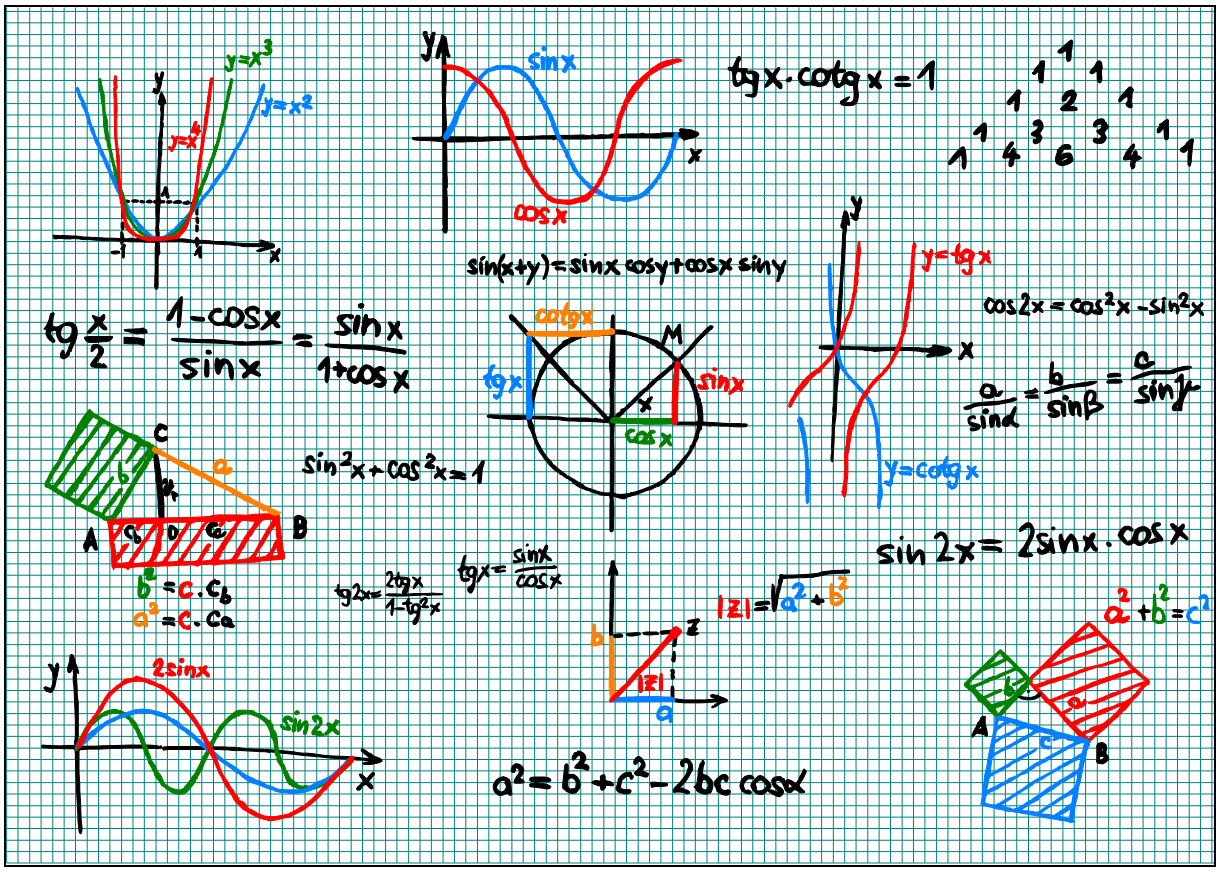
Unit Support Notes

Unit Support Notes — Mathematics: Relationships (National 5)



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

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Relationships* (National 5) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the Unit Specification
- the Course Specification
- the Course Assessment Specification
- the Course Support Notes
- appropriate assessment support materials

General guidance on the Unit

Aims

The *Relationships* (National 5) Unit is a mandatory Unit in the National 5 Mathematics Course. The *Relationships* Unit is also available as a free-standing Unit and is designed to meet the needs of a broad range of learners who may choose to study it.

The general aim of this Unit is to develop skills linked to mathematical relationships. These include solving and manipulating equations, working with graphs and carrying out calculations on the lengths and angles of shapes. The Outcomes cover aspects of algebra, geometry, trigonometry and reasoning.

Progression into this Unit

Entry into 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 4 Mathematics Course or its component Units

Prior learning, life and work experiences may also provide an appropriate basis for entry into this Unit. This could include relevant skills, knowledge and understanding and appropriate experiences and outcomes from the mathematics curriculum area.

Centres wishing to establish the suitability of learners without prior qualifications and/or experiences and outcomes may benefit from carrying out a diagnostic review of prior life and work experiences. This approach may be particularly useful for adults returning to education.

Skills, knowledge and understanding covered in the Unit

Information about skills, knowledge and understanding is given in the National 5 Mathematics *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other Units within National 5 Mathematics

Mathematics has applications in many subject areas, and skills developed in this Unit could support progression in this and other curriculum areas. These skills can also support progression into Skills for Work Courses, National Progression Awards, National Certificate Group Awards, and employment.

Approaches to learning and teaching

The purpose of this section is to provide advice and guidance on sequencing and integration of approaches to learning and teaching for this Unit.

Sequencing
The skills linked to the *Relationships* Unit can be delivered sequentially or concurrently. Teachers/lecturers can choose to deliver these in any order. There is no specific amount of time allocated to each. This will often depend on the needs of the learners.

Integration

Combining skills within the Unit
Outcomes could be integrated by combining the reasoning skills Outcome with any of the other Outcomes.

- Simultaneous equations could be derived from a mathematical problem before solution.
- A quadratic equation and graph could be used in a context-based problem.
- A problem could be set in a real-life context which involves the use of Pythagoras' theorem.
- A problem could be set in a real-life context which involves the use of similarity.

Combining skills across Units
For centres delivering this Unit as part of the (Mathematics National 5) Course, Outcomes of this Unit may be integrated with Outcomes in the other Units.

- Equations of this Unit could be combined with expressions in Outcome 1 of the *Expressions and* Formulae Unit.
- The equation of a straight line of this Unit could be combined with gradient in the *Expressions and Formulae* Unit.
- Sketching a quadratic function of this Unit could be combined with completing the square in the *Expressions and Formulae* Unit.
- Related angles of this Unit could be combined with sine and cosine rules in the *Applications* Unit.

The National 5 Mathematics *Course Support Notes* provide further advice and guidance on approaches to learning and teaching which are relevant to all component Units of the Course.

Developing skills for learning, skills for life and skills for work

For this Unit there are significant opportunities to develop the following skills for learning, skills for life and skills for work; some of these opportunities are described in the table below:

SQA skills for learning, skills for life and skills for work framework definition	**Suggested approaches for learning and teaching**
Numeracy is the ability to use numbers to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results.	Throughout this Unit learners will have ample opportunities to use number to solve contextualised problems involving STEM-based subjects (science, technology, engineering and mathematics). As the level of detail and size of number in the calculations increases, it will become increasingly important that learners are able to use both graphing and scientific calculators with confidence. Learners should be encouraged as much as possible to manage problems, tasks and case studies involving numeracy by analysing the context, carrying out calculations, drawing conclusions, making deductions and informed decisions.
Applying is the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.	Wherever possible, learners should be given the opportunity to apply the skills, knowledge and understanding they have developed to solve mathematical problems in a range of real-life contexts. Learners should be encouraged to think about how they are going to tackle problems or situations, decide which skills to use and then carry out the calculations necessary to complete the task, for example solving a quadratic equation. To determine a learner's level of understanding, learners should be encouraged to show and explain their thinking. At National 5, learners could be encouraged to think creatively to adapt strategies to suit the given problem or situation.
Analysing and evaluating This covers the ability to identify and weigh-up the features of a situation or issue and to use your judgement of them in coming to a conclusion. It includes reviewing and considering any potential solutions.	Wherever possible, learners should be given the opportunity to identify real-life tasks or situations which require the use of mathematics. Learners should be encouraged to analyse the task, situation or case to decide how it can be addressed and what mathematical skills will need to be applied. Learners should also be provided with opportunities to interpret the results of their calculations and to draw conclusions. Conclusions drawn by the learner could be used to form the basis of making choices or decisions for example, analysing a situation involving the use of linear or simultaneous equations. Where

	the opportunity arises, learners could be given the chance to identify and analyse situations involving mathematics which are of personal interest to themselves.

There may also be further opportunities for the development of additional skills for learning, skills for life and skills for work in the delivery of this Unit. These opportunities may vary and are at the discretion of the centre.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice and guidance on approaches to integrating assessment within this Unit.

The *Relationships* Unit can be assessed in a variety of ways and could include for example:

- a project or investigation
- problem solving tasks or activities
- short/extended response tests

These approaches are not exhaustive and other possibilities also exist.

The following table gives some examples of how these approaches could be used within the Unit to provide a varied and integrated assessment experience. This approach aims to make the assessment more coherent and meaningful for learners.

The sequencing and integration of assessment for this Unit could also mirror the models described in the section on 'Approaches to learning and teaching'.

Approach to assessment	**Examples of approaches to assessment**
Project/ investigation	Learners could be given a mathematical project involving related trigonometric functions.
Problem solving tasks or activities	Learners could be asked to apply their knowledge of quadratics in a task or activity to explore graphs of quadratic functions, determining their turning points from different forms of their equation.
Short/extended response test	Learners could be given a test which includes short response and extended response questions. This may include solving linear and quadratic equations. Extended response questions may allow assessment of reasoning by posing a problem or requiring interpretation of a solution.

It would normally be expected that considerable learning and teaching would have taken place prior to the collection of evidence for assessment purposes.

Further advice and guidance on assessment for the Mathematics Course and its components Units is contained within the *Course Support Notes.*

Exemplification of assessment is provided in Unit assessment support.

When delivering this Unit as part of the National 5 Mathematics Course, reference should be made to the appropriate content statements within the 'Further mandatory information on Course coverage' section in the *Course Assessment Specification*.

Equality and inclusion

Information about equality and inclusion issues related to this and other Units in Mathematics is given in the National 5 Mathematics Course Support Notes.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment (June 2008)*
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: May 2014 (version 1.0)

History of changes to Unit Support Notes

Version	Description of change	Authorised by	Date

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Unit Support Notes

Unit Support Notes — Mathematics: Applications (National 5)

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Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Applications* (National 5) Unit. They are intended for teachers and lecturers who are delivering the Unit. They should be read in conjunction with:

- the Unit Specification
- the Course Specification
- the Course Assessment Specification
- the Course Support Notes
- appropriate assessment support materials

General guidance on the Unit

Aims

The *Applications* (National 5) Unit is a mandatory Unit in the National 5 Mathematics Course. The *Applications* Unit is also available as a free-standing Unit and is designed to meet the needs of a broad range of learners who may choose to study it.

The general aim of this Unit is to develop skills linked to applications of mathematics. These include using trigonometry, geometry, number processes and statistics within real-life contexts. The Outcomes cover aspects of these skills and also skills in reasoning.

Progression into this Unit

Entry into 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 4 Mathematics Course or its component Units

Prior learning, life and work experiences may also provide an appropriate basis for entry into this Unit. This could include relevant skills, knowledge and understanding and appropriate experiences and outcomes from the mathematics curriculum area.

Centres wishing to establish the suitability of learners without prior qualifications and/or experiences and outcomes may benefit from carrying out a diagnostic review of prior life and work experiences. This approach may be particularly useful for adults returning to education.

Skills, knowledge and understanding covered in the Unit

Information about skills, knowledge and understanding is given in the National 5 Mathematics Course Support Notes.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other Units within National 5 Mathematics

Mathematics has applications in many subject areas, and skills developed in this Unit could support progression in this and other curriculum areas. These skills can also support progression into Skills for Work Courses, National Progression Awards, National Certificate Group Awards, and employment.

Approaches to learning and teaching

The purpose of this section is to provide general advice and guidance on sequencing and integration of approaches to learning and teaching for this Unit.

Sequencing
The skills linked to the *Applications* Unit can be delivered sequentially or concurrently. Teachers/lecturers can choose to deliver these in any order. There is no specific amount of time allocated to each. This will often depend on the needs of the learners.

Integration

Combining skills within the Unit
Outcomes could be integrated by combining the reasoning skills Outcome with any of the other Outcomes.

- Sine and cosine rules in a problem situation involving bearings. Vectors could be used in a context-based problem.
- A problem could be set in a scientific context which involves the use of line of best fit.

Combining skills across Units
For centres delivering this Unit as part of the National 5 Mathematics Course, Outcomes of this Unit may be integrated with Outcomes in the other Units.

- Vectors of this Unit could be combined with Pythagoras' theorem of the *Relationships* Unit for vectors at right angles.
- Area of a triangle of this Unit could be combined with area of sector of *Expressions and Formulae.*
- Sine and cosine rules of this Unit could be combined with related angles of the *Relationships* Unit.

The National 5 Mathematics Course *Support Notes* provide advice and guidance on approaches to learning and teaching which apply to all component Units of the Course.

Developing skills for learning, skills for life and skills for work

For this Unit there are significant opportunities to develop the following skills for learning, skills for life and skills for work; some of these opportunities are described in the table below:

SQA skills for learning, skills for life and skills for work framework definition	**Suggested approaches for learning and teaching**
Numeracy is the ability to use numbers to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results.	Throughout this Unit learners will have ample opportunities to use number to solve contextualised problems involving STEM-based subjects (science, technology, engineering and mathematics). As the level of detail and size of number in the calculations increases, it will become increasingly important that learners are able to use both graphing and scientific calculators with confidence. Learners should be encouraged as much as possible to manage problems, tasks and case studies involving numeracy by analysing the context, carrying out calculations, drawing conclusions, making deductions and informed decisions.
Applying is the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.	Wherever possible, learners should be given the opportunity to apply the skills, knowledge and understanding they have developed to solve mathematical problems in a range of real-life contexts. Learners should be encouraged to think about how they are going to tackle problems or situations, decide which skills to use and then carry out the calculations necessary to complete the task, for example using the sine rule. To determine a learner's level of understanding, learners should be encouraged to show and explain their thinking. At National 5, learners could be encouraged to think creatively to adapt strategies to suit the given problem or situation.
Analysing and evaluating This covers the ability to identify and weigh-up the features of a situation or issue and to use your judgement of them in coming to a conclusion. It includes reviewing and considering any potential solutions.	Wherever possible, learners should be given the opportunity to identify real-life tasks or situations which require the use of mathematics. Learners should be encouraged to analyse the task, situation or case to decide how it can be addressed and what mathematical skills will need to be applied. Learners should also be provided with opportunities to interpret the results of their calculations and to draw conclusions. Conclusions drawn by the learner could be used to form the basis of making choices or decisions, for example, by analysing a situation involving the use of bearings and trigonometry. Where the opportunity arises, learners could be given the chance to identify and analyse situations involving mathematics which are of personal interest to themselves.

There may also be further opportunities for the development of additional skills for learning, skills for life and skills for work in the delivery of this Unit. These opportunities may vary and are at the discretion of the centre.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice and guidance on approaches to integrating assessment within this Unit.

The *Applications* Unit can be assessed in a variety of ways and could include for example:

- a project or investigation
- problem solving tasks or activities
- short/extended response tests

These approaches are not exhaustive and other possibilities also exist.

The following table gives some examples of how these approaches could be used within the Unit to provide a varied and integrated assessment experience. This approach aims to make the assessment more coherent and meaningful for learners.

The sequencing and integration of assessment for this Unit could also mirror the models described in the section on 'Approaches to learning and teaching'.

Approach to assessment	**Examples of approaches to assessment**
Project/ investigation	Learners could be given a mathematical project involving compound interest or depreciation.
Problem solving tasks or activities	Learners could be asked to apply their knowledge of trigonometry to problems of navigation.
Short/extended response test	Learners could be given a test which includes short response and perhaps extended response questions. This may include addition and subtraction of vectors or working with fractions. Extended response questions may allow assessment of reasoning by posing a problem or requiring interpretation of a solution.

It would normally be expected that considerable learning and teaching would have taken place prior to the collection of evidence for assessment purposes.

Further advice and guidance on assessment for the Mathematics Course and its components Units is contained within the *Course Support Notes.*

Exemplification of assessment is provided in Unit assessment support.

When delivering this Unit as part of the National 5 Mathematics Course, reference should be made to the appropriate content statements within the 'Further mandatory information on Course coverage' section in the *Course Assessment Specification*.

Equality and inclusion

Information about equality and inclusion issues related to this and other Units in Mathematics is given in the National 5 Mathematics *Course Support Notes*.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment (June 2008)*
- Principles and practice papers for curriculum areas
- Research Report 4 — Less is More: Good Practice in Reducing Assessment Time
- Coursework Authenticity — a Guide for Teachers and Lecturers
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

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History of changes to Unit Support Notes

Version	Description of change	Authorised by	Date

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