SCOTTISH QUALIFICATIONS AUTHORITY

MATHEMATICS
Intermediate 2

Fourth edition – published March 2002

SCOTTISH QUALIFICATIONS AUTHORITY

NOTE OF CHANGES TO ARRANGEMENTS
FOURTH EDITION PUBLISHED MARCH 2002

COURSE TITLE:	Mathematics (Intermediate 2)
COURSE NUMBERS AND TITLES FOR ENTRY TO COURSES:	C100 11 Mathematics: Maths 1, 2 and 3 C101 11 Mathematics: Maths 1, 2 and Applications

National Course Specification

Course Details:	Course structure section has been updated to show the new codes and titles **for entry** to courses in Mathematics with optional routes.

National Unit Specification

All Units:	No changes.

SCOTTISH QUALIFICATIONS AUTHORITY

National Course Specification

MATHEMATICS (INTERMEDIATE 2)

COURSE NUMBERS

C100 11 Mathematics: Maths 1, 2 and 3
C101 11 Mathematics: Maths 1, 2 and Applications

COURSE STRUCTURE

In order to ensure the accurate and complete transfer of data to and from centres, new codes and titles **for entry** to courses in Mathematics with optional routes have been introduced to reflect the options chosen by candidates. The course code C056 11 for Mathematics (Intermediate 2) will no longer be acceptable for entry for the summer or winter diets. The codes detailed below must be used.

Unit codes and titles remain unchanged. There will be no change to the titles of the Mathematics courses as they appear on the certificate.

C100 11 Mathematics: Maths 1, 2 and 3

This course consists of three mandatory units as follows:

D321 11	***Mathematics 1 (Int 2)***	***1 credit (40 hours)***
D322 11	***Mathematics 2 (Int 2)***	***1 credit (40 hours)***
D323 11	***Mathematics 3 (Int 2)***	***1 credit (40 hours)***

C101 11 Mathematics: Maths 1, 2 and Applications

This course consists of three mandatory units as follows:

D321 11	***Mathematics 1 (Int 2)***	***1 credit (40 hours)***
D322 11	***Mathematics 2 (Int 2)***	***1 credit (40 hours)***
D324 11	***Applications of Mathematics (Int 2)***	***1 credit (40 hours)***

Administrative Information

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National Course Specification: general information (cont)

COURSE Mathematics (Intermediate 2)

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 General award
- Intermediate 1 Mathematics or its component units including *Mathematics 3 (Int 1)*
- equivalent

It should be noted that *Mathematics 2 (Int 2)* assumes knowledge of the statistical content of *Mathematics 2 (Int 1).*

CORE SKILLS

This course gives automatic certification of the following:

Complete core skills for the course	Numeracy	Int 2
Additional core skills for the course	Critical Thinking	Int 2

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 2)

RATIONALE

As with all mathematics courses, Intermediate 2 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 2 Mathematics course, which contains *Mathematics 1 (Int 2)*, *2 (Int 2)* and *3 (Int 2)* is designed to meet the needs of candidates who wish to progress to Higher 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 Higher course.

Mathematics 1 (Int 2) and *2 (Int 2)* taken together with *Applications of Mathematics (Int 2)* form the basis of a course designed to meet the needs of candidates who require a mathematics qualification at Intermediate 2 level, but who do not intend to proceed to a mathematics course at Higher 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 2 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 in the areas of arithmetic, algebra, geometry, trigonometry and statistics. 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 which involve solving problems and which require more extended thinking and decision making. Candidates should be exposed to coursework tasks which require them to interpret problems, select appropriate strategies, come to conclusions, and communicate intelligibly.

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 written and 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

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 20 and 21. 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 2)		
Calculations involving percentages carry out calculations involving percentages in appropriate contexts: appreciation/depreciation	One of the examples of appreciation should be compound interest.	Compound interest and appreciation/ depreciation provide ample opportunities for candidates to experience using percentage calculations in context.
Volumes of solids find the volumes of spheres, cones and prisms	Formulae should be given. Prisms to include cylinders.	Rounding to a given number of significant figures should always be within a context. Candidates should be aware of the problems caused by rounding too early, and should be encouraged to use full calculator accuracy in order to ensure that early rounding does not significantly alter the accuracy of an answer.
round calculations to a required number of significant figures		

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Linear relationships find the gradient of a straight line between two points (x_1, y_1) and (x_2, y_2) know that in the equation $y = ax + b$ of a straight line, 'a' represents the gradient and 'b' represents the intercept on the y-axis and use this to sketch the line without drawing accurately determine the equation of a straight line in the form $y = ax + b$ from its graph		Candidates should be encouraged to use the graphic facility on calculators to investigate the effects of varying the gradient and the y-intercept of straight lines.
Algebraic operations multiply algebraic expressions involving brackets	eg $x(x + 2y) = x^2 + 2xy$ eg $(3x + 5)(x - 1) = 3x^2 + 2x - 5$ eg $(x + 2)(x^2 - 3x + 1) = x^3 - x^2 - 5x + 2$ [A/B]	
factorise algebraic expressions: common factor difference of two squares with numerical coefficients >1	eg $x^2 + 3x = x(x + 3)$ eg $x^2 - y^2 = (x + y)(x - y)$ eg $4x^2 - 9y^2 = (2x - 3y)(2x + 3y)$ [A/B]	
factorise trinomial expressions	eg $x^2 + x - 6 = (x + 3)(x - 2)$ eg $2x^2 - 5x - 3 = (2x + 1)(x - 3)$ [A/B] $3x^4 + 5x^2 - 2 = (3x^2 - 1)(x^2 + 2)$ [A/B]	

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Properties of the circle find the length of an arc of a circle find the area of a sector of a circle use the properties of circles: relationship between tangent and radius angle in a semi-circle the interdependence of the centre, bisector of a chord and a perpendicular to a chord [A/B]		An investigative approach should be taken to introduce these topics. For example, angle in a semi-circle can be introduced by candidates measuring angles taken from the diameter to points inside and outside the circle. Questions can be asked, such as: what happens to the size of the angle as the point gets closer to the circumference? What do you think happens if the point lies on the circumference? Is this true for all circles? Interactive geometry packages could also be used for an investigative approach to this topic.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Mathematics 2 (Int 2) The statistical content of Mathematics 2 (Int 1) is underlined and should be integrated into the teaching of this unit. This content is required for progression purposes and will be assessed only as part of the overall statistical content. **Trigonometry** find the sine, cosine and tangent of angles other than acute angles find the area of a scalene triangle using area = ½ *bc* sin *A* solve scalene triangles by using the Sine Rule/Cosine Rule use the Cosine Rule to find an angle of a triangle, given all three sides [A/B] **Simultaneous linear equations** construct formulae to describe a linear relationship		Sine Rule and Cosine Rule should always be applied in context. The results could be proved using an investigative approach. Candidates should be allowed to solve scalene triangles using right-angled trigonometry in numerical examples, before going on to prove the general rule using literals.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
know the significance of the point of intersection of two graphs: solve simultaneous linear equations in two variables graphically solve simultaneous linear equations in two variables algebraically		Examples in context should be used here to introduce this topic, for example: car hire costs, electricity tariffs, where the point of intersection has a 'real-life' meaning.
Graphs, charts and tables extract and interpret data from bar graphs, line graphs, pie charts and stem-and-leaf diagrams construct bar graphs, line graphs 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). This work (ie underlined content) is covered in Mathematics 2 (Int 1).
construct and interpret a scattergraph add a cumulative frequency column to an ungrouped frequency table find the median and quartiles from a data set or ungrouped frequency table		Candidates should be familiar with the use of advanced calculators and computers (ie spreadsheets) to manipulate and graph data.
construct and interpret boxplots and dotplots construct a piechart		Note that, in order to be able to construct a boxplot, quartiles must first be calculated.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Use of simple statistics calculate the mean, mode and range of a data set or an ungrouped frequency table	At this level a 'data set' denotes a matrix of raw data ie data as it was collected, having had nothing done to it. If some elements of data are repeated many times then raw data may be displayed as a frequency table.	Candidates should be familiar with calculation of the mean, median, mode and range from a data set and from an ungrouped frequency table and with the interpretation of those statistics. This work (ie underlined content) is covered in Mathematics 2 (Int 1).
calculate the semi-interquartile range from a data set or ungrouped frequency table calculate the standard deviation of a data set	At this level, almost every context met by candidates in real-life, in examinations, or in support materials, will involve data obtained as a random sample from a population. The formula for the sample standard deviation, s, is $s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2-(\sum x)^2/n}{n-1}}$ where n is the sample size. The second version is much easier to compute, with or without a calculator, and avoids the possibility of rounding errors.	Technology - statistical calculators and spreadsheets - could be extensively used. Software packages can be used to explore the effect of changing data on the statistics calculated. Candidates should develop a good understanding of the fact that standard deviation is a measure of spread and an awareness of what actual values mean.
determine the equation of a best-fitting straight line on a scattergraph and use it to estimate a *y*-value given the *x*-value	Correlation should be strong positive or negative.	The discussion of correlation (and the possible errors in interpolation and extrapolation) should include all types of correlation, along with examples of correlation which do not come from any cause-and-effect.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
know that probability is a measure of chance between 0 and 1 find probability defined as: $\frac{\text{no. of favourable outcomes}}{\text{total no. of outcomes}}$ where all the outcomes are equally likely	Probability should be found from (experimental) data or from knowledge of the situation (eg, probability of drawing an ace from a pack of cards). Candidates should be aware that probability from experimental data is an estimate.	Simulations provide a good context for discussion of probability - starting with practical techniques and going on to random number functions on calculators and computers.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Mathematics 3 (Int 2)		
Algebraic operations reduce an algebraic fraction to its simplest form	eg $\frac{(x+1)^2}{(x+1)^3} = \frac{1}{x+1}$, $x \neq -1$	
apply the four rules to algebraic fractions	eg $\frac{4}{a} + \frac{3}{b} = \frac{4b+3a}{ab}$, $a, b \neq 0$	
change the subject of formulae	eg $v = u + at$ for t	
simplify surds	$\sqrt{ab} = \sqrt{a}\sqrt{b}$; $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$;	Candidates should be encouraged to investigate properties of √: for example, does $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$? This can be extended to investigating examples such as — does $\sin(a + b) = \sin a + \sin b$? — does $(a + b)^2 = a^2 + b^2$?
express with a rational denominator [A/B]	$\frac{a}{\sqrt{b}} = \frac{a\sqrt{b}}{b}$ [A/B]	
simplify expressions using the laws of indices	eg $\frac{x^2x^4}{x^3} = \frac{x^6}{x^3} = x^3$, $x \neq 0$ $5b^{-2} \times 3b = 15b^{-1}$ $m^{1/2} \times 3m^{-3/2} = 3m^{-1}$ $2x^2 \div 4x = 0.5x$ eg $(x^{3/2})^2 = x^3$ [A/B] $\frac{1}{\sqrt{(3x^6)}} = \frac{1}{\sqrt{3}} x^{-3}$ [A/B]	The ability to use the laws of indices correctly is an essential skill at this level and is excellent preparation for the Higher Mathematics units/course.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Quadratic functions recognise quadratics of the form $y = kx^2$ and $y = (x + a)^2 + b$; $a, b, k \in$ Z from their graphs		Use should be made of the graphic facility on calculators to allow an investigative approach to the teaching of the solution of a quadratic equation. Candidates should be encouraged to discover the roots of a variety of quadratics by zooming in on solutions, or by using the intersect facility offered by most modern graphic calculators. The link between the factorised form of a quadratic and the roots can then be highlighted, and it can be shown that the use of algebra provides a quicker and more accurate way to find the roots of a quadratic.
identify the nature and coordinates of the turning point and the equation of the axis of symmetry of a quadratic of the form $y = k(x + a)^2 + b$; $a, b \in$ Z, $k = \pm 1$	$y = kx^2$ should be included.	
know the meaning of the term 'roots of a quadratic equation'		
solve quadratic equations graphically		
solve quadratic equations by factorisation and by using the quadratic formula	eg $x^2 + x - 6 = 0$ $x^2 + 2x - 8 = 0$ eg $2x^2 - 5x - 3 = 0$ [A/B] $2x^2 - 5x + 1 = 0$ [A/B]	Introducing quadratics which do not have integer roots will then serve to illustrate to candidates the limitations of the graphic facility and lead to an introduction of the quadratic formula as a more precise way of solving quadratic equations. Use could also be made of computer algebra packages.
Further trigonometry recognise the graphs of sine, cosine and tangent functions		Candidates could explore the properties of these graphs through the use of graphic calculators or graph-drawing packages on computers.
sketch and identify trigonometric functions involving a multiple angle involving a phase angle [A/B]	eg $f(x) = 2 \sin 3x°$ eg $f(x) = \cos(x + 30)°$ [A/B]	Maximum, minimum and periodicity should all be considered.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
solve simple trigonometric equations in degrees define the period of a trigonometric function either from its graph or from its equation simplify expressions using $\sin^2 A + \cos^2 A = 1$ and $\tan A = \frac{\sin A}{\cos A}$ [A/B]	eg $2 \sin x° + 1 = 0$ $(0 \leq x \leq 360)$ eg $\frac{(1-\cos^2 x)}{2\cos x}$ [A/B]	Candidates should be shown how to solve trigonometric equations graphically as well as algebraically.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
Applications of Mathematics (Int 2)		
Straightforward calculations in a social context know the terms: gross pay, net pay, basic pay, wage, overtime, bonus, annual salary, monthly salary, commission, income tax, taxable income, tax allowances, superannuation, National Insurance	Holiday pay and other common terms related to this context should be used and explained as required, eg, pension contributions, company share schemes.	It is important that candidates are provided with realistic examples.
calculate overtime payments and incentive payments such as commission		
calculate net earnings given salary, details of incentive schemes and details of deductions	Incentive schemes such as commission.	
calculate tax deductions given details of earnings, allowances and rates of tax	Tax should be calculated both annually and monthly.	
know the meaning of the terms: with (without) loan protection, payment protection, APR, minimum payment, credit limit	The concept of APR should be explained to candidates.	
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
• understand the different charges involved in using a credit card	eg, Cash withdrawal charges, overdraft, minimum payment.	
• solve problems involving the interpretation of information presented in loan repayment tables	eg, The comparison of the cost of a loan with and without loan protection. The problems should be structured and could involve percentage calculations as well as the reading of the 'small print'.	
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.
construct and interpret a network diagram construct and interpret a tree 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.
interpret and use a flowchart which contains at least two decision boxes		The techniques suggested here are simple and problems could be solved by other methods, but the techniques used could be applied to large complex problems. 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 flowcharts. For example, in science decision trees are used to assist in the identification of plants, animals and rocks.

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
enter given data into a spreadsheet enter formulae into a spreadsheet replicate (copy and paste) formulae in a spreadsheet use the SUM and AVERAGE functions in a spreadsheet		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.
design a spreadsheet	eg A spreadsheet which calculates compound interest.	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. Candidates at this level should also be introduced to the graph drawing facility of spreadsheets and possibly make use of this within their statistical assignment.
Formulae interpret and use formulae expressed in words in applications	The applications should include other areas of the curriculum such as technological studies, engineering, science, economics, etc. eg, The following rule is used to determine the correct dosage of medicine for children. child's dose = adult dose x $\frac{\text{weight of child in pounds}}{150 \text{ pounds}}$	The aim of this section is to reinforce substitution into formulae and solution of straightforward equations within real-life applications. Candidates would not be required to change the subject of formulae, although they could be taught to do this in simple cases. Alternatively, the numbers could be substituted in first and then the resulting

National Course Specification: course details (cont)

CONTENT	COMMENT	APPROACHES
interpret and use formulae expressed in symbols in applications	The approximate length of belt needed to connect two pulleys is given by the formula $B = 2L + 1.625(D + d)$, where B is the length of the belt, L is the distance between two pulley centres, D is the diameter of the larger pulley and d is the diameter of the smaller pulley. The formulae for surface areas of spheres, cones and composite solids should also be introduced within contexts.	equation solved to find the unknown variable.
Statistical assignment estimate the mean, median, mode, quartiles and semi-interquartile range for grouped or interval data in a frequency table estimate: the mean by using the midpoint of each group or interval the mode by using the previous and next frequency to the modal class the median and quartiles from an ogive semi-interquartile range = $\frac{Q_3 - Q_1}{2}$	The median and quartiles can be found by the traditional method of drawing an ogive which plots cumulative frequency against the interval upper limit. Alternatively, linear interpolation may be employed using the appropriate frequencies but, due to the arithmetical complexity of this technique, it is recommended only for the more able candidates and would not be a requirement in any formal assessment.	For the purposes of internal assessment, candidates could be asked to: (i) collect their own data, analyse it and comment briefly on their findings, eg what age group you are in, which income band you are in etc. or (ii) analyse and compare two sets of given data, eg A sample of leaves is gathered from two different species of rhododendron. The length of each leaf is measured to the nearest mm. The data from each species is tabulated. Analyse the data and comment with respect to a comparison between the two types of rhododendron. A comparison of average and variability is all that would be expected.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 2)

ASSESSMENT

To gain a course award, 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 on the course award.

When units are taken as component parts of a course, candidates will have the opportunity to achieve 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 are 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 two hours' duration. Candidates will sit either an examination assessing *Mathematics 1 (Int 2), 2 (Int 2)* and *3 (Int 2)* or one assessing *Mathematics 1 (Int 2), 2 (Int 2)* and *Applications of Mathematics (Int 2).* 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 calculators and contain a balance of short questions designed mainly to test knowledge and understanding and extended response questions which also test 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 of 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 for numbers and quantities eg 5% of £3.20, 70% of 8kg.
Integers:	add, subtract multiply and divide positive and negative numbers.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 2)

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 2 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 qualitative and quantitative 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 a strategy, or sequence of strategies.

Grade A competence is demonstrated through an ability to decide on strategies and apply them 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 an appropriate degree of accuracy, marshal facts, sustain logical reasoning and appreciate the requirements of a proof.

Grade A performance is demonstrated through an ability to cope with processing data in more complex situations and sustaining logical reasoning, where the situation is less readily identifiable with a standard form.

(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 and unfamiliar contexts.

National Course Specification: course details (cont)

COURSE Mathematics (Intermediate 2)

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, through an investigative approach, sometimes giving candidates the opportunity to work cooperatively. Coursework tasks will 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 are not always 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 2 course should develop these to a high 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 Higher, further study will involve more abstract mathematics, and many will be ready to develop their mathematical thinking through investigative work where generalisation is possible and where rigour is encouraged in communicating conclusions. For candidates choosing the *Applications of Mathematics (Int 2)* route with the emphasis on applications, investigative work should also have a prominent position in the course.

Candidates should be encouraged to make appropriate use of technology. Candidates should maintain their skills in written and mental calculation; 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. Calculators with mathematical and graphical facilities and those with computer algebra systems (CAS) can be utilised as powerful tools both for processing data, especially in the study of statistics, and for reinforcing mathematical concepts. The use of calculators should help candidates gain confidence in making conjectures based on numerical or graphical evidence. Candidates should be aware that errors are inevitably introduced in the course of computation or in the limitations of the graphical display. Computers can also make a significant contribution to learning and teaching. The use of software packages in statistics will enhance the learning and teaching and allow candidates greater flexibility through ease of computation and display.

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 2)

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 2)

NUMBER D321 11

COURSE Mathematics (Intermediate 2)

SUMMARY

This unit seeks to extend the mathematical skills learned at General level of Standard Grade or Intermediate 1, including percentage calculations, volumes of solids, linear relationships, algebraic operations and properties of the circle. It is a mandatory unit of the Mathematics Intermediate 2 course.

OUTCOMES

1 Perform calculations involving percentages.
2 Use formulae to find volumes of solids.
3 Use linear relationships.
4 Perform algebraic operations.
5 Use properties of the circle.

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 General award, or Intermediate 1 Mathematics award or its component units including *Mathematics 3 (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 1 (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2.

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 2

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 2)

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 calculations involving percentages.

Performance criteria

(a) Solve problems involving appreciation/depreciation.

OUTCOME 2

Use formulae to find volumes of solids.

Performance criteria

(a) Find the volume of a sphere, a cone and a cylinder.
(b) Round calculations to a required number of significant figures.

OUTCOME 3

Use linear relationships.

Performance criteria

(a) Determine the gradient of a straight line.
(b) Sketch a straight line given its equation in the form $y = ax + b$.
(c) Determine the equation of a straight line in the form $y = ax + b$ from its graph.

OUTCOME 4

Perform algebraic operations.

Performance criteria

(a) Multiply algebraic expressions involving brackets.
(b) Factorise algebraic expressions: common factor, difference of two squares.
(c) Factorise a trinomial expression.

National Unit Specification: statement of standards (cont)

UNIT Mathematics 1 (Intermediate 2)

OUTCOME 5

Use properties of the circle.

Performance criteria

(a) Find the length of an arc of a circle.
(b) Calculate the area of a sector of a circle.
(c) Solve problems using properties of a circle.

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 2)

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 2 level aims to build upon and extend candidates' mathematical knowledge and skills. Within this unit, the percentage calculations in number and money at Intermediate 1 level are extended within Outcome 1 to calculations involving appreciation and depreciation. In particular, the concept of interest is extended from simple to compound interest.

Outcome 2 builds upon the work on area at Intermediate 1 level and introduces the formulae for the volumes of spheres, cones and cylinders. Significant figures are also introduced here. The geometry of Intermediate 1 level is further extended in Outcome 5 where properties of the circle are studied.

The work on straight line in *Mathematics 3 (Int 1)* is extended in Outcome 3 with a more formal treatment of the equation of a straight line.

Algebraic skills are an important part of the mathematician's toolkit. Outcome 4 begins to extend the basic algebraic operations introduced at Intermediate 1 level by introducing factorisation and extending the work in *Mathematics 3 (Int 1)* on multiplication of expressions involving brackets.

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 throughout the unit 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.

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 2)

NUMBER D322 11

COURSE Mathematics (Intermediate 2)

SUMMARY

This unit is the second of two mandatory units which, together with one optional unit, comprise the Intermediate 2 Mathematics course. Mathematics 2 (Int 2) provides candidates with the opportunity to study further aspects of mathematics, including trigonometry and solution of simultaneous equations and further aspects of statistics.

OUTCOMES

1 Use trigonometry.
2 Solve simultaneous linear equations.
3 Use graphs, charts and tables.
4 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 2)*
- equivalent

Administrative Information

Superclass: RB

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Mathematics 2 (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2.

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	Numeracy	Int 2
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 Mathematics 2 (Intermediate 2)

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 trigonometry.

Performance criteria

(a) Calculate the area of a triangle using trigonometry.
(b) Solve problems using Sine and Cosine rules.

OUTCOME 2

Solve simultaneous linear equations.

Performance criteria

(a) Solve graphically a pair of simultaneous linear equations in two variables.
(b) Solve algebraically a pair of simultaneous linear equations in two variables.

OUTCOME 3

Use graphs, charts and tables.

Performance criteria

(a) Find the quartiles from a data set.
(b) Construct a boxplot from a data set.
(c) Construct a piechart.

OUTCOME 4

Use simple statistics.

Performance criteria

(a) Calculate the standard deviation from a data set.
(b) Determine the equation of a best-fitting line and use it to estimate a y value given the x value.
(c) Assign probability to an event.

National Unit Specification: statement of standards (cont)

UNIT Mathematics 2 (Intermediate 2)

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 2)

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 2 level aims to build upon and extend candidates' mathematical knowledge and skills. Within Outcome 1, the right-angled trigonometry introduced at Intermediate 1 level is extended to include the Sine and Cosine Rules.

Outcome 2 introduces the solution of simultaneous linear equations both graphically and algebraically.

In Outcome 3, the statistics contained at Intermediate 1 level is extended to include the construction of pie charts and boxplots. In Outcome 4 the calculation of statistical measures is extended to standard deviation, the work on probability becomes more formalised and candidates are introduced to regression.

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, throughout the unit, 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 2)

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, trigonometric and statistical 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 3 (Intermediate 2)

NUMBER D323 11

COURSE Mathematics (Intermediate 2)

SUMMARY

This unit seeks to extend the candidate's mathematical experience in the areas of algebra and trigonometry, and to introduce the candidate to quadratic and trigonometric functions. It is an optional unit of the Intermediate 2 Mathematics course.

OUTCOMES

1 Perform algebraic operations.
2 Use properties of quadratic functions.
3 Use further trigonometry.

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

CREDIT VALUE

1 credit at Intermediate 2.

Administrative Information

Superclass: RB

Publication date: November 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Mathematics 3 (Intermediate 2)

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 2

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 2)

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 algebraic operations.

Performance criteria

(a) Reduce an algebraic fraction to its simplest form.
(b) Apply the four rules to algebraic fractions.
(c) Change the subject of a formula.
(d) Simplify surds.
(e) Simplify expressions using the laws of indices.

OUTCOME 2

Use properties of quadratic functions.

Performance criteria

(a) Determine the equations of quadratic functions of the form $y = (x + a)^2 + b$ and $y = kx^2$; $a, b, k \in \mathbf{Z}$ from their graphs.
(b) Identify the nature and co-ordinates of the turning point and the equation of the axis of symmetry of a quadratic of the form $y = k(x + a)^2 + b$; $a, b \in \mathrm{Z}$, $k = \pm 1$.
(c) Solve quadratic equations graphically, by factorisation and by using the quadratic formula.

OUTCOME 3

Use further trigonometry.

Performance criteria

(a) Sketch and identify trigonometric functions involving multiple angles.
(b) Solve a simple trigonometric equation in degrees.

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 2)

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 2 level aims to build upon and extend candidates' mathematical knowledge and skills. The main aim of this unit is to provide a sound base for progression to Higher level with particular emphasis on algebraic and trigonometric manipulation, solution of equations and graphs of functions. Mathematics at Higher level assumes a competence and a confidence in these areas to the extent that the knowledge and skills can be routinely recalled and applied to the solution of problems in a wide range of contexts.

Outcome 1 requires the demonstration of a comprehensive ability in algebraic processes, ranging from algebraic fractions through manipulation of formulae to operations on surds and use of the laws of indices.

Outcomes 2 and 3 require a demonstration of competence in graphs of quadratic and trigonometric functions, and the solution of both quadratic and trigonometric equations.

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 throughout the unit to make use of their skills of mental calculation, to make efficient use of calculators, and to apply the strategy of checking. Numerical checking, checking the solution of an equation or checking a result against the context in which it is set are integral to 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 process. 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.

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 2)

NUMBER D324 11

COURSE Mathematics (Intermediate 2)

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 Intermediate 2 Mathematics course.

OUTCOMES

1 Perform straightforward calculations in a social context.
2 Design and interpret logic diagrams.
3 Use formulae in applications.
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 2)*
- *Mathematics 2 (Int 2)*
- 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 2)

CREDIT VALUE

1 credit at Intermediate 2.

CORE SKILLS

This unit gives automatic certification of core skills for the unit:

Complete core skills for the unit	Numeracy	Int 2
Additional core skills 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 2)

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 salary, details of incentive schemes and details of deductions.
(b) Calculate the tax deduction given details of earnings, allowances and rates of tax.
(c) Solve problems involving the interpretation of information presented in a loan repayment table.

OUTCOME 2

Design and interpret logic diagrams.

Performance criteria

(a) Construct and interpret a tree diagram.
(b) Interpret and use a flowchart which contains two decision boxes.
(c) Design a spreadsheet.

OUTCOME 3

Use formulae in applications.

Performance criteria

(a) Interpret and use a formula expressed in words in an application.
(b) Interpret and use a formula expressed in symbols in an application.

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.

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

National Unit Specification: statement of standards (cont)

UNIT Applications of Mathematics (Intermediate 2)

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 19, the assignment must satisfy the performance criteria. A report on the project is required from each individual candidate. This 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 2)

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 2 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 Higher 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, calculations in the contexts of earning and borrowing, both of which are highly relevant to day to day existence, are studied in depth, including income tax calculations and credit card charges. In Outcome 2, modern methods of sequencing and scheduling operations, which are linked closely to the use of technology, are taken to a greater depth than in *Applications of Mathematics (Int 1)* and candidates should acquire an increased awareness of the importance of logical thinking, the clarity of logic diagrams, and the power of spreadsheet procedures. In Outcome 3, the emphasis is on the use of formulae in applications, and candidates should be provided with a variety of formulae both in words and in symbols. The variety of contexts should illustrate how much formulae are used in industry/commerce and other areas of the curriculum. In Outcome 4, candidates are required to undertake a statistical assignment.

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 throughout the unit 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.

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.

In Outcome 4 candidates are required to undertake a statistical assignment.

It is expected that candidates will be able to achieve the numerical, algebraic and statistical performance criteria in the 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).