

National 4 Applications of Mathematics Course Support Notes



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

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Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 4 Applications of 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 *Added Value Unit Specification*, and the Unit Specifications for the Units in the Course.

The National 4 Applications of Mathematics Course has been benchmarked against the Scottish Credit and Qualifications Framework (SCQF) at level 4. The Course is made up of three mandatory Units and an Added Value Unit.

Mandatory Units

Managing Finance and Statistics (National 4)	(6 SCQF credit points)
Geometry and Measures (National 4)	(6 SCQF credit points)
Numeracy (National 4) ¹	(6 SCQF credit points)
Applications of Mathematics Test (National 4) points)	(6 SCQF credit points)

¹ The Numeracy (National 4) *Unit Support Notes* are published separately.

General guidance on the Course

Aims

The purpose of the National 4 Applications of Mathematics Course is to motivate and challenge learners by enabling them to think through real-life situations involving mathematics and to form a plan of action based on logic.

The Course develops confidence in being able to handle mathematical processes and information in a range of real-life contexts. The Course also enables learners to make informed decisions based on data presented in a variety of forms.

The mathematical skills within this Course are underpinned by numeracy and are designed to develop learners' skills in mathematical reasoning relevant to learning, life and work.

The Course aims to:

- ◆ motivate and challenge learners by enabling them to select and apply mathematical skills to tackle straightforward real-life problems or situations
- ◆ develop the ability to interpret straightforward real-life problems or situations involving mathematics
- ◆ develop confidence in the subject and a positive attitude towards the use of mathematics in straightforward real-life situations
- ◆ apply mathematical operational skills with an appropriate degree of accuracy
- ◆ use mathematical reasoning skills to assess risk, draw conclusions and explain decisions
- ◆ communicate mathematical information in an appropriate way

In addition, learners will have the opportunity to develop generic and transferable skills for learning, skills for life and skills for work. These include numeracy, thinking skills, literacy and employability.

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 one or more of the following or by equivalent qualifications and/or experience:

- ◆ National 3 Applications of Mathematics Course

Experiences and outcomes

New National Courses have been designed to draw on and build on the curriculum experiences and outcomes as appropriate. Qualifications developed for the senior phase of secondary education are benchmarked against SCQF levels. SCQF level 4 and the curriculum level 4 are broadly equivalent in terms of level of demand although qualifications at SCQF level 4 will be more specific to allow for more specialist study of subjects.

Learners who have completed Curriculum for Excellence experiences and outcomes will find these an appropriate basis for doing the Course.

Experiences and outcomes from the mathematics curriculum area may provide an appropriate basis for doing this Course. The following experiences and outcomes are particularly relevant:

- ◆ 'I can use a variety of methods to solve number problems in familiar contexts, clearly communicating my processes and solutions.'(MNU 3-03a)
- ◆ 'Having investigated different routes to a solution, I can find the area of compound 2D shapes and the volume of compound 3D objects, applying my knowledge to solve practical problems.' (MTH 3-11b)
- ◆ 'When analysing information or collecting data of my own, I can use my understanding of how bias may arise and how sample size can affect precision, to ensure that the data allows for fair conclusions to be drawn.' (MTH 3-20b)
- ◆ 'I can find the probability of a simple event happening and explain why the consequences of the event, as well as its probability, should be considered when making choices.' (MNU 3-22a)

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

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 *Added Value Unit Specification* for mandatory information about the skills, knowledge and understanding to be covered in this Course.

The following skills, knowledge and understanding will be developed throughout the Units in the Course. However, some Units may offer more opportunities than others for the development of skills, knowledge and understanding as suggested in the table below:

- ✓✓✓ Significant opportunities to develop within the Unit
- ✓✓ Some opportunities to develop within the Unit

Skills knowledge and understanding	Managing Finance and Statistics	Geometry and Measures	Numeracy	Added Value Unit
interpret straightforward real-life situations involving mathematics	✓✓	✓✓	✓✓✓	✓✓
identify appropriate mathematical operational skills to tackle straightforward real-life situations or problems	✓✓✓	✓✓✓	✓✓✓	✓✓
use mathematical operational skills to an appropriate degree of accuracy	✓✓✓	✓✓✓	✓✓✓	✓✓✓
use mathematical reasoning skills to draw conclusions or explain decisions	✓✓	✓✓	✓✓✓	✓✓
communicate mathematical information in an appropriate way	✓✓✓	✓✓✓	✓✓	✓✓

Suggested learning and teaching approaches for the development of the skills, knowledge and understanding across the Course can be found in Appendix 1.

Progression from this Course

This Course or its component Units may provide progression to:

- ◆ National 5 Applications of Mathematics Course
- ◆ other qualifications in mathematics or related areas
- ◆ further study, employment and/or training

Approaches to learning and teaching

The purpose of this section is to provide general advice and guidance on approaches to learning and teaching which can be used for any of the component Units within the Course.

Effective learning and teaching will draw on a variety of approaches to enrich the experience of learners. In particular, a mix of approaches which provide opportunities for personalisation and choice will help to motivate and challenge learners.

The skills-based focus of the Course readily lends itself to a variety of approaches to learning and teaching such as interdisciplinary learning, cross-curricular opportunities, investigative and problem solving approaches; individual/collaborative working, resource-based learning and e-learning. Examples of how each of these approaches could be used within learning and teaching are described below:

Interdisciplinary learning could be used to develop learners' mathematical skills through scheduled or special events planned throughout the year, for example:

- ◆ Trade fairs or sponsored events could involve managing finance and statistics. Learners could collect and record data such as income and expenditure, and results from sponsored events including the amount of money pledged and collected. Financial data could be represented in graphical form and then analysed to establish the amount of profit and/or loss or the amount of money pledged compared to the amount of money collected.
- ◆ Shows, exhibitions and plays could be used as contexts to manage finance collected from ticket sales and to calculate the costs of production. Learners could also be involved in the planning and management of the stage by plotting the position and size of props, furniture or equipment. Scale drawings could be created for this purpose.
- ◆ Sports days or national sporting events, eg Commonwealth Games or Olympics could provide opportunities to manage statistics by taking measurements and recording the results from events. These results could be represented in graphical form and interpreted as part of a write up following the event. Learners could also use the data to calculate mean scores or calculate the range of results for a particular event. Learners could also develop their geometric skills by planning the use of space and the positioning of equipment for sports day events.
- ◆ Visiting speakers, external visits or work experience could highlight when and how finance, statistics, geometry and measurements are used in the workplace. This could include for example: retail outlets, IT companies, construction firms, architects and accountancy firms.
- ◆ School trips or excursions could be used to apply mathematical and numerical skills in a variety of contexts such as outdoor education centres, field trips, visits to museums or visits local companies. Learners planning to go on school trips abroad could be asked to convert currencies using different companies to work out the best deal.

Cross-curricular opportunities topics or themes could be used to build on the relationship between mathematics and other curriculum areas such as technology, geography, science and physical education. Examples of possible cross-curricular learning and teaching opportunities are described in the following table:

Curriculum area	Possible cross-curricular learning and teaching opportunities
Technology	<ul style="list-style-type: none"> ◆ using knowledge of shape, space and measurement to design and make items ◆ working with a range of measuring tools and equipment ◆ calculating the cost of producing a range of items using different materials ◆ calculating the quantity of materials required based on a related measurement, eg area or volume ◆ creating scale drawings of items to be constructed ◆ being aware of the need for tolerance and accuracy in measurement when designing and making items
Art	<ul style="list-style-type: none"> ◆ using knowledge of shape and space to create models, pictures or patterns ◆ using scale factors on the dimensions of shapes, pictures or models
Geography	<ul style="list-style-type: none"> ◆ taking and recording measurements during field trips ◆ planning a basic navigation course for travelling on foot between points ◆ using scale when working with maps or plans ◆ collecting, organising, presenting and comparing data collected during field trips and using relative frequencies to describe the probability of observations ◆ producing a scattergraph based on information collected from a survey
Health and Wellbeing	<ul style="list-style-type: none"> ◆ using a range of measuring instruments during cooking or when preparing food ◆ carrying out calculations associated with dietary requirements and food labelling ◆ applying fractions when using recipes ◆ working out the best deal when buying ingredients ◆ understanding the need for accuracy of measurements in cooking and the possible effects of too much or too little ingredients ◆ analysing health statistics and investigating risk associated with diet and exercise using probability to describe likelihood of illnesses or conditions

Science	<ul style="list-style-type: none"> ◆ recording data collected during experiments ◆ presenting data in different graphical forms, manipulating and comparing data and interpreting the results ◆ calculating a quantity based on a related quantity during experiments
Physical education	<ul style="list-style-type: none"> ◆ measuring physical achievements, recording, comparing and reporting results to others in graphical form ◆ taking fitness measurements such as heart rate and breathing rates and determining patterns or trends ◆ combining knowledge of maths, geography and physical education in orienteering activities ◆ comparing fitness data and recording changes over time ◆ using first fit algorithm when packing away equipment or designing storage facilities for PE equipment ◆ using percentages, fractions and decimal fractions to measure the probability of sporting outcomes

Investigative/problem solving approaches may provide the opportunity for learners to observe, explore, experiment and discuss mathematical approaches to solve real-life problems. For example, by asking ‘what would happen if....?’, learners could explore the concepts of probability, investigate risk and determine best value, or find out what would happen to savings or borrowing repayments when interest rates are changed. This approach has the potential to stimulate mathematical thinking, especially when supported by questioning and/or discussion. Prompt questions could be used to establish learners’ understanding for example: ‘What did you do to work that out? Could this problem have been solved in a different way? If yes, what would you have done differently?’

Individual and/or collaborative working could provide learners with the opportunity to ‘think, pair, share’ mathematical strategies for tackling real-life tasks. For example:

- ◆ Learners could be asked to work on their own to propose a strategy to solve a problem involving time management. Learners could then be asked to share their ideas with others and to agree which strategy would be the best.
- ◆ Online tests, textbook exercises, quizzes or competitions could also be used to practise mathematical and numerical skills and strategies, sharpen recall of number facts and develop efficient calculation strategies.
- ◆ Exposition is an important technique. However, learners should be engaged as much as possible. The engagement of learners working on their own could be enhanced by teachers/lecturers providing opportunities for personalisation and choice where possible. Learners could be asked to relate the mathematics to their own circumstances or be asked to collect data to work with.

Collaborative approaches can be used within Units and across Courses where it is helpful to simulate real life situations, share tasks and promote team working skills. However, there must be clear evidence to show that the learner has met the required assessment standards for the Unit or Course.

Resource-based learning could include, for example:

- ◆ Using technology to collect, organise and represent data and information
- ◆ Using real-life or simulated environments to develop skills in managing money or time and in using measuring instruments
- ◆ Using calculators, computers, tablets, mobile phones and other electronic devices to explore numbers, manage time, or check answers to complex calculations. The use of technology is particularly appropriate when this is a naturally occurring feature of the context in which learning is taking place. Calculators often help learners to process numbers, freeing up time for them to analyse situations, draw conclusions and make informed decisions. However, learners should, where possible, be encouraged to develop and improve their skills in completing both written and mental calculations to develop numerical fluency and efficiency
- ◆ Using real-life materials such as government statistics, invoices, publications, bills and advertisements

Where resources permit, centres could use technology to support learning and teaching. For the National 4 Applications of Mathematics Course this could include:

- ◆ Using ICT and other technologies such as calculators and computers for handling data and performing more complex calculations.
- ◆ Using multi-media packages to work with geometry
- ◆ Using online tests and interactive programmes
- ◆ Using spreadsheets and other data handling programmes to collect, record and manipulate data
- ◆ Using web-based resources such as financial or health-related statistics as stimulus material

Examples of learning and teaching contexts that could be used for the Units within this Course can be found in Appendix 1.

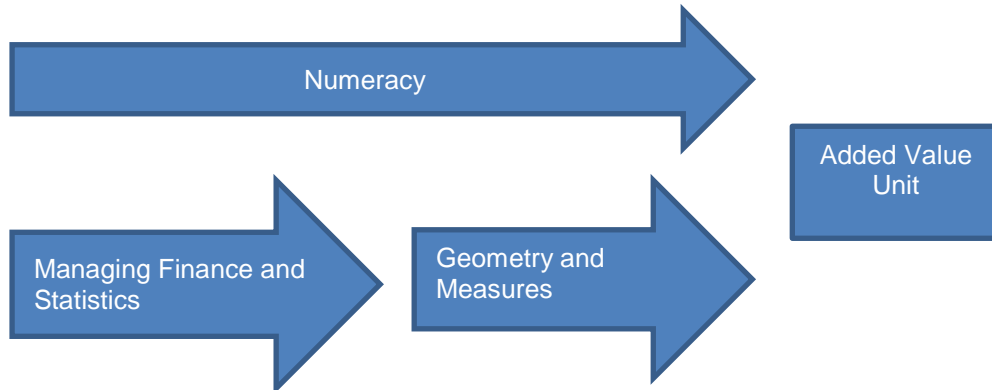
Examples of suggested learning and teaching resources can be found in Appendix 2.

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 examples which follow illustrate possible approaches which may be adopted. Please note that other combinations are also possible.

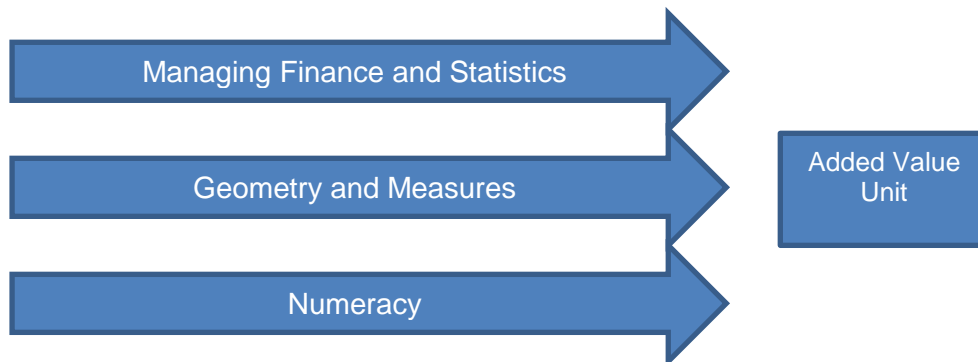
Example 1:

This example shows the possibility of delivering the *Managing Finance and Statistics Unit* and *Geometry and Measures Unit* sequentially, with the *Numeracy Unit* being delivered throughout. This sequence would allow more time for learning and teaching and provide the opportunity to reinforce and consolidate numerical skills through the Course. The *Managing Finance and Statistics* and *Geometry and Measures* Units can be delivered in any order. Completion of all three Units would lead on to the assessment of Added Value which draws on the skills, knowledge and understanding from across the Course.



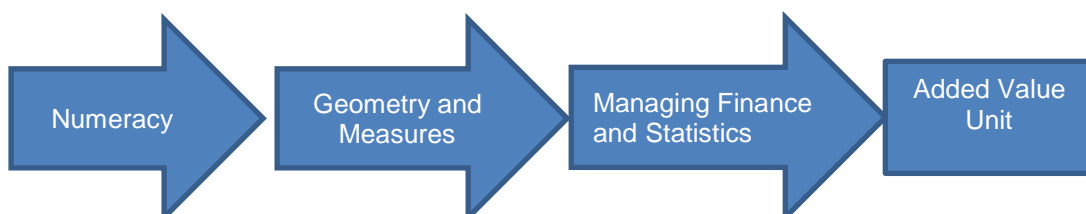
Example 2:

This example shows the possibility of delivering all three Units: *Managing Finance and Statistics*, *Geometry and Measures* and the *Numeracy Unit*, concurrently. This approach would be particularly useful if Applications of Mathematics is delivered using a range of topics or themes which cut across all three Units. Completion of all three Units at the same time would lead to the Added Value Unit which draws on the skills, knowledge and understanding from across the Course.



Example 3:

This example shows the possibility of delivering the *Numeracy Unit*, *Managing Finance and Statistics Unit* and the *Geometry and Measures Unit*, sequentially. This example could be beneficial for learners needing to reinforce and consolidate their numerical skills at the start of the Course. *Managing Finance and Statistics* and *Geometry and Measures* can be delivered in any order. Completion of all three Units would lead on to the Added Value Unit.



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

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 should be built into the Course where there are appropriate opportunities.

Throughout the Course there are significant opportunities to develop the following skills for learning, skills for life and skills for work:

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

Applying — the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.

Analysing and evaluating — the ability to identify and weigh-up the features of a situation or issue and to use judgement when coming to a conclusion. It includes reviewing and considering potential solutions.

Numeracy — the ability to select and apply number processes, money, time and measurement, and information handling skills in real-life contexts.

In addition, there may also be opportunities for learners to develop their literacy and employability skills:

Literacy — the ability 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 analyse real-life contexts and communicate their thinking by presenting mathematical information using numbers, diagrams, symbols and words.

Employability skills — the ability to apply personal qualities, skills, knowledge, understanding, and attitudes in changing economic environments. The mathematical operational and reasoning skills in this Course aim to develop learners' ability to respond to mathematical situations that could arise in the workplace by analysing a situation, deciding which mathematical strategies to use, work through those strategies effectively, and make informed decisions.

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

Learners will benefit from receiving accurate and regular feedback regarding their learning. This helps to ensure they are actively involved in the assessment process. It is also important that different approaches to assessment are adopted to suit the varying needs of learners.

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 the examples shown in the section on 'Approaches to learning and teaching'.

A combined approach to assessment has the advantage of:

- ◆ bringing together elements of different Units and encouraging the transfer of skills, knowledge and understanding
- ◆ making learning and assessment more coherent and relevant for learners

Assessment strategies and methods

The skills-based focus of the Course readily lends itself to a variety of approaches to assessment. Whichever approach is used, assessments must be valid, reliable and fit for purpose. Each assessment should therefore:

- ◆ be designed to allow learners to produce sufficient evidence to show they have achieved the required Outcomes and Assessment Standards for the Unit
- ◆ allow consistent judgements to be made
- ◆ be appropriate for the aims and purposes of the Course

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

Suggested assessment approach	Units	An example of how this approach could be used across the Course
Problem solving tasks or activities	<ul style="list-style-type: none">◆ Managing Finance and Statistics Unit◆ Numeracy Unit	A financial problem could be given to learners which would draw on the <i>Managing Finance and Statistics Unit</i> as well as the <i>Numeracy Unit</i> . For example, learners could be asked to determine a financial position using given budget information. This could include factors affecting personal income and expenditure over the period of a month. Learners could be asked to produce a budget which takes

		into account income and expenditure and to develop a long term savings plan over the period of a year. Learners could be asked to calculate interest gained on savings.
Projects or investigations	<ul style="list-style-type: none"> ◆ Managing Finance and Statistics Unit ◆ Geometry and Measures Unit ◆ Numeracy Unit 	A project/investigation could be used to combine the assessment of numeracy, statistics, and geometry. For example, learners could be asked to work with scale drawings to plan the landscape of a garden. Learners could be asked to calculate required quantities and costs of materials for the job. The job could include working out the amount of fencing required, the amount of slabs needed for a patio or the volume of bark chippings needed to cover a flower bed. Learners could also be asked to calculate the gradient of a ramp into the garden for disabled access.
Short/extended response tests	<ul style="list-style-type: none"> ◆ Managing Finance and Statistics Unit ◆ Geometry and Measures Unit ◆ Numeracy Unit 	Learners could be given short or extended response tests online or on paper which covers the Outcomes and Assessment Standards for each Unit. Where possible all questions should be set within realistic and relevant contexts for the learners and could include a mix of short and extended response questions.

When designing internal assessments, teachers/lecturers are encouraged to be as inclusive as possible taking into account the needs and experiences of their learners. In particular, internal assessment should:

- ◆ use content, resources and materials that recognise different groups and avoid bias or stereotyping
- ◆ provide a balance of assessment methods and adopt alternative approaches to gathering evidence which build in opportunities for personalisation and choice where appropriate

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 which shows learners' understanding of mathematical processes
- ◆ computer-generated assessment records or printouts from simulations, eg SQA Solar or online tests
- ◆ photographs of project or investigative work
- ◆ a product such as a spreadsheet or computer-generated graphic

Please note, this list is not exhaustive and other types of evidence are also possible.

When evidence for the Course is collected using a combined approach, the use of the combined skills list for the Units provided in Appendix 3 may be helpful.

Evidence must be generated for all Outcomes and Assessment Standards.

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.

Centres may consider it appropriate to delay re-assessment until further learning has taken place. Re-assessment opportunities could be built into other assessment opportunities within other Units.

Authentication

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.

Added value

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

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

The Added Value Unit addresses the key purposes and aims of the Course as defined in the Course rationale. It will do this by addressing breadth and application through the use of mathematical ideas and strategies that can be applied to organising and planning straightforward aspects in personal life, the workplace and the wider world.

The assessment of added value will be done through a test and include the application and integration of financial, measurement, geometric and statistical skills in real-life contexts involving reasoning. Numerical skills underpin all aspects of the Unit and the ability to use these without the aid of a calculator will also be assessed.

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

- ◆ analyse a range of real-life problems and situations involving finance, statistics, geometry and measurement
- ◆ select appropriate mathematical process and strategies
- ◆ apply mathematical process and strategies to solve problems or tackle situations both with and without, the aid of a calculator
- ◆ draw conclusions based on the results of the processes and strategies to make and explain decisions or choices
- ◆ respond to short and extended response questions

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

Equality and inclusion

The additional support needs of learners should be taken into account when planning learning experiences or when considering any reasonable adjustments. Assessment methods should offer learners an equal opportunity to demonstrate their achievement. This should be reflected in the language used, the use of different assessment methods and the use of appropriate illustrative materials which reflect an inclusive view.

Any additional support provided to learners to help them access assessment tasks should maintain the integrity of the Outcomes and Assessment Standards.

Examples of support which may be appropriate for this Course are as follows:

- ◆ allowing extra time to complete tasks
- ◆ practical helpers under direct learner instruction could assist with practical activities (this could also include a reader or scribe as appropriate)
- ◆ adapted equipment would also be appropriate for measuring tasks
- ◆ the use of a calculator or similar aid
- ◆ ICT and other assistive technologies

Other types of support are also possible and would be determined by the teacher/lecturer in response to the specific needs of the learner.

Further details about equality and inclusion relevant to each Unit can be found in the *Unit Support Notes*.

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

Applications of Mathematics: Managing Finance and Statistics (National 4)		
1 The learner will use reasoning skills and financial skills linked to straightforward real-life contexts by:		
1.1 Interpreting a situation involving finance and identifying an appropriate strategy		
1.2 Using appropriate mathematical processes and/or calculations to determine a solution		
1.3 Explaining a solution in relation to the context		
Sub-skills	Explanation	Suggested learning and teaching contexts
Determining a financial position, given budget information	<p>Budgeting and planning for personal use or planning a straightforward event.</p> <p>Balancing straightforward incomings and outgoings from a range of sources.</p>	A project or simulated approach could be used to determine a financial position using given budget information. For example, budgeting for an event such as a party or day out. Learners could be encouraged to use spreadsheets to organise data and perform calculations.
Investigating factors affecting income	<p>Investigate and interpret income and deductions for different personal circumstances and career choices. These could include:</p> <ul style="list-style-type: none"> ◆ basic pay, gross/net pay ◆ overtime ◆ bonus ◆ commission ◆ benefits and allowances ◆ National Insurance ◆ income tax 	<p>An investigative approach could be used to find out pay and pay deductions for a chosen job or career.</p> <p>Real-life materials could be used such as job advertisements and simplified employment contracts.</p> <p>Calculations could involve: basic pay, overtime, gross/net pay, allowances, National Insurance and income tax.</p> <p>Learners could be asked to complete missing information on a simplified salary slip.</p>

<p>Determining the best deal, given two pieces of information</p>	<p>Compare at least three products, given two pieces of information on each</p>	<p>Learners could use the internet to source information about a chosen product such as a mobile phone or broadband contract.</p> <p>Given two pieces of information, learners could compare at least three products, such as amount of data download allowed per month and associated costs.</p> <p>Buying and selling simulations such as a shop or call centre could also be used.</p> <p>Determining the best deal could be integrated with converting between currencies by comparing the rates offered by travel agents, online or from a bureau de change.</p>
<p>Converting between currencies</p>	<p>Comparing costs between two different currencies in either direction</p>	<p>Contexts could include travel scenarios and information from different currency converters.</p> <p>Learners could discuss the impact of different rates and the effect of commission. For example, deciding how much Euro will be given for £500 worth of Sterling taking into account deductions for commission.</p>
<p>Investigating the impact of interest rates for savings and borrowing in a basic situation</p>	<p>These include:</p> <ul style="list-style-type: none"> ◆ loans ◆ savings rate ◆ bank accounts ◆ credit agreements 	<p>Learners could be given or asked to collect a variety of real-life loan and interest rate tables.</p> <p>Learners could calculate and discuss which savings scheme would give the best return and which borrowing schemes would be the most expensive over a given period of time.</p> <p>Investigate the terms of pre-paid and normal credit cards.</p> <p>The meaning of term APR could be discussed although understanding of this term is not required.</p>

2 The learner will use reasoning skills and statistical skills linked to straightforward real-life contexts by:

2.1 Interpreting a situation involving data and identifying an appropriate strategy

2.2 Representing data appropriately

2.3 Interpreting and/or comparing data to draw conclusions

Sub-skills	Explanation	Suggested learning and teaching contexts
Using statistics to investigate risk	Investigate the meaning of lifestyle statistics	<p>An investigative approach could be used to assess risk.</p> <p>Real-life health and safety statistics could be used. For example, learners could interpret statistics in graphical form showing the mortality rates for smoking and non-smoking individuals. They could relate this to life expectancy and lifestyle choices.</p> <p>Alternatively, learners could calculate the chances of winning a major lottery prize and compare this with the chances of selecting the winning result in a football match.</p> <p>Learners could also discuss the possibility of bias in data and the possible effects of large or small sample sizes.</p>
Using and presenting statistical information in diagrams	<p>Using and presenting straightforward statistical diagrams (technology may be used). These should include:</p> <ul style="list-style-type: none"> ◆ bar graphs ◆ line graphs ◆ pie charts ◆ frequency tables without class intervals 	<p>Learners could carry out a project, possibly drawing on other curriculum areas.</p> <p>Learners could be asked to organise data they have collected and represent it in graphical form. For example, learners could conduct a survey in schools about the amount of time other pupils spend over the period of a week: watching television, playing computer games, and playing outside.</p> <p>Links with Social Subjects or Modern Studies could contextualise the development of these skills.</p>

Using diagrams to illustrate data	Bar graphs, line graphs, pie charts, stem and leaf diagrams	<p>It is suggested that sources of graphs are gathered from a range of contexts such as media, social situations, vocational contexts and any area of interest to the learners, eg sport.</p> <p>Learners could use calculators with statistical functions and computers to manipulate and graph data. The emphasis should be on comparison and interpretation of graphs and diagrams. Learners could collect and discuss examples of graphical data used in newspapers, magazines, leaflets etc.</p>
Comparing data sets, using mean and range	Using ungrouped data	<p>At this level a 'data set' is raw data, ie data as it was collected with nothing done to it.</p> <p>Learners could discuss the concept of average as well as calculate averages. Learners could also compare and discuss the different measures of central tendency and how the way in which data is presented could be misleading.</p> <p>A range of different extended response questions with scaffolding could be used to compare data sets in a range of different contexts.</p>
Constructing a frequency table	Without class intervals	If time permits, learners could conduct a simple survey to collect their own data or work collaboratively to collect data.
Constructing a scattergraph	From given or gathered data	Collected data could be used to construct frequency tables and scattergraphs.
Drawing a best fitting straight line on a scattergraph	Drawing a best-fitting straight line by eye — estimating one variable, given the other. The scattergraph should show a high positive or negative correlation.	

Applications of Mathematics: Geometry and Measures (National 4)

The learner will use reasoning skills and measurement skills linked to straightforward real-life contexts by:

1.1 Interpreting a situation involving measurement and identifying an appropriate strategy

1.2 Using appropriate mathematical processes and/or calculations to determine a solution

1.3 Explaining a solution in relation to the context

Sub-skills	Explanation	Suggested learning and teaching contexts
Solving a basic problem in time management	Use time intervals to make plans including across midnight	Learners could work with various scenarios which involve the calculation of time intervals such as travel arrangements, event/task management. For example, learners could estimate the arrival time at a destination the following day.
Calculating a quantity based on a related measurement	Any required formula or relationship will be given	Contexts from other curricular areas could be used to deliver this aspect of the Course. Technology, Home Economics, art and craft subjects in particular lend themselves well to this content. For example, in technology, learners could calculate the amount of sheet metal needed to make a tool box from a given plan which incorporates the use of formula and a ± 1 mm tolerance. This aspect could be done at the same time as investigating the need for tolerance in a measurement.
Constructing a scale drawing with a given scale	Scales expressed as a ratio or scaled line	Contexts from practical curricular areas could be used to deliver this aspect of the Course. For example, in fashion and textile technology, learners could adapt a garment pattern to produce a half-size prototype.

		In geography, learners could produce a scale map of the school, college or local area.
Planning a basic navigation course	Use measurement of angles and length to interpret and to plan a straightforward navigation course	<p>From a given starting point, learners could use a protractor to plot a navigation course using given bearings and distance. Then, using a given millimetre scale, learners could present this course in graphical form and calculate the distance from the starting point.</p> <p>Where resources permit, learners could plot this navigation course around the school or college grounds or within a local area.</p>
Carrying out container packing, using a first-fit algorithm	Filling containers in the order of arrival	<p>A practical problem solving approach could be used. Learners could be given the dimensions of a cardboard box, and asked to work out how many tins of given diameter could be packed into the box.</p> <p>Other scenarios could include:</p> <ul style="list-style-type: none"> ◆ packing storage boxes into a removal van or shed ◆ packing boxes of food into a larger container ◆ filling a ferry with vehicles of different sizes
Investigating the need for tolerance in a measurement	Accuracy up to two decimal places	Learners could consider the need for tolerance in the quality control of manufactured items such as the size of garments, numbers of biscuits in tin or the number of nails in a packet.

The learner will use reasoning skills and geometric skills linked to straightforward real-life contexts by:

2.1 Interpreting a situation involving geometry and identifying an appropriate strategy

2.2 Using appropriate mathematical processes and/or calculations to determine a solution

2.3 Explaining a solution in relation to the context

Sub-skills	Explanation	Suggested learning and teaching contexts
Determining the gradient of a slope	Using 'vertical height' and 'horizontal distance'	An investigative approach could be used to develop geometric skills using real-life contexts.
Investigating a situation involving perimeter	<ul style="list-style-type: none"> ◆ rectilinear ◆ circular ◆ composite shape 	<p>For example, learners could design a ramp for wheel chair access with given dimensions in the form of height and distance. Learners could also be asked to check if these dimensions comply with given UK building regulations for wheel chair access.</p> <p>Learners could also be asked to calculate the perimeter of a garden to work out the amount of wood required to make a fence.</p> <p>Learners could be asked to calculate the area of a wall or sign to be decorated and then work out how much paint would be required.</p> <p>The volume of a cylindrical garden feature, eg the base of a bird bath could be calculated to work out how much concrete would be needed to fill it.</p> <p>Alternatively, learners could be asked to calculate the volume of a new brand of packaging for a drink or food item to work out how much it would hold.</p>
Investigating a situation involving area	<ul style="list-style-type: none"> ◆ triangles ◆ kite, rhombus, parallelogram ◆ circle ◆ composite shape 	
Investigating a situation involving volume	<ul style="list-style-type: none"> ◆ prism (including cuboid, cylinder) 	

Solving a problem involving the use of Pythagoras' theorem		<p>A problem solving approach could be used to apply Pythagoras' theorem to give different dimensions of the length of a ramp for:</p> <ul style="list-style-type: none"> ◆ wheelchair access to a building ◆ car access to a garage ◆ children's slide
Using a scale factor on the dimensions of a shape	Problems involving increase/decrease in an amount or measurement according to a scale factor	<p>Apply basic scale factors on the dimensions of a shape such as:</p> <ul style="list-style-type: none"> ◆ altering the size of a garment/textile item ◆ working with simplified building plans or drawings ◆ adapting a plan for a prototype into a full scale model ◆ enlarging/reducing an artist's picture to fit into a given frame

Numeracy (National 4)

The learner will use numerical skills to solve straightforward, real-life problems involving money/time/measurement.

Assessment Standard	Explanation	Suggested learning and teaching contexts
1.1 Selecting and using appropriate numerical notation and units	<ul style="list-style-type: none"> ◆ Numerical notation should include: =, +, −, ×, /, ÷, <, >, (), %, colon and decimal point ◆ Units should include: <ul style="list-style-type: none"> — money (pounds and pence) — time (months, weeks, days, hours, minutes, seconds) — measurement of length (millimetre, centimetre, metre, kilometre, mile); weight (gram, kilogram); volume (millilitre, litre) and temperature (Celsius or Fahrenheit) 	<p>A wide range of approaches could be used for learning and teaching numeracy skills. These could include:</p> <ul style="list-style-type: none"> ◆ discrete numerical exercises using textbooks and worksheets ◆ contextualised short and extended response questions ◆ investigative work requiring the selection and application of numerical skills ◆ interdisciplinary activities which involve the selection and use of a range of numerical processes such as art, craft subjects, technology, home economics, physical education and geography
1.2 Selecting and carrying out calculations	<ul style="list-style-type: none"> ◆ add and subtract whole numbers including negative numbers ◆ multiply whole numbers of any size, with up to four-digit whole numbers ◆ divide whole numbers of any size, by a single digit whole number, by 10 or 100 ◆ round answers to the nearest significant figure or two decimal places ◆ find simple percentages and fractions of shapes and quantities, eg 50%, 10%, 20% and 25%, $33\frac{1}{3}\%$; $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{10}$, $\frac{1}{5}$ ◆ calculate percentage increase and decrease ◆ convert equivalences between common fractions, decimal fractions and percentages ◆ calculate rate: eg miles per hour or number of texts per month ◆ calculate distance given speed and time ◆ calculate time intervals using the 12-hour and 	<p>To enrich the delivery of the Numeracy Unit, it is recommended that learners develop the ability to:</p> <ul style="list-style-type: none"> ◆ use knowledge of rounding and estimation to check or decide if an answer is appropriately accurate ◆ use mental strategies such as number facts, doubling, halving, place value, adding-on, times tables, approximation and factors to carry out calculations efficiently ◆ understand the interrelationships between fractions, decimal fractions and percentages to choose an efficient route to a solution. For example, when asked to evaluate a discount of 10% on an item costing £100, an elegant solution would involve understanding that 10% is the same as a $\frac{1}{10}$, and that calculating $\frac{1}{10}$ of £100 will give the same answer as 10% of £100.

	<p>24-hour clock</p> <ul style="list-style-type: none"> ◆ calculate volume (cube and cuboid), area (rectangle and square) and perimeter (shapes with straight lines) ◆ calculate ratio and direct proportion 	<p>Examples of contexts in which these skills can be applied are given in the Numeracy <i>Unit Support Notes</i>.</p>
1.3 Recording measurements using a straightforward scale on an instrument	<ul style="list-style-type: none"> ◆ use measuring instruments with straightforward scales to measure length, weight, volume and temperature ◆ read scales to the nearest marked, unnumbered division with a functional degree of accuracy 	<p>Learners should be aware that exact measurements are not always possible and that the level of accuracy is often dependent on the measuring instrument and the nature of the task. A suitable scale is one where the numbered divisions are marked every 10. The ability to read both digital and analogue scales should be developed.</p>
1.4 Interpreting the measurements and the results of calculations to make decisions	<ul style="list-style-type: none"> ◆ use appropriate checking methods, eg check sums and estimation ◆ interpret results of measurements involving time, length, weight, volume and temperature ◆ recognise the inter-relationship between units in the same family, eg mm/cm, cm/m, g/kg, and ml/l ◆ use vocabulary associated with measurement to make comparisons for length, weight, volume and temperature 	<p>Measurement activities can be carried out in a variety of familiar real-life contexts. This can include counting squares, or by using common formula and the use of scale drawings. Examples of topics could include: packaging, DIY and cooking.</p>
1.5 Explaining decisions based on the results of measurements or calculations	<ul style="list-style-type: none"> ◆ give reasons for decisions based on the results of measurements or calculations 	<p>Learners could be given the opportunity to discuss in group what decisions could be made based on the results of measurements or calculations.</p>

The learner will interpret graphical data and situations involving probability to solve straightforward, real-life problems involving money/time/measurement.

Assessment Standard	Explanation	Suggested learning and teaching contexts
2.1 Extracting and interpreting data from at least two different straightforward graphical forms	Straightforward graphical forms should include: <ul style="list-style-type: none"> ◆ a table with at least four categories of information ◆ a chart where the values are given or where the scale is obvious, eg pie ◆ a graph where the scale is obvious, eg bar, pie, scatter or line graph ◆ a diagram, eg stem and leaf, map or plan 	Examples of contexts in which these skills can be applied are given in the Numeracy <i>Unit Support Notes</i> (Appendix 3).
2.2 Making and explaining decisions based on the interpretation of data	<ul style="list-style-type: none"> ◆ make decisions based on observations of patterns and trends in data ◆ make decisions based on calculations involving data ◆ make decisions based on reading scales in straightforward graphical forms ◆ offer reasons for the decisions made based on the interpretation of data 	This aspect of the Numeracy Unit could be delivered at the same time as the statistical Outcomes in Managing Finance and Statistics Unit.
2.3 Making and explaining decisions based on probability	<ul style="list-style-type: none"> ◆ recognise patterns and trends and use these to state the probability of an event happening ◆ make predictions and use these predictions to make decisions ◆ use relative frequencies, contingency tables and describe probability through the use of percentages, decimal fractions and fractions to make and explain decisions 	<p>Learners could be introduced to the idea of probability as a measure of chance and uncertainty. This could include reference to the likelihood of events happening in familiar contexts, eg the weather, accidents and winning events</p> <p>Learners should be given the opportunity to: work with relative frequencies; contingency tables; and using percentages, fractions as measures of probability.</p>

Appendix 2: Suggested resources

The following table lists organisations that may provide suitable resources for the delivery of the National 4 Applications of Mathematics Course.

Suggested organisation available through the web	Possible resources or support materials
BBC Scottish Bitesize Maths	Provides online resources for teaching and learning mathematics.
BBC Skillswise Maths	Is a free-to-access website for adult tutors and students, with printable worksheets and factsheets and online games, videos and quizzes.
Teaching Ideas	Provides free online resources for Mathematics and Numeracy. Many examples are contextualised and age graded.
Office of Fair Trading Skilled to Go	Skilled to Go uses real-life consumer situations, such as choosing a mobile phone, to help learners develop consumer skills, knowledge and confidence alongside literacy and numeracy. Skilled to Go is a free toolkit of resources including games, quizzes, role plays and case studies, plus video and audio content.
National Centre for Excellence in the Teaching of Mathematics (NCETM)	The NCETM aims to meet the needs of teachers of mathematics and realise the potential of learners through continuing professional development (CPD). The NCETM provides and signposts resources to teachers, mathematics education networks, HEIs and CPD providers throughout England. At the same time, the National Centre encourages schools and colleges to learn from their own best practice through collaboration among staff and by sharing good practice locally, regionally and nationally.
Nrich maths	This website offers thousands of free mathematics enrichment materials (problems, articles and games) for teachers and learners from ages 5 to 19 years. All the resources are designed to develop subject knowledge, problem-solving and mathematical thinking skills. The website is updated with new material on the first day of every month.
STEM Scotland	STEM Scotland is the website to assist you to find information on science engagement in Scotland and is supported by the Office of the Chief Scientific Advisor of the Scottish Government with the aim to champion science in Scotland. This website will help you to find science, technology, engineering, and maths activities suitable for various pupil levels linked to Curriculum for Excellence, family activities, and science engagement for the general public.

The above resources were correct at the time of print and may be subject to change.

Appendix 3: Combined skills list for the Units

This skills list may be particularly useful if a combined or thematic approach is taken to assess the National 4 Applications of Mathematics Course. The following skills could be drawn on and possibly combined to demonstrate achievement of the Units.

Financial skills

- ◆ Determining a financial position, given budget information (MF&S)
- ◆ Investigating factors affecting income (MF&S)
- ◆ Determining the best deal given two pieces of information (MF&S)
- ◆ Converting between currencies (MF&S)
- ◆ Investigating the impact of interest rates for savings and borrowing in a basic situation (MF&S)

Statistical skills

- ◆ Using statistics to investigate risk (MF&S)
- ◆ Using and presenting statistical information in diagrams (MF&S)
- ◆ Using diagrams to illustrate data (MF&S)
- ◆ Comparing data sets using mean and range (MF&S)
- ◆ Constructing a frequency table (MF&S)
- ◆ Constructing a scattergraph
- ◆ drawing a best fitting straight line on a scatter graph (MF&S)

Measurement skills

- ◆ Solving a basic problem in time management (G&M)
- ◆ Calculating a quantity based on a related measurement (G&M)
- ◆ Constructing a scale drawing with a given scale (G&M)
- ◆ Planning a basic navigation course (G&M)
- ◆ Measuring in millimetres (G&M)
- ◆ Carrying out container packing using 1st fit algorithm (G&M)
- ◆ Investigating the need for tolerance in a measurement (G&M)

Geometric skills

- ◆ Determining the gradient of a slope (G&M)
- ◆ Investigating a situation involving perimeter (G&M)
- ◆ Investigating a situation involving area (G&M)
- ◆ Investigating a situation involving volume (G&M)
- ◆ Solving a problem involving Pythagoras' theorem (G&M)
- ◆ Using a scale factor on the dimensions of a shape (G&M)

Numerical skills

- ◆ Selecting and using appropriate numerical notation and units (N)
- ◆ Selecting and carrying out calculations (N)
- ◆ Recording measurements using a straightforward scale on an instrument (N)
- ◆ Interpreting measurements and results of calculations to make decisions (N)
- ◆ Explaining decisions based on the results of measurements and calculations (N)
- ◆ Extracting and interpreting data from at least two different straightforward graphical forms (N)
- ◆ Making and explaining decisions based on the interpretation of data (N)
- ◆ Making and explaining decisions based on probability (N)

Key:

Managing Finance and Statistics: (MF&S)

Geometry and Measures (G&M)

Numeracy (N)

Appendix 4: 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: October 2017 (version 2.0)

History of changes to Course Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Pages 17–27 — Headings in column one of Appendix 1 amended to indicate that these are sub-skills in the case of the first two Units and Assessment Standards in the Numeracy Unit.	Qualifications Manager	May 2014
	2.0	Lifeskills Mathematics changed to Applications of Mathematics	Qualifications Manager	October 2017

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Unit Support Notes — Applications of Mathematics: Managing Finance and Statistics (National 4)



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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 of Mathematics: Managing Finance and Statistics (National 4) 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 *Added Value Unit Specification*
- ◆ the *Course Support Notes*
- ◆ appropriate assessment support materials

General guidance on the Unit

Aims

The Managing Finance and Statistics (National 4) Unit is a mandatory Unit in the National 4 Applications of Mathematics Course. The Managing Finance and Statistics 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 that focus on the use of mathematical ideas and strategies that can be applied to managing finance and statistics in straightforward real-life contexts. This includes using skills in budgeting as well as skills in organising and presenting data, to explain solutions and/or draw conclusions. The Outcomes cover aspects of finance and statistics in real-life situations requiring mathematical reasoning.

Learners who complete this Unit will be able to:

- 1 Use reasoning skills and financial skills linked to straightforward real-life contexts.
- 2 Use reasoning skills and statistical skills linked to straightforward real-life contexts.

In addition, learners will have the opportunity to develop generic and transferable skills for learning, skills for life and skills for work. These include numeracy and thinking skills.

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 3 Applications of Mathematics Course or its component Units
- ◆ Core Skills Numeracy (SCQF level 3)

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. Examples of experiences and outcomes that are particularly relevant are given in the *Course Support Notes*.

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 4 Applications of 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 the National 4 Applications of Mathematics Course
- ◆ Managing Finance and Statistics (National 5) Unit
- ◆ Personal Finance Award (SCQF level 4)
- ◆ Core Skills Numeracy (SCQF level 5)
- ◆ National Certificate Group Awards
- ◆ further study, employment and/or training

The *Managing Finance and Statistics Unit* has applications in a variety of other subject areas as well as life and work. The skills, knowledge and understanding developed in this Unit could support both breadth and depth of learning in other curriculum areas such as business, science, social studies and health and wellbeing, in addition to life and work contexts.

Approaches to learning and teaching

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

Effective learning and teaching will draw on a variety of approaches to enrich the experience of learners. In particular, a mix of approaches which provide opportunities for personalisation and choice will help to motivate and challenge learners. Some of these approaches include: interdisciplinary learning, cross-curricular approaches, investigative and problem solving approaches, resource based learning and e-learning. Examples of how these approaches could be used across all component Units of the Course are described in the *Course Support Notes*.

Examples of how these approaches could be used to combine and integrate the learning and teaching of this Unit are outlined in the table below. The combination of delivery of this Unit is entirely at the discretion of the centre. Two approaches are suggested here, but other possibilities may exist:

Possible combinations	Suggested approaches
Outcomes 1 and 2 combined	<p>In this approach, the financial and statistical Outcomes could be combined.</p> <p>Learners could be given the opportunity to use financial statistics to investigate risk; and use and present statistical information within financial contexts.</p> <p>Assessment evidence could be collected for the two Outcomes at the same time.</p>
Outcomes 1 and 2 sequentially	<p>In this approach, the financial and statistical Outcomes could be delivered sequentially and in any order.</p> <p>However, it may be beneficial for learners to develop their knowledge and understanding of finance in Outcome 1 first, if there is an intention to use this knowledge and understanding as a context for statistics in Outcome 2.</p> <p>Alternatively, different contexts can be used for the delivery of statistics in Outcome 2.</p> <p>Assessment evidence could be collected at the end of the Unit or during the delivery of each Outcome.</p>

Further information about resources for learning and teaching can be found in Appendix 2 of the Course Support Notes.

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
<p>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.</p>	<p>Throughout this Unit learners will have ample opportunities to: use number to solve financial and statistical problems arising in everyday life; solve practical problems involving money and handle information through interpretation, drawing conclusions, making deductions and informed decisions.</p>
<p>Applying is the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.</p>	<p>Wherever possible, learners could be given the opportunity to apply the skills, knowledge and understanding they have developed to solve financial and statistical problems in a range of real-life contexts. Learners could be encouraged to think about how they are going to tackle problems, decide which skills to use and then carry out the calculations in order to complete the task. To determine a learner's level of understanding, learners could be encouraged to show and explain their thinking.</p>
<p>Analysing and evaluating is 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.</p>	<p>Wherever possible, learners should be given the opportunity to analyse real-life problems or situations involving finance and statistics. Learners could be asked to discuss the problem or situation with others and to decide which mathematical strategies and processes would be required to provide a solution.</p> <p>Learners could also be asked to analyse and evaluate the results of their calculations to draw conclusions. Conclusions drawn by the learner could be used to form the basis of choices or decisions.</p>

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

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

The Managing Money and Statistics Unit can be assessed in a variety of ways and could include, for example:

- ◆ practical assignments such as a project or investigation
- ◆ specific assessment tasks or activities
- ◆ discrete tests or question papers

The following table gives some example 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. Please note that these approaches are not exhaustive and other possibilities also exist.

Approach to assessment	Outcomes	Examples of approaches to assessment
Project/ investigation	Outcome 1 Outcome 2 combined	Learners could be given a set of data to interpret based on financial options such as credit agreements, savings accounts or currency conversion rates. Learners could be asked to identify an appropriate strategy to interpret the data, to make comparisons and perform calculations to determine and explain what they think would be the best deal. Learners could be asked to represent given financial data in an appropriate diagram such as a scattergraph or frequency table.
Assessment tasks/activities	Outcome 1 Outcome 2	For Outcome 1, learners could be asked to analyse a given scenario based on income for a particular career, eg police officer. Learners could be asked to find out about factors affecting income such as basic pay, tax, National Insurance and overtime. Learners could fill in missing information on incomplete pay slips and work out take home pay. For Outcome 2, learners could be given a set of data which they could use to construct a frequency table. Learners could then be asked to present this information in a different way, and use statistics to compare the data and draw conclusions.
Discrete test or question paper	Outcome 1 Outcome 2 combined	Learners could be given a test which consists of short response and extended response questions. For Outcome 1 this may include converting between currencies, calculating the impact of interest rates or determining the best

		<p>deal given two pieces of information. The use of extended response questions could provide opportunities for assessing reasoning skills. For example, based on a given scenario, learners could draw conclusions from a line of best fit drawn by the learner on a scattergraph.</p>
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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 Applications of Mathematics Course and its components Units is contained within the *Course Support Notes*.

When delivering this Unit as part of the National 4 Applications of Mathematics Course, reference should be made to the appropriate content statements within the 'Further mandatory information on Course coverage' section in the *Added Value Unit Specification*.

Equality and inclusion

It is important that where possible, inclusive approaches to learning and assessment encourage personalisation and choice for learners. The additional support needs of learners should also be taken into account when planning learning experiences and when considering any reasonable adjustments that may be required.

Any additional support provided to learners to help them access assessment tasks should maintain the integrity of the Outcomes and Assessment Standards.

Examples of support which may be appropriate for this Unit are as follows:

- ◆ practical helpers under direct learner instruction could assist with practical activities
- ◆ adapted equipment
- ◆ the use of a calculator or similar aid
- ◆ ICT and other assistive technologies

Other types of support are also possible and would be determined by the teacher/lecturer in response to the specific needs of the learner.

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

Unit details	Version	Description of change	Authorised by	Date
	2.0	Lifeskills Mathematics changed to Applications of Mathematics	Qualifications Manager	October 2017

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Unit Support Notes — Applications of Mathematics: Geometry and Measures (National 4)



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Introduction

These Support Notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Applications of Mathematics: Geometry and Measures (National 4) Unit. They are intended for teachers and lecturers who are delivering the Unit. They should be read in conjunction with the:

- ◆ the *Unit Specification*
- ◆ the *Course Specification*
- ◆ the *Added Value Unit Specification*
- ◆ the *Course Support Notes*
- ◆ appropriate assessment support materials

General guidance on the Unit

Aims

The Geometry and Measures (National 4) Unit is a mandatory Unit in the National 4 Applications of Mathematics Course. The Geometry and Measures 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 that focus on the use of mathematical ideas and strategies that can be applied to geometry and measurement in straightforward real-life contexts. This includes using skills in interpreting and in using shape, space and measures to determine and explain solutions. The Outcomes cover aspects of geometry and measurement in real-life situations requiring mathematical reasoning.

Learners who complete this Unit will be able to:

- 1 Use reasoning skills and measurement skills linked to straightforward real-life contexts.
- 2 Use reasoning skills and geometric skills linked to straightforward real-life contexts.

In addition, learners will have the opportunity to develop generic and transferable skills for learning, skills for life and skills for work. These include numeracy and thinking skills.

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 3 Applications of Mathematics Course or its component Units
- ◆ Core Skills Numeracy (SCQF level 3)

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. Examples of experiences and outcomes that are particularly relevant are given in the *Course Support Notes*.

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 4 Applications of 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 the National 4 Applications of Mathematics Course
- ◆ Geometry and Measures (National 5) Unit
- ◆ Core Skills Numeracy (SCQF level 5)
- ◆ National Certificate Group Awards
- ◆ further study, employment and/or training

The Geometry and Measures Unit has applications in a variety of other subject areas as well as life and work. The skills, knowledge and understanding developed in this Unit could support both breadth and depth of learning in other curriculum areas such as technology, science, health and wellbeing and physical education, in addition to life and work contexts.

Approaches to learning and teaching

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

Effective learning and teaching will draw on a variety of approaches to enrich the experience of learners. In particular, a mix of approaches which provide opportunities for personalisation and choice will help to motivate and challenge learners. Some of these approaches include: interdisciplinary learning, cross-curricular approaches, investigative and problem solving approaches, resource based learning and e-learning. Examples of how these approaches could be used across all component Units of the Course are described in the *Course Support Notes*.

Examples of how these approaches could be used to combine and integrate the learning and teaching of this Unit are outlined in the table below. The combination of delivery of this Unit is entirely at the discretion of the centre. Two approaches are suggested here, but other possibilities may exist:

Possible combinations	Suggested approaches
Outcomes 1 and 2 combined	<p>In this approach, the measurement and geometric Outcomes could be combined.</p> <p>Learners could be given the opportunity to use measurements whilst investigating gradients, perimeters, area and volume. Learners could also apply measures whilst solving a problem involving Pythagoras' theorem or when using a scale factor on the dimensions of a shape.</p> <p>Assessment evidence could be collected for both Outcomes at the same time.</p>
Outcomes 1 and 2 sequentially	<p>In this approach, the geometry and measures Outcomes could be delivered sequentially and in any order.</p> <p>However, it may be beneficial for learners to develop their knowledge and understanding of measures in Outcome 1 first, if there is an intention to use this knowledge and understanding as a basis for learning about geometry in Outcome 2.</p> <p>Assessment evidence could be collected at the end of the Unit or during the delivery of each Outcome.</p>

Further information about resources for learning and teaching can be found in Appendix 2 of the Course Support Notes.

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
<p>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.</p>	<p>Throughout this Unit learners will have ample opportunities to: use number to solve problems arising in real-life contexts involving geometry and measurement.</p> <p>Through both Outcomes, learners could be given the opportunity to handle measurement and geometric data in the form of scale drawings, plans and maps which could be used to draw conclusions and/or make decisions.</p>
<p>Applying is the ability to use existing information to solve a problem in a different context, and to plan, organise and complete a task.</p>	<p>Wherever possible, learners could be given the opportunity to apply the skills, knowledge and understanding they have developed to solve geometric and measurement problems in a range of real-life contexts. Learners could be encouraged to think about how they are going to tackle problems, decide which skills to use and then carry out measurements and calculations to complete the task. To determine a learner's level of understanding, learners could be encouraged to show and explain their thinking.</p>
<p>Analysing and evaluating is 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.</p>	<p>Wherever possible, learners should be given the opportunity to analyse real-life problems or situations involving geometry and measures. Learners could be asked to discuss the problem or situation with others and to decide which strategies and processes would be required to provide a solution.</p> <p>Learners could also be asked to analyse and evaluate the results of their measurements and calculations to draw conclusions. Conclusions drawn by the learner could be used to form the basis of any choices or decisions.</p>

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

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

The Geometry and Measures Unit can be assessed in a variety of ways and could include, for example:

- ◆ practical assignments such as a project or investigation
- ◆ specific assessment tasks or activities
- ◆ discrete tests or question papers

The following table gives some example 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. Please note that these approaches are not exhaustive and other possibilities also exist.

Approach to assessment	Outcomes	Examples of approaches to assessment
Project/ investigation	Outcome 1 Outcome 2 combined	Learners could be asked to investigate a gardening or farming scenario by: <ul style="list-style-type: none"> ◆ calculating the area of the lawn/field to work out how much fertiliser would be required ◆ calculating the perimeter of the lawn/field to work out how much fencing would be required ◆ calculating quantities of materials e.g. weed killer based on related measurements, eg area
Assessment tasks/activities	Outcome 1 Outcome 2	<p>For Outcome 1, learners could be given a starting point and be asked to use a protractor to plot a navigation course using given bearings and distance. Then, using a given millimetre scale, learners could present this course in graphical form, calculating the distance from the starting point.</p> <p>For Outcome 2, learners could be asked to work out the gradient of a slope to find out whether it would be safe enough for access into a medical centre or hospital. Building regulations could be provided and learners would need to determine the gradient of the slope and compare this against the regulations.</p>

Discrete test or question paper	Outcome 1 Outcome 2 combined	Learners could be given a test which consists of short response and extended response questions. For Outcome 1 this may include planning a basic navigation course, constructing a scale drawing using a given scale. The use of extended response questions could provide opportunities for assessing reasoning skills. For example, drawing conclusions from solutions to a basic problem involving time.
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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 Applications of Mathematics Course and its components Units is contained within the *Course Support Notes*.

When delivering this Unit as part of the National 4 Applications of Mathematics Course, reference should be made to the appropriate content statements within the 'Further mandatory information on Course coverage' section in the *Added Value Unit Specification*.

Equality and inclusion

It is important that where possible, inclusive approaches to learning and assessment encourage personalisation and choice for learners. The additional support needs of learners should also be taken into account when planning learning experiences and when considering any reasonable adjustments that may be required.

Any additional support provided to learners to help them access assessment tasks should maintain the integrity of the Outcomes and Assessment Standards.

Examples of support which may be appropriate for this Unit are as follows:

- ◆ practical helpers under direct learner instruction could assist with practical activities
- ◆ adapted equipment
- ◆ the use of a calculator or similar aid
- ◆ ICT and other assistive technologies

Other types of support are also possible and would be determined by the teacher/lecturer in response to the specific needs of the learner.

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

Unit details	Version	Description of change	Authorised by	Date
	2.0	Lifeskills Mathematics changed to Applications of Mathematics	Qualifications Manager	October 2017

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Unit Support Notes — Numeracy (National 4)

Unit Support Notes for the Numeracy Unit are available on the [Literacy and Numeracy page](#) of SQA's website.



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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).