SCOTTISH QUALIFICATIONS AUTHORITY

MATHEMATICS
Intermediate 1

Third edition – published November 1999

SCOTTISH QUALIFICATIONS AUTHORITY

NOTE OF CHANGES TO ARRANGEMENTS
THIRD EDITION PUBLISHED ON CD-ROM NOVEMBER 1999

COURSE TITLE: Mathematics (Intermediate 1)

COURSE NUMBER: C056 10

National Course Specification

Course Details: Core skills statements expanded

National Units Specification

All Units: Core skills statements expanded

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National Course Specification

MATHEMATICS (INTERMEDIATE 1)

COURSE NUMBER C056 10

COURSE STRUCTURE

This course has three units, as follows:

Mandatory units

D321 10	***Mathematics 1 (Int 1)***	***1 credit (40 hours)***
D322 10	***Mathematics 2 (Int 1)***	***1 credit (40 hours)***

These units should be taken in the order above, followed by whichever optional unit is chosen.

Optional units - choose one from

D323 10	***Mathematics 3 (Int 1)***	***1 credit (40 hours)***
D324 10	***Applications of Mathematics (Int 1)***	***1 credit (40 hours)***

In common with all courses, this course includes 40 hours over and above the 120 hours for the component units. This may be used for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning and preparation for external assessment. This time is an important element of the course and advice on its use is included in the course details.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- Standard Grade Mathematics Foundation award
- *Using Mathematics 3 (Acc 3)* unit
- equivalent

Administrative Information

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Course Specification: general information (cont)

COURSE Mathematics (Intermediate 1)

CORE SKILLS

This course gives automatic certification of the following:

Complete core skills for the course	Numeracy	Int 1
Additional core skills components for the course	Critical Thinking	Int 1

For information about the automatic certification of core skills for any individual unit in this course, please refer to the general information section at the beginning of the unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Course Specification: course details

COURSE Mathematics (Intermediate 1)

RATIONALE

As with all mathematics courses, Intermediate 1 Mathematics aims to build upon and extend candidates' mathematics in a way that recognises problem solving as an essential skill and enables them to integrate their knowledge of different aspects of the subject.

Because of the importance of these features, the grade descriptions for mathematics emphasise the need for candidates to undertake extended thinking and decision making, so as to solve problems and integrate mathematical knowledge. The use of coursework tasks to help meet the grade descriptions in problem solving is encouraged.

Where appropriate, mathematics should be developed in context, and the use of mathematical techniques should be applied in social and vocational contexts related to likely future work and study.

The Intermediate 1 Mathematics course, which contains *Mathematics 1 (Int 1), 2 (Int 1)* and *3 (Int 1)* is designed to meet the needs of candidates who wish to progress to Intermediate 2 Mathematics. In this course, the emphasis is placed on developing an appreciation of the power of mathematical language and the efficiency of algorithms in preparation for the Intermediate 2 course.

Mathematics 1 (Int 1) and *2 (Int 1)* taken together with *Applications of Mathematics (Int 1)* form the basis of a course designed to meet the needs of candidates who require a mathematics qualification at Intermediate 1 level, but who do not intend to proceed to a mathematics course at Intermediate 2 level. The course aims to enhance candidates' skills in applying their mathematics in a range of contexts with the emphasis on real-life applications.

The skills and knowledge of mathematics at Intermediate 1 level can be illustrated in technological, vocational, scientific, social and environmental contexts. Candidates' experiences of placing mathematics in context and basing their learning on the solution of problems allows the course to contribute to other areas of learning, to communication skills, to creative thinking and to personal and social development.

COURSE CONTENT

The syllabus is designed to build upon and extend candidates' previous mathematical learning, to introduce them to the areas of algebra and elementary statistics and, depending on the optional unit chosen, to introduce trigonometry and extend algebraic methods or to broaden the candidate's mathematical experience by considering applications of mathematics. The course makes demands over and above the requirements of individual units. Candidates should be able to integrate their knowledge across the component units of the course. Some of the 40 hours of flexibility time should be used to ensure that candidates satisfy the grade descriptions for mathematics courses that involve solving problems, and which require more extended thinking and decision making. Candidates should be exposed to coursework tasks that require them to interpret problems, select appropriate strategies, come to conclusions and communicate intelligibly.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 1)

Where appropriate, mathematical topics should be taught and skills in applying mathematics developed through real-life contexts. Candidates should be encouraged throughout the course to make use of their skills in mental and paper and pencil calculation. They should also be able to make efficient use of calculators and to apply the strategy of checking.

Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, there should be evidence of a checking procedure within the calculation. There are various checking procedures which could be used:

- relating to a context – 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order

The need for checking arises in all mathematical processes and candidates should, therefore, be prepared to provide evidence of checking of more than just numerical calculations within the course assessment, eg, checking the solution of an equation by substitution into the original equation.

It is expected that candidates will be able to demonstrate attainment in the algebraic, trigonometric and statistical content of the course without the use of computer software or sophisticated calculators.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Course Specification: course details (cont)

DETAILED CONTENT

The content listed below should be covered in teaching the course. All of this content will be subject to sampling in the external assessment. Part of this assessment will be carried out in a question paper where a calculator will not be allowed. Any of the topics may be sampled in this part of the assessment. The external assessment will also assess problem solving skills, see the grade descriptions on pages 17 and 18. Where comment is offered, this is intended to help in the effective teaching of the course.
Mental, pencil and paper and calculator computation should be employed as appropriate to the context and the computational ability of the candidate. Necessary checking procedures should be emphasised.

References shown in this style indicate the depth of treatment appropriate to Grades A and B.

CONTENT	COMMENT	APPROACHES
Mathematics 1 (Int 1) **Basic calculations** find a percentage of a quantity express one quantity as a percentage of another [A/B] round calculations to a given degree of accuracy: to nearest whole number; to nearest 10, 100, 1000; to a given number of decimal places solve simple problems on direct proportion	 eg calculations such as 17½% of £240 in the contexts of discount, VAT, simple interest for whole year and for a fraction of a year [A/B]	

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Basic geometric properties find the areas of simple composite shapes find the volumes of cubes and cuboids find the area and circumference of a circle	Composite shapes should include rectangles and right-angled triangles and semi-circles [A/B].	An investigative approach to areas and circumferences of circles should be taken.
Expressions and formulae evaluate expressions evaluate formulae expressed in words evaluate simple formulae expressed in symbols	eg If $a = 20$ and $b = 4$ evaluate $2b - a$. eg Profit is given by selling price less cost price. eg Evaluate $L = 3a + 2b$, $s = vt$, $A = ½\ bh$, $R = V \div I$; for whole number values of variables.	Formulae from other areas of the curriculum, such as Physics, could be used here.
Calculations in everyday contexts carry out calculations involving money in appropriate social contexts use exchange rates to convert from pounds sterling to foreign currency foreign currency to pounds sterling [A/B]	eg Wage rise (added to initial wage); commission; bonus; overtime; hire purchase; insurance premium at £2.90 per £1000 on amount of £64,500.	Wherever possible, candidates should use real-life examples, such as information leaflets from banks, newspaper tables providing exchange rates and insurance tables issued by companies. The importance of checking that an answer is sensible should be stressed here.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Mathematics 2 (Int 1) **Integers** plot and read coordinates in all four quadrants		
add and subtract positive and negative integers subtract a negative integer from an integer [A/B]	Mainly in practical contexts, eg, temperature, height above sea-level, etc. eg 3 – (–2) [A/B]	Candidates who intend to complete the course containing Mathematics 3 (Int 1) require to develop a facility with integers for algebraic manipulation and the solution of equations.
multiply two integers where one is positive and one is negative and divide a negative integer by a positive integer multiply and divide two integers where both are negative and multiply three or more integers [A/B]		
Speed, distance and time interpret distance–time graphs		
recognise the significance of the point of intersection of two graphs, where the graphs are in context		Software packages which draw distance–time graphs could be used here.
calculate time intervals, including those over midnight or midday on the 12-hour clock	Examples would involve straightforward quantities of time such as quarter of an hour.	
distance, speed, time – calculate one, given the other two		Where candidates have access to a scientific calculator, the use of the fraction key could be taught.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
The Theorem of Pythagoras solve problems in right-angled triangles using the Theorem of Pythagoras		An investigative approach should be used to introduce the theorem of Pythagoras.
Simple graphs, charts and tables extract and interpret data from bar graphs, line graphs, pie charts and stem-and-leaf diagrams		Sources of graphs include the media, social subjects, vocational contexts and social contexts, including anything of direct interest to the candidate (eg sport). Candidates could use advanced calculators with statistical functions and computers (eg spreadsheets), to manipulate and graph data. The technology could also be used to graph the same set of data in different ways to compare the suitability of each method. The emphasis should be on comparison and interpretation of graphs and diagrams, including discussion of a wide variety of graphs.
construct bar graphs, line graphs and stem-and-leaf diagrams	Data could be in the form of an ungrouped frequency table.	
interpret trends in graphs		
construct a frequency table from data without class intervals		
construct and interpret a scattergraph	The scattergraph should show high positive or negative correlation, ie, indicate the connection between the variables.	
draw a best-fitting straight line by eye on a scattergraph and use it to estimate the value of one variable given the other		It may be helpful to students to discuss the use of the point $(\overline{x}, \overline{y})$ as a 'hanger' for a best-fitting straight line but it is not a requirement at this level. Similarly, the method of semi-averages (split the data in half and plot the average of each half) may be useful in introducing this topic. There should be informal discussion of correlation, interpolation and extrapolation and the high possibilities of errors in interpreting graphs.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Use of simple statistics calculate the mean, median, mode and range from a data set	At this level a 'data set' denotes a matrix of raw data ie data as it was collected, having had nothing done to it.	Candidates could routinely use spreadsheets (and other appropriate software) and calculators with statistical functions, especially when working with large amounts of (real) data.
calculate the mean, median, mode and range of data presented in an ungrouped frequency table	If some of the elements of data are repeated many times then raw data may be displayed as a frequency table.	
interpret calculated statistics [A/B]	Examples: • compare mean or range for two sets of data • compare individual data points with the mean/mode (commenting 'well above average' or 'about average') Candidates should also compare the different measures of central tendency: 'normally shaped' distributions will illustrate that the mean, mode and median are often very close, but in skewed distributions they can be very different and the use of one particular statistic can be misleading.	Candidates should develop the ability to interpret the meaning and implication of these calculated statistics - for example, they should discuss the concept of 'average' as well as calculating it, especially when discussing the measures in vocational or personal and social education contexts.
state the probability of a simple outcome	Simple outcomes such as: • a 5 from rolling a die numbered 1 to 6; • one value from a given frequency table.	Candidates should be introduced to the idea of probability as a measure of chance. The emphasis should be on 'write down' and 'simple outcome' in a familiar context.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Mathematics 3 (Int 1)		
Simple algebraic operations		
evaluate formulae expressed in symbols	eg $v = u + at$ eg $P = I^2R$, $d = \sqrt{(x^2 + y^2)}$ [A/B]	
manipulate algebraic expressions involving brackets		
multiply expressions	eg $3\ (x + 2) = 3x + 6$ $5(x - 3) = 5x - 15$ $2(x + 2y) = 2x + 4y$	
remove brackets and collect like terms	eg $2x + 3(x + 3y) = 5x + 9y$	
factorise expressions – common factor	eg $3x + 6 = 3(x + 2)$	
solve simple linear equations	eg $x + 3 = 5$ $2x = 3$ $3x - 5 = x + 11$ $2(x + 3) = 14$ eg $\frac{1}{3}x = 7$ [A/B] $x + 7 = 4x - 5$ [A/B]	
solve simple inequalities	eg $2x < 7$ $2x + 1 < 10$	

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Graphical relationships know the equation $y = ax + b$ as the equation of a straight line draw a straight line given its equation in the form $y = ax + b$ by drawing up a table of values	eg $y = 2x + 5$ Candidates should also meet lines with equations of the form $x = a$ and $y = b$.	Candidates could use calculators with graphic facilities and graph-drawing packages on computers within this topic.
Trigonometry in a right-angled triangle solve right-angled triangles using sine, cosine and tangent	Excluding the case where the unknown in the ratio is in the denominator.	
Standard form (scientific notation) interpret index notation, 10^n, as used in standard form rewrite large and small numbers using standard form	eg Interpret 3.2×10^5 as 320 000.	
interpret calculator display perform simple calculations using standard form	eg 2.1 E -4 as 0.000 21. eg The orbit of a satellite is approximately 5.3×10^4 km. How far does the satellite travel in five orbits?	It is assumed that all candidates will use scientific calculators for any calculations in standard form (scientific notation) and that most calculations will be set in context.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Applications of Mathematics (Int 1)		
Straightforward calculations in a social context know the terms: gross pay, net pay, basic pay, overtime, bonus, annual salary	Holiday pay and other common terms related to this context should be used and explained as required.	It is important that candidates are provided with realistic examples, eg, candidates could investigate the method of pay for their choice of career.
know that the following terms refer to deductions: National Insurance, income tax, superannuation, pension contribution		
given the rate of pay, calculate gross pay		
calculate overtime payments	Overtime to be double time and time and a half.	
calculate net pay	Candidates would be given the deductions. Calculation of taxable income and tax deducted is not expected.	
know the meaning of the terms: with (without) loan protection, payment protection, APR	A simple explanation of APR should be given.	
use a loan table: to find the monthly repayment for a given amount		Candidates should be given a variety of loan tables, using real-life examples wherever possible.
to calculate the total repayments based on a set of conditions	Conditions would include with (without) payment protection, amount and the term.	
to calculate the cost of the loan, ie the difference between the total repayments and the loan		

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Logic diagrams know the meaning of the terms: vertices (nodes), order of node, and arcs in a network diagram		Critical path analysis is a relatively recent development in mathematics. The techniques were first used by the Electricity Generating Board in the 1950s when they were trying to reduce the time taken to overhaul electricity generating equipment.
interpret a simple network diagram	eg Consider the shortest route given travelling times, distances, etc.	
recognise statement boxes and decision boxes in a flowchart	Candidates should also be introduced to decision tree diagrams.	The procedure is to list all the jobs to be done, arrange them in a logical order on a diagram and then see what effect this has on the completion time. The techniques suggested here are simple and the problems could be solved by other methods, but the techniques used could be applied to large complex problems.
interpret and use a simple flowchart which contains at least one decision box		Decision tree diagrams are diagrams which display information and are used to find an answer to a question or to sort items into different categories. They are similar to flow charts. For example, in science decision trees are used to assist in the identification of plants, animals and rocks.
enter given data into a spreadsheet		
enter simple formulae into a spreadsheet	eg A formula which calculates the cost by multiplying unit cost by number of items and calculates the total cost.	If candidates are using spreadsheets in other areas of the curriculum, then every effort should be made to ensure that the same package is used within this part of the course. For example, Clarisworks may be used in Business Studies. However it should be noted that most spreadsheet packages use the same terminology and contain the same functions.
replicate (copy and paste) formulae in a spreadsheet		

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
use the SUM function in a spreadsheet use the AVERAGE function in a spreadsheet design a simple spreadsheet **Scale drawings and surface areas of solids** know the eight main compass points know and understand three figure bearings measure bearings in scale drawings three figure bearings: plot L given the distance and bearing from K; and plot M given its bearings from K and L [A/B] construct and interpret scale drawings, (scales expressed as ratio or scaled line) recognise cylinders and triangular prisms from their nets calculate surface areas of triangular prisms and cylinders [A/B]	Construct geometrical models of simple physical situations, eg, navigation, surveying, gradient of a slope, angles of elevation/depression.	When working with spreadsheets, candidates should be aware of the need to format numbers, ie, fixing numbers to two decimal places. Eg, in Clarisworks, to format numbers the candidate would use the Format menu to select the Numbers menu and then fix to two decimal places. This will ensure that all answers are automatically rounded to two decimal places. Wherever possible, this topic should be taught within contexts, such as packaging.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Statistical assignment collect data and illustrate it using a boxplot prepare a numerical summary of a data set consisting of minimum, maximum, quartiles and median calculate the range and interquartile range for a data set use a numerical summary to construct a boxplot compare two or more data sets by constructing and interpreting multiple boxplots	An example to illustrate the techniques involved would be to provide candidates with marks of a maths test out of 50 for two different classes. Candidates should then construct boxplots of the data showing all relevant working. A brief report should then be written on the analysis of the data.	For the purposes of internal assessment, candidates could be asked to either collect their own data or be given data with contextual notes; analyse the data using the techniques listed and interpret the results in context.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 1)

ASSESSMENT

To gain an award in Intermediate 1 Mathematics, the candidate must achieve all the component units of the course, as well as the external assessment. External assessment will provide the basis for grading attainment in the course award.

When units are taken as component parts of a course, candidates should have the opportunity to demonstrate achievement at levels beyond that required to attain each of the unit outcomes. This attainment may, where appropriate, be recorded and used to contribute towards course estimates, and to provide evidence for appeals. Additional details are provided, where appropriate, with the exemplar assessment materials. Further information on the key principles of assessment is provided in the paper *Assessment* (HSDU, 1996) and in *Managing Assessment* (HSDU, 1998).

DETAILS OF THE INSTRUMENTS FOR EXTERNAL ASSESSMENT

The external assessment will take the form of an examination of one and a half hours duration. Candidates will sit either an examination assessing *Mathematics 1 (Int 1), 2 (Int 1)* and *3 (Int 1)*, or one assessing *Mathematics 1 (Int 1), 2 (Int 1)* and *Applications of Mathematics (Int 1).* The external examination will test the candidates' ability to retain and integrate mathematical knowledge across the component units of the course. Each examination will consist of two papers, one of which will not allow the use of a calculator. The two papers will contain a balance of short questions designed mainly to test knowledge and understanding and extended response questions which also assess problem solving skills. These two styles of questions will include ones which are set in more complex contexts to provide evidence for performance at Grades A and B.
The papers will be designed so that approximately 60% of the marks will be opportunities at Grade C.

Non-calculator numerical skills

The following numerical skills may be assessed in the non-calculator paper of the external course examination. These skills may be assessed within a context that requires some knowledge of facts or routine algorithms. For instance the ability to multiply two whole numbers may be required as part of an area of a rectangle question.

Whole numbers:	multiply 2 digit numbers by 2 digit numbers for simple cases eg 38 x 11
Decimals:	add or subtract numbers given to 3 decimal places; multiply or divide a number given to at most 3 decimal places by a single digit whole number; multiply or divide numbers given to at most 3 decimal places by multiples of 10, 100, 1000.
Fractions:	simple fraction of a quantity eg 2/3 of 18
Percentages:	find commonly used whole number percentages of numbers and quantities eg 5% of £3.20, 70% of 8kg.

Integers: add and subtract positive and negative numbers (mainly in practical contexts such as temperature, height above sea-level etc); multiply two integers where one is positive and one is negative and divide a negative integer by a positive integer.

Note: The following integer skills may also be assessed but these are at A/B level; subtract a negative integer from an integer; multiply and divide two integers where both are negative and multiply three or more integers.

GRADE DESCRIPTIONS

The descriptions below are of expected performances at Grade C and at Grade A. They are intended to assist candidates, teachers, lecturers and users of the certificate and to help establish standards when question papers are being set. The grade of the award will be based on the total score obtained in the examination.

Intermediate 1 Mathematics courses should enable candidates to solve problems which integrate mathematical knowledge across performance criteria, outcomes and units, and which require extended thinking and decision making. The award of Grades A, B or C is determined by the candidate's demonstration of the ability to apply knowledge and understanding to problem solving. To achieve Grades A and B in particular, this demonstration will involve more complex contexts including the depth of treatment indicated in the detailed content tables.

In solving problems, candidates should be able to:

(a) interpret the problem and consider what might be relevant;
(b) decide how to proceed by selecting an appropriate strategy;
(c) implement the strategy through applying mathematical knowledge and understanding, and come to a conclusion;
(d) decide on the most appropriate way of communicating the solution to the problem in an intelligible form.

Familiarity and complexity affect the level of difficulty of problems. It is generally easier to interpret and communicate information in contexts where the relevant variables are obvious and where their inter-relationships are known. It is usually more straightforward to apply a known strategy than to modify one or devise a new one. Some concepts are harder to grasp and some techniques more difficult to apply, particularly if they have to be used in combination.

Exemplification of problem solving at Grade C and Grade A

(a) Interpret the problem and consider what might be relevant
At Grade C candidates should be able to interpret mathematical information as it arises within:

- the description of real-life situations
- the context of other subjects
- the context of familiar areas of mathematics

Grade A performance is demonstrated through coping with the interpretation of more complex contexts requiring a higher degree of reasoning ability in the areas described above.

(b) Decide how to proceed by selecting an appropriate strategy
At Grade C candidates should be able to tackle problems by selecting an appropriate strategy.

Grade A performance is demonstrated through an ability to decide on and apply strategies to more complex contexts.

(c) Implement the strategy through applying mathematical knowledge and understanding and come to a conclusion
At Grade C candidates should be able to use their knowledge and understanding to carry through their chosen strategy and come to a conclusion. They should be able to process data in numerical and symbolic form to a required degree of accuracy and marshal facts.

Grade A performance is demonstrated through an ability to cope with processing data in more complex situations.

(d) Decide on the most appropriate way of communicating the solution to the problem in an intelligible form
At Grade C candidates should be able to communicate mathematical information intelligibly and to express the solution in language appropriate to the situation.

Grade A performance is demonstrated through an ability to communicate intelligibly in more complex situations.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 1)

APPROACHES TO LEARNING AND TEACHING

The learning and teaching process should foster positive attitudes to the subject. Exposition to a group or class remains an essential technique at this level and active candidate involvement in learning should be encouraged through questioning and discussion. However, investigative approaches to learning should also feature prominently. Where appropriate, new skills and concepts should be introduced within a context and, when suitable, candidates should be given the opportunity to work co-operatively. Coursework tasks can support these approaches and simultaneously allow the grade descriptions on problem solving to be met.

It is important to realise that the skills to be developed cannot always be completely justified in terms of the immediate problem presented to candidates. Manipulative skills are, however, an important part of the mathematician's toolkit and candidates following an Intermediate 1 course with the intention of progressing to Intermediate 2 should develop these to an acceptable degree of fluency.

One of the aims of mathematics courses is to prepare candidates for the future demands of adult life, employment, further study and training. Such an aim implies that all candidates should be encouraged to tackle problems as they appear in the real world. Such problems are not always well defined and may require information to be sought and decisions to be made. Work of this kind will allow candidates to see the relevance of what they are learning. For those candidates who wish to progress to Intermediate 2, further study will involve more symbolic mathematics and many will readily develop their mathematical thinking through investigations where generalisation is possible, and where rigour is encouraged in communicating conclusions.

Candidates should be encouraged to make appropriate use of technology. Calculators can be utilised as powerful tools for processing data, especially in the study of statistics. Candidates should maintain their skills in written and mental calculation, and the use of the calculator should complement and not replace these skills. Candidates should use calculators sensibly and appreciate the need to estimate answers and check calculations.

References to approaches to learning and teaching are made at appropriate points within the *detailed content* section of this document.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 1)

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SUBJECT GUIDES

A Subject Guide to accompany the Arrangements documents has been produced by the Higher Still Development Unit (HSDU) in partnership with the Scottish Consultative Council on the Curriculum (SCCC) and Scottish Further Education Unit (SFEU). The Guide provides further advice and information about:

- support materials for each course
- learning and teaching approaches in addition to the information provided in the Arrangements document
- assessment
- ensuring appropriate access for candidates with special educational needs

The Subject Guide is intended to support the information contained in the Arrangements document. The SQA Arrangements documents contain the standards against which candidates are assessed.

SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Mathematics 1 (Intermediate 1)

NUMBER D321 10

COURSE Mathematics (Intermediate 1)

SUMMARY

This unit seeks to provide practice in numerical skills and an introduction to geometry and algebra. It is a mandatory unit of the Mathematics Intermediate 1 course.

OUTCOMES

1 Perform basic calculations.
2 Use basic geometric properties.
3 Evaluate expressions and formulae.
4 Perform calculations in everyday contexts.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- Standard Grade Mathematics Foundation award
- *Using Mathematics 3 (Acc 3)* unit
- equivalent

CREDIT VALUE

1 credit at Intermediate 1.

Administrative Information

Superclass: KC

Publication date: November 1999

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Version: 03

National Unit Specification: general information (cont)

UNIT Mathematics 1 (Intermediate 1)

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	None
Core skills components for the unit	Using Number Int 1

Additional information about core skills is published *in Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Mathematics 1 (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Perform basic calculations.

Performance criteria

(a) Find a percentage of a quantity.
(b) Round calculations to a given degree of accuracy.
(c) Solve simple problems on direct proportion.

OUTCOME 2

Use basic geometric properties.

Performance criteria

(a) Find the area of a simple composite shape.
(b) Find the volume of a cube and a cuboid.
(c) Find the area and the circumference of a circle.

OUTCOME 3

Evaluate expressions and formulae.

Performance criteria

(a) Evaluate an expression.
(b) Evaluate a formula expressed in words.
(c) Evaluate a simple formula expressed in symbols.

OUTCOME 4

Perform calculations in everyday contexts.

Performance criteria

(a) Carry out calculations involving money in appropriate social contexts.
(b) Use a table of exchange rates to convert from pounds sterling to foreign currency.

National Unit Specification: statement of standards (cont)

UNIT Mathematics 1 (Intermediate 1)

Evidence requirements

Although there are various ways of demonstrating achievement of the outcomes, evidence would normally be presented in the form of a closed book test under controlled conditions. Examples of such tests are contained in the National Assessment Bank.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Unit Specification: support notes

UNIT Mathematics 1 (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Each mathematics unit at Intermediate 1 level aims to build upon and extend candidates' mathematical knowledge and skills. Within this unit, basic calculations in number and money introduced at Access 3 level are extended within Outcome 1 and applied, in Outcome 4, to calculations set in a wide variety of contexts which are relevant to the everyday needs of candidates, such as hire purchase, wages, etc.

Outcome 2 extends the work on area at Access 3 level and introduces the formulae for circumference and area of the circle.

Outcome 3 introduces the use of symbols in simple formulae and provides a basis for the work on formulae contained in both *Mathematics 3 (Int 1)* and *Applications of Mathematics (Int 1)*.

The recommended content for this unit can be found in the course specification. The *detailed content* section provides illustrative examples to indicate the depth of treatment required to achieve a unit pass and advice on teaching approaches.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates should be encouraged to make use of their skills of mental calculation, to make efficient use of calculators and to apply the strategy of checking. Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, there should be evidence of a checking procedure within the calculation. There are various checking procedures which could be used:

- relating to a context - 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order

Further advice on learning and teaching approaches is contained within the Subject Guide for Mathematics.

National Unit Specification: support notes (cont)

UNIT Mathematics 1 (Intermediate 1)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment for this unit will normally be in the form of a closed book test. Such tests should be carried out under supervision and it is recommended that candidates attempt an assessment designed to assess all the outcomes within the unit. Successful achievement of the unit is demonstrated by candidates achieving the thresholds of attainment specified for all the outcomes in the unit. Candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained. Further advice on assessment and retesting is contained within the National Assessment Bank.

It is expected that candidates will be able to achieve the algebraic performance criteria in the unit without the use of computer software or sophisticated calculators.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Mathematics 2 (Intermediate 1)

NUMBER D322 10

COURSE Mathematics (Intermediate 1)

SUMMARY

This unit seeks to provide the opportunity to study further aspects of mathematics and to be introduced to elementary statistics. It is a mandatory unit of the Mathematics Intermediate 1 course.

OUTCOMES

1 Use integers.
2 Use speed, distance and time.
3 Use the Theorem of Pythagoras.
4 Use simple graphs, charts and tables.
5 Use simple statistics.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- *Mathematics 1 (Int 1)*
- equivalent

CREDIT VALUE

1 credit at Intermediate 1.

Administrative Information

Superclass: RB

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Mathematics 2 (Intermediate 1)

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	None
Core skills components for the unit	Using Graphical Information Int 1

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Mathematics 2 (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Use integers.

Performance criteria

(a) Plot and read coordinates.
(b) Add and subtract positive and negative integers.

OUTCOME 2

Use speed, distance and time.

Performance criteria

(a) Interpret a distance-time graph.
(b) Solve problems involving speed, distance and time.

OUTCOME 3

Use the Theorem of Pythagoras.

Performance criterion

(a) Solve a problem in a right-angled triangle using the Theorem of Pythagoras.

OUTCOME 4

Use simple graphs, charts and tables.

Performance criteria

(a) Construct and interpret a frequency table and a stem-and-leaf diagram.
(b) Interpret a piechart.
(c) Construct a scattergraph, draw (by eye) a best-fitting straight line and use it to estimate.

National Unit Specification: statement of standards (cont)

UNIT Mathematics 2 (Intermediate 1)

OUTCOME 5

Use simple statistics.

Performance criteria

(a) Find the mean, median, mode and range from a data set.
(b) State the probability of a simple outcome.

Evidence requirements

Although there are various ways of demonstrating achievement of the outcomes, evidence would normally be presented in the form of a closed book test under controlled conditions. Examples of such tests are contained in the National Assessment Bank.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Unit Specification: support notes

UNIT Mathematics 2 (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Each mathematics unit at Intermediate 1 level aims to build upon and extend candidates' mathematical knowledge and skills. In this unit, Outcome 1 introduces negative integers within the context of Cartesian coordinates, and addition and subtraction are extended to include negative integers. Outcome 2 is concerned with the inter-relationship between speed, distance and time, and work here should focus on real-life contexts as should the work on the Theorem of Pythagoras within Outcome 3. Outcomes 4 and 5 extend the range of common statistical graphs to include stem-and-leaf diagrams, with a more formal treatment of the interpretation of graphs, and introduce the calculation of simple statistical measures.

The recommended content for this unit can be found in the course specification. The *detailed content* section provides illustrative examples to indicate the depth of treatment required to achieve a unit pass and advice on teaching approaches.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates should be encouraged to make use of their skills of mental calculation, to make efficient use of calculators and to apply the strategy of checking. Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, there should be evidence of a checking procedure within the calculation. There are various checking procedures which could be used:

- relating to a context - 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order

Further advice on learning and teaching approaches is contained within the Subject Guide for Mathematics.

National Unit Specification: support notes (cont)

UNIT Mathematics 2 (Intermediate 1)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment for this unit will normally be in the form of a closed book test. Such tests should be carried out under supervision and it is recommended that candidates attempt an assessment designed to assess all the outcomes within the unit. Successful achievement of the unit is demonstrated by candidates achieving the thresholds of attainment specified for all the outcomes in the unit. Candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained. Further advice on assessment and retesting is contained within the National Assessment Bank.

It is expected that candidates will be able to achieve the numerical and statistical performance criteria in the unit without the use of computer software or sophisticated calculators.

In assessment, candidates are required to show their working in carrying out algorithms and processes.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Mathematics 3 (Intermediate 1)

NUMBER D323 10

COURSE Mathematics (Intermediate 1)

SUMMARY

This unit seeks to extend the candidate's mathematical experience in the areas of algebra, including graphical relationships and calculation, and of elementary trigonometry. It is an optional unit of the Mathematics Intermediate 1 course.

OUTCOMES

1 Perform simple algebraic operations.
2 Use graphical relationships.
3 Use trigonometry in a right-angled triangle.
4 Use standard form.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- *Mathematics 1 (Int 1)*
- *Mathematics 2 (Int 1)*
- equivalent

Administrative Information

Superclass: RB

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Mathematics 3 (Intermediate 1)

CREDIT VALUE

1 credit at Intermediate 1.

CORE SKILLS

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Mathematics 3 (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME

Perform simple algebraic operations.

Performance criteria

(a) Evaluate a formula expressed in symbols.
(b) Manipulate an algebraic expression involving brackets.
(c) Factorise an expression using a common factor.
(d) Solve simple linear equations.
(e) Solve simple inequalities.

OUTCOME 2

Use graphical relationships.

Performance criteria

(a) Draw a straight line given its equation in the form $y = ax + b$ by drawing up a table of values.

OUTCOME 3

Use trigonometry in a right-angled triangle.

Performance criteria

(a) Solve right-angled triangles using trigonometry.

OUTCOME 4

Use standard form (scientific notation).

Performance criteria

(a) Interpret numbers expressed in standard form.
(b) Convert a large and a small number into standard form.
(c) Use standard form in a simple calculation.

National Unit Specification: statement of standards (cont)

UNIT Mathematics 3 (Intermediate 1)

Evidence requirements

Although there are various ways of demonstrating achievement of the outcomes, evidence would normally be presented in the form of a closed book test under controlled conditions. Examples of such tests are contained in the National Assessment Bank.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Unit Specification: support notes

UNIT Mathematics 3 (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Each mathematics unit at Intermediate 1 level aims to build upon and extend candidates' mathematical knowledge and skills. The use of formulae and integers in *Mathematics 1* and *2 (Int 1)* is extended to a more formal treatment of algebra in Outcome 1. The use of algebra within a simple geometrical context is illustrated through the straight line in Outcome 2. It should be noted that candidates are required to draw the straight line from a table of values only and that this outcome is extended within *Mathematics 1 (Int 2)* to a more formal treatment of the straight line. The properties of right-angled triangles are extended further by the introduction of elementary trigonometry in Outcome 3, and the use of standard form and the calculator are explored in Outcome 4.

The recommended content for this unit can be found in the course specification. The *detailed content* section provides illustrative examples to indicate the depth of treatment required to achieve a unit pass and advice on teaching approaches.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates should be encouraged to make use of their skills in mental calculation, to make efficient use of calculators, and to apply the strategy of checking. Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, there should be evidence of a checking procedure within the calculation. There are various checking procedures which could be used:

- relating to a context - 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order

Further advice on learning and teaching approaches is contained within the Subject Guide for Mathematics.

National Unit Specification: support notes (cont)

UNIT Mathematics 3 (Intermediate 1)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment for this unit will normally be in the form of a closed book test. Such tests should be carried out under supervision and it is recommended that candidates attempt an assessment designed to assess all the outcomes within the unit. Successful achievement of the unit is demonstrated by candidates achieving the thresholds of attainment specified for all the outcomes in the unit. Candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained. Further advice on assessment and retesting is contained within the National Assessment Bank.

It is expected that candidates will be able to achieve the algebraic and trigonometric performance criteria in the unit without the use of computer software or sophisticated calculators.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Applications of Mathematics (Intermediate 1)

NUMBER D324 10

COURSE Mathematics (Intermediate 1)

SUMMARY

This unit seeks to provide candidates with the opportunity to study further mathematics with the emphasis on applying mathematics and statistics to problems and assignments. It is an optional unit of the Mathematics Intermediate 1 course.

OUTCOMES

1 Perform straightforward calculations in a social context.
2 Interpret and design logic diagrams.
3 Use scale drawings and nets of solids.
4 Undertake a short statistical assignment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- *Mathematics 1 (Int 1)*
- *Mathematics 2 (Int 1)*
- equivalent

Administrative Information

Superclass: RB

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Applications of Mathematics (Intermediate 1)

CREDIT VALUE

1 credit at Intermediate 1.

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	Numeracy	Int 1
Additional core skills components for the unit	None	

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Applications of Mathematics (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Perform straightforward calculations in a social context.

Performance criteria

(a) Calculate net earnings given rates of pay, including overtime, bonuses and deductions.
(b) Use a loan table to calculate total repayment based on a set of conditions.

OUTCOME 2

Interpret and design logic diagrams.

Performance criteria

(a) Interpret a simple network diagram.
(b) Interpret and use a simple flowchart.
(c) Design a simple spreadsheet.

OUTCOME 3

Use scale drawings and nets of solids.

Performance criteria

(a) Use a three figure bearing.
(b) Construct and interpret a scale drawing.
(c) Recognise cylinders and triangular prisms from their nets.
(d) Calculate the surface area of a triangular prism.

Evidence requirements

Although there are various ways of demonstrating achievement of Outcomes 1, 2 and 3, evidence would normally be presented in the form of a closed book test under controlled conditions. Examples of such tests are contained in the National Assessment Bank.

National Unit Specification: statement of standards (cont)

UNIT Applications of Mathematics (Intermediate 1)

OUTCOME 4

Undertake a short statistical assignment.

Performance criteria

(a) Illustrate (tabulate) data.
(b) Analyse the data.
(c) Communicate conclusions.

Evidence requirements

Using the statistical content listed in the *detailed content* on page 16, the assignment must satisfy the performance criteria of Outcome 4. A report on the project is required from each individual candidate. The report may include sets of data, graphs, computer printout, calculated statistics, consideration of probability and a conclusion. Examples of assignments are contained in the National Assessment Bank.

In assessments, candidates are required to show their working in carrying out algorithms and processes.

National Unit Specification: support notes

UNIT Applications of Mathematics (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Each mathematics unit at Intermediate 1 level aims to build upon and extend candidates' mathematical knowledge and skills. This unit is intended primarily to meet the needs of candidates who do not intend to progress to Intermediate 2 level mathematics, but who may progress to courses or employment which require the application of mathematics. The emphasis, therefore, is placed on real-life applications, and on involving candidates in extended problems and assignments requiring them to make decisions and draw comparisons. The contexts for the applications should be as up to date as possible and, consequently, teachers, lecturers and tutors should try to keep abreast of changes and trends to ensure that candidates are working with current data and practices.

Within Outcome 1, calculation skills acquired previously are applied in the contexts of earning and borrowing, both of which are highly relevant to day to day existence. Modern methods of sequencing and scheduling operations, which are also linked closely to the use of technology, are introduced in Outcome 2, where candidates should acquire an awareness of the importance of logical thinking in most activities. The realistic and practical aspects of a variety of contexts involving scale drawings are emphasised in Outcome 3. Also in Outcome 3, the work on area within *Mathematics 1 (Int 1)* is extended to surface areas of triangular prisms. This content should be taught, wherever possible, within a context, such as packaging. In Outcome 4 candidates are required to undertake a statistical assignment which should draw on the statistical content listed on page 16 of the *detailed content*.

The recommended content for this unit can be found in the course specification. The *detailed content* section provides illustrative examples to indicate the depth of treatment required to achieve a unit pass and advice on teaching approaches.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates should be encouraged to make use of their skills of mental calculation, to make efficient use of calculators and to apply the strategy of checking. Numerical checking or checking a result against the context in which it is set is an integral part of every mathematical process. In many instances, the checking can be done mentally, but on occasions, to stress its importance, there should be evidence of a checking procedure within the calculation. There are various checking procedures which could be used:

- relating to a context - 'How sensible is my answer?'
- estimate followed by a repeated calculation
- calculation in a different order

National Unit Specification: support notes (cont)

UNIT Applications of Mathematics (Intermediate 1)

Further advice on learning and teaching approaches is contained within the subject guide for Mathematics.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment for this unit will normally be in the form of a closed book test. Such tests should be carried out under supervision and it is recommended that candidates attempt an assessment designed to assess all the outcomes within the unit. Successful achievement of the unit is demonstrated by candidates achieving the thresholds of attainment specified for all the outcomes in the unit. Candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained. Further advice on assessment and retesting is contained within the National Assessment Bank.

The fourth outcome is assessed by means of a report on a statistical assignment which meets the performance criteria.

It is expected that candidates will be able to achieve the numerical and statistical performance criteria of this unit without the use of computer software or sophisticated calculators.

In assessments, candidate are required to show their working in carrying out algorithms and processes.

Further advice on assessment and retesting is contained within the National Assessment Bank.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).