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Level 1/Level 2 Certificate
Mathematics

Specification

Edexcel Level 1/Level 2 Certificate in Mathematics (KMAO)

First examination June 2012

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Acknowledgements

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Introduction

The Edexcel Level 1/Level 2 Certificate in Mathematics is designed for use in schools and colleges. It is part of a suite of qualifications offered by Edexcel.

Key subject aims

The Edexcel Level 1/Level 2 Certificate in Mathematics qualification enables students to:

- develop their knowledge and understanding of mathematical concepts and techniques
- acquire a foundation of mathematical skills for further study in the subject or related areas
- enjoy using and applying mathematical techniques and concepts, and become confident to use mathematics to solve problems
- appreciate the importance of mathematics in society, employment and study.

Key features and benefits of the specification

Key features and benefits are:

- tiers of entry that allow students to be entered for the appropriate level
- questions designed to be accessible to students of all abilities within that tier
- papers that are balanced for topics and difficulty
- equivalent to the levels of Edexcel's UK GCSE in Mathematics
- a full range of teacher support
- a solid basis for students wishing to progress to Edexcel AS and Advanced GCE Level, or equivalent qualifications.

Contents

Specification at a glance

This Level 1/Level 2 Certificate qualification is comprised of two assessments.

- Students are entered at either Foundation Tier or Higher Tier.
- Foundation Tier students will take papers 1F and 2F. Questions in the Foundation Tier paper are targeted at grades in the range C–G. The highest grade that will be awarded at Foundation Tier is grade C.
- Higher Tier students will take Papers 3H and 4H. Questions in the Higher Tier paper are targeted at grades in the range A*–D. There is a 'safety net' grade E for students who narrowly fail to achieve grade D.
- Students who fail to achieve grade G on Foundation Tier or grade E on Higher Tier will be awarded Ungraded.

Foundation Tier	**Paper code: 1F and 2F**
• Externally assessed • Availability: January and June series • First assessment: June 2012 • Two papers: 1F and 2F	**Each paper is 50% of the total Level 1/ Level 2 Certificate marks**
Overview of content • Number • Algebra • Geometry • Statistics • Probability	
Overview of assessment • Each paper is assessed through a two-hour examination set and marked by Edexcel. • The total number of marks for each paper is 100. • Each paper will have approximately equal marks available for each of the targeted grades. • Each paper will assess the full range of targeted grades at Foundation Tier. • There will be some common questions targeted at grades C and D across papers 1F and 3H and papers 2F and 4H, to aid standardisation and comparability of award between tiers.	

Higher Tier	**Paper code: 3H and 4H**
• Externally assessed • Availability: January and June series • First assessment: June 2012 • Two papers: 3H and 4H	**Each paper is 50% of the total Level 1/ Level 2 Certificate marks**
Overview of content • Number • Algebra • Geometry • Statistics • Probability	
Overview of assessment • Each paper is assessed through a two-hour examination set and marked by Edexcel. • The total number of marks for each paper is 100. • Each paper will have approximately equal marks available for each of the targeted grades. • Each paper will assess the full range of targeted grades at Higher Tier. • Questions will assume knowledge from the Foundation Tier subject content. • There will be some common questions targeted at grades C and D, across papers 3H and 1F and papers 4H and 2F, to aid standardisation and comparability of award between tiers.	

External assessment

In all examination papers:

- diagrams will not necessarily be drawn to scale and measurements should not be taken from diagrams unless instructions to this effect are given
- each student may be required to use mathematical instruments, eg pair of compasses, ruler, protractor
- calculators may be used
- tracing paper may be used
- formulae sheets will be provided.

Calculators

Students will be expected to have access to a suitable electronic calculator for all examination papers. The use of a calculator is permitted throughout the assessment. Students will be expected to know how to use estimation to evaluate approximations to numerical calculations, and to show the appropriate stages of their working out.

The electronic calculator to be used by students attempting Foundation Tier examination papers (1F and 2F) should have these functions as a minimum:

- +, −, ×, ÷, x^2, $\sqrt{x}$, memory, brackets, x^y, $x^{\frac{1}{y}}$, sine, cosine, tangent and their inverses.

The electronic calculator to be used by students attempting Higher Tier examination papers (3H and 4H) should have these functions as a minimum:

- +, −, ×, ÷, x^2, $\sqrt{x}$, memory, constant function, brackets, x^y, $x^{\frac{1}{y}}$, $\bar{x}$, Σx, Σfx, standard form, sine, cosine, tangent and their inverses.

Calculators with any of the following facilities are prohibited in all examinations:

- databanks; retrieval of text or formulae; QWERTY keyboards; built-in symbolic algebra manipulations; symbolic differentiation or integration.

Qualification content

National Qualifications Framework (NQF) criteria

This qualification complies with the requirements of the common criteria which is prescribed by the regulatory authorities.

Knowledge, skills and understanding

This Edexcel Level 1/Level 2 Certificate in Mathematics requires students to demonstrate application and understanding of the following.

Number

- Use numerical skills in a purely mathematical way and in real-life situations.

Algebra

- Use letters as equivalent to numbers and as variables.
- Understand the distinction between expressions, equations and formulae.
- Use algebra to set up and solve problems.
- Demonstrate manipulative skills.
- Construct and use graphs.

Geometry

- Use properties of angles.
- Understand a range of transformations.
- Work within the metric system.
- Understand ideas of space and shape.
- Use a ruler, a pair of compasses and a protractor appropriately.

Statistics

- Understand basic ideas of statistical averages.
- Use a range of statistical techniques.
- Use basic ideas of probability.

Papers 1F and 2F (Foundation Tier)

Content overview – Assessment objectives (AO)

AO1: Number and algebra

- Numbers and the number system
- Set language and notation
- Equations, formulae and identities
- Sequences, functions and graphs

AO2: Geometry

- Shape, space and measure
- Vectors and transformation geometry

AO3: Data handling

- Statistics
- Probability

Assessment overview

- Two written papers taken at the end of the course.
- Each paper is assessed through a two-hour examination set and marked by Edexcel.
- The total number of marks for each paper is 100.
- Each paper weighted at 50% of the qualification, targeted at grades C–G.

Detailed unit content

AO1 Number and algebra		
1 Numbers and the number system		
	Students should be taught to:	**Notes**
1.1 Integers	understand and use integers (positive, negative and zero) both as positions and translations on a number line	
	understand place value	
	use directed numbers in practical situations	To include temperature, sea level
	order integers	
	use the four rules of addition, subtraction, multiplication and division	
	use brackets and the hierarchy of operations	
	use the terms odd, even and prime numbers, factors and multiples	
	identify prime factors, common factors and common multiples	

1 Numbers and the number system		
1.2 Fractions	understand and use equivalent fractions, simplifying a fraction by cancelling common factors	$\frac{8}{60} = \frac{2}{15}$ in its simplest form (lowest terms)
	understand and use mixed numbers and vulgar fractions	
	identify common denominators	
	apply common denominators to order fractions	
	calculate a given fraction of a given quantity, expressing the answer as a fraction	
	express a given number as a fraction of another number	
	use common denominators to add and subtract fractions	
	convert a fraction to a decimal or a percentage	$\frac{3}{5} = 0.6 = 60\%$ $\frac{4}{9} = 0.4444\ldots = 0.4$
	understand and use unit fractions as multiplicative inverses	$3 \div 5 = 3 \times \frac{1}{5}$
	multiply and divide a given fraction by an integer, by a unit fraction and by a general fraction	
1.3 Decimals	use decimal notation	
	order decimals	
	convert a decimal to a fraction or a percentage	Terminating decimals only
	recognise that a terminating decimal is a fraction	$0.65 = \frac{65}{100} = \frac{13}{20}$
1.4 Powers and roots	identify square numbers and cube numbers	
	calculate squares, square roots, cubes and cube roots	
	use index notation and index laws for multiplication and division of positive integer powers	
	express integers as the product of powers of prime factors	$720 = 2^4 \times 3^2 \times 5$

1 Numbers and the number system		
1.5 Set language and notation	understand the definition of a set use the set notation $\cup$, $\cap$ and $\in$ and $\notin$ understand the concept of the Universal Set and the Empty Set and the symbols for these sets	 $\mathscr{E}$ = Universal Set Ø or { } = Empty Set
1.6 Percentages	understand that 'percentage' means 'number of parts per 100' express a given number as a percentage of another number express a percentage as a fraction and as a decimal understand the multiplicative nature of percentages as operators solve simple percentage problems, including percentage increase and decrease	 15% of 120 = $\frac{15}{100} \times 120$ Find the interest earned after one year on £3,000 invested at 5% per annum Find 100% when another percentage is given
1.7 Ratio and proportion	use ratio notation, including reduction to its simplest form and its various links to fraction notation divide a quantity in a given ratio or ratios use the process of proportionality to evaluate unknown quantities calculate an unknown quantity from quantities that vary in direct proportion solve word problems about ratio and proportion	Expressing in the form 1: n Share £416 in the ratio 5:3 or 4:3:1 s varies directly as t. Find the missing value in a table Including maps and scale diagrams

1 Numbers and the number system		
1.8 Degree of accuracy	round integers to a given power of 10 round to a given number of significant figures or decimal places identify upper and lower bounds where values are given to a degree of accuracy use estimation to evaluate approximations to numerical calculations	By rounding each value to one significant figure, estimate the value of $\frac{4.9 \times 24.6}{46.3}$ to one significant figure. Note: Students should be encouraged to show the appropriate stages of their working out when using estimation to evaluate approximations to numerical calculations.
1.9 Standard form	**Higher Tier only.**	
1.10 Applying number	use and apply number in everyday personal, domestic or community life carry out calculations using standard units of mass, length, area, volume and capacity understand and carry out calculations using time carry out calculations using money, including converting between currencies	Metric units only
1.11 Electronic calculators	use a scientific electronic calculator to determine numerical results.	$3.3^2 + \sqrt{4.3}$ correct to 2 significant figures

2 Equations, formulae and identities		
	Students should be taught to:	**Notes**
2.1 Use of symbols	understand that symbols may be used to represent numbers in equations, or variables in expressions and formulae	
	understand that algebraic expressions follow the generalised rules of arithmetic	
	use index notation for positive integer powers	$a^3 = a \times a \times a$
	use index laws in simple cases	$x^3 \times x^2 = x^5$ $\frac{x^7}{x^3} = x^4$ $(x^2)^3 = x^6$ $\frac{x^2}{x^5} = \frac{1}{x^3}$
2.2 Algebraic manipulation	evaluate expressions by substituting numerical values for letters	
	collect like terms	
	multiply a single term over a bracket	
	take out single common factors	Factorise $x^2 + 3x$
	expand the product of two simple linear expressions	$(x + 3)(x - 2)$ $= x^2 + 3x - 2x - 6$ $= x^2 + x - 6$
2.3 Expressions and formulae	understand that a letter may represent an unknown number or a variable	
	use correct notational conventions for algebraic expressions and formulae	
	substitute positive and negative integers, decimals and fractions for words and letters in expressions and formulae	Evaluate $2x - 3y$ when $x = -2$ and $y = 4$
	use formulae from mathematics and other real-life contexts expressed initially in words or diagrammatic form and convert to letters and symbols	

2 Equations, formulae and identities		
2.4 Linear equations	solve linear equations, with integer or fractional coefficients, in one unknown in which the unknown appears on either side or both sides of the equation	$3x + 7 = 22$ $\frac{2}{3}x = 60$ $4x - 2 = 10 - x$ $5x + 17 = 3(x + 6)$ $\frac{15 - x}{4} = 2$ $\frac{1}{6}x + \frac{1}{3}x = 5$
	set up simple linear equations from given data	The three angles of a triangle are $a°$, $(a + 10)°$, $(a + 20)°$. Find the value of a
2.5 Proportion	**Higher Tier only.**	
2.6 Simultaneous linear equations	calculate the exact solution of two simple simultaneous equations in two unknowns	$y = 2x$, $x + y = 12$ $x + y = 14$, $x - y = 2$
2.7 Quadratic equations	**Higher Tier only.**	

2 Equations, formulae and identities		
2.8 Inequalities	understand and use the symbols >, <, ≥ and ≤	To include double-ended inequalities eg $1 < x \leq 5$
	understand and use the convention for open and closed intervals on a number line	
	solve simple linear inequalities in one variable and represent the solution set on a number line	$3x - 2 < 10$, so $x < 4$ $7 - x \leq 5$, so $2 \leq x$
	represent simple linear inequalities on rectangular cartesian graphs	
	identify regions on rectangular cartesian graphs defined by simple linear inequalities	Shade the region defined by the inequalities $x \geq 0$, $y \geq 1$, $x + y \leq 5$ Conventions for the inclusion of boundaries are not required

3 Sequences, functions and graphs		
	Students should be taught to:	**Notes**
3.1 Sequences	generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	Including odd, even, squares, multiples and powers
	find subsequent terms of an integer sequence and the rule for generating it	5, 9, 13, 17 … (add 4) 1, 2, 4, 8, … (multiply by 2)
3.2 Functional notation	**Higher Tier only.**	
3.3 Graphs	interpret information presented in a range of linear and non-linear graphs	To include speed/time and distance/time graphs
	understand and use conventions for rectangular Cartesian coordinates	
	plot points (x, y) in any of the four quadrants	
	locate points with given Cartesian coordinates	
	determine the Cartesian coordinates of points identified by geometrical information	
	determine the Cartesian coordinates of the midpoint of a line segment, given the coordinates of the two end points	
	draw and interpret straight line conversion graphs	To include currency conversion graphs
	find the gradient of a straight line	A ramp rises 15 m over a horizontal distance of 60 m, therefore the gradient of the ramp is 15/60 = 0.25
	recognise that equations of the form $y = mx + c$ are straight line graphs	To include $x = k$, $y = c$, $y = x$, $y - x = 0$

3 Sequences, functions and graphs		
3.3 Graphs *continued*	generate points and plot graphs of linear and quadratic functions	Including completion of values in tables and equations of the form $ax + by = c$
3.4 Calculus	**Higher Tier only.**	

AO2 Shape, space and measures		
4 Geometry		
	Students should be taught to:	**Notes**
4.1 Angles and triangles	distinguish between acute, obtuse, reflex and right angles	
	use angle properties of intersecting lines, parallel lines and angles on a straight line	Angles at a point, vertically opposite angles, alternate angles, corresponding angles
	understand the exterior angle of a triangle property and the angle sum of a triangle property	
	understand the terms isosceles, equilateral and right-angled triangles and the angle properties of these triangles	

4 Geometry		
4.2 Polygons	recognise and give the names of polygons	To include parallelogram, rectangle, square, rhombus, trapezium, kite, pentagon, hexagon and octagon
	understand and use the term quadrilateral and the angle sum property of quadrilaterals	The four angles of a quadrilateral are 90°, $(x + 15)°$, $(x + 25)°$ and $(x + 35)°$ Find the value of x
	understand and use the properties of the parallelogram, rectangle, square, rhombus, trapezium and kite	
	understand the term regular polygon and calculate interior and exterior angles of regular polygons	
	understand and use the angle sum of polygons	For a polygon with n sides, the sum of the interior angles is $(2n - 4)$ right angles
	understand congruence as meaning the same shape and size	
	understand that two or more polygons with the same shape and size are said to be congruent to each other	

4 Geometry		
4.3 Symmetry	recognise line and rotational symmetry identify any lines of symmetry and the order of rotational symmetry of a given two-dimensional figure	 Name a quadrilateral with no lines of symmetry and order of rotational symmetry of 2
4.4 Measures	interpret scales on a range of measuring instruments calculate time intervals in terms of the 24-hour and 12-hour clock make sensible estimates of a range of measures understand angle measure including three-figure bearings measure an angle to the nearest degree understand and use the relationship between average speed, distance and time	 Use am and pm
4.5 Construction	measure and draw lines to the nearest millimetre construct triangles and other two-dimensional shapes using a combination of a ruler, a protractor and compasses solve problems using scale drawings use straight edge and compasses to: (i) construct the perpendicular bisector of a line segment (ii) construct the bisector of an angle	

4 Geometry		
4.6 Circle properties	recognise the terms centre, radius, chord, diameter, circumference, tangent, arc, sector and segment of a circle	
	understand chord and tangent properties of circles	Two tangents from a point to a circle are equal in length Tangents are perpendicular to the radius at the point of contact The line from the centre of a circle which is perpendicular to a chord bisects the chord (and the converse)
4.7 Geometrical reasoning	give informal reasons, where required, when arriving at numerical solutions to geometrical problems	Reasons will only be required for geometrical calculations based on lines (including chords and tangents), triangles or polygons
4.8 Trigonometry and Pythagoras' Theorem	understand and use Pythagoras' Theorem in two dimensions understand and use sine, cosine and tangent of acute angles to determine lengths and angles of a right-angled triangle apply trigonometrical methods to solve problems in two dimensions	 To include bearings

4 Geometry		
4.9 Mensuration of 2-D shapes	convert measurements within the metric system to include linear and area units find the perimeter of shapes made from triangles and rectangles find the area of simple shapes using the formulae for the areas of triangles and rectangles find the area of parallelograms and trapezia find circumferences and areas of circles using relevant formulae	$cm^2 \rightarrow m^2$ and vice versa
4.10 3-D shapes and volume	recognise and give the names of solids understand the terms face, edge and vertex in the context of 3-D solids find the surface area of simple shapes using the area formulae for triangles and rectangles find the surface area of a cylinder find the volume of right prisms, including cuboids and cylinders, using an appropriate formula convert between units of volume within the metric system	To include cube, cuboid, prism, pyramid, cylinder, sphere and cone $cm^3 \rightarrow$ litres and vice versa
4.11 Similarity	understand and use the geometrical properties that similar figures have corresponding lengths in the same ratio but corresponding angles remain unchanged use and interpret maps and scale drawings	

5 Vectors and transformation geometry		
	Students should be taught to:	**Notes**
5.1 Vectors	**Higher Tier only.**	
5.2 Transformation geometry	understand that rotations are specified by a centre and an angle	
	rotate a shape about a point through a given angle	
	recognise that an anti-clockwise rotation is a *positive* angle of rotation and a clockwise rotation is a *negative* angle of rotation	
	understand that reflections are specified by a mirror line	Such as $x = 1$, $y = 2$, $y = x$, $y - x = 0$
	construct a mirror line given an object	
	reflect a shape given a mirror line	Reflect a triangle in the line $y = x$
	understand that translations are specified by a distance and direction	
	translate a shape	Given, for example, 5 units in the x direction, and 3 units in the y direction (not angle and distance)
	understand that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations remains congruent to the original shape	
	understand that enlargements are specified by a centre and a scale factor	Positive scale factor only (including fractions)
	understand that enlargements preserve angles and not lengths	
	enlarge a shape given the scale factor	With or without a centre given
	identify and give complete descriptions of transformations	

AO3 Handling data		
6 Statistics		
	Students should be taught to:	**Notes**
6.1 Graphical representation of data	use different methods of presenting data use appropriate methods of tabulation to enable the construction of statistical diagrams interpret statistical diagrams	Pictograms, bar charts and pie charts only
6.2 Statistical measures	understand the concept of average calculate the mean, median, mode and range for a discrete data set calculate an estimate for the mean for grouped data identify the modal class for grouped data	Data could be in a list or tabulated form Includes simple problems using these measures

6 Statistics		
6.3 Probability	understand the language of probability	Outcomes, equal likelihood, events, random
	understand and use the probability scale	P(certainty) = 1 P(impossibility) = 0
	understand and use estimates or measures of probability from theoretical models	
	understand the concepts of a sample space and an event, and how the probability of an event happening can be determined from the sample space	
	list all the outcomes for single events and for two successive events in a systematic way	For the tossing of two coins, the sample space can be listed as: Heads (*H*), Tails (*T*) (*H*, *H*), (*H*, *T*), (*T*, *H*), (*T*, *T*)
	estimate probabilities from previously collected data	
	calculate the probability of the complement of an event happening	P(not A) = 1 − P(A)
	use the addition rule of probability for mutually exclusive events	P(Either A or B occurring) = P(A) + P(B) when A and B are mutually exclusive
	understand and use the term *expected frequency*.	Determine an estimate of the number of times an event with a probability of $\frac{2}{5}$ will happen over 300 tries

Papers 3H and 4H (Higher Tier)

Content overview – Assessment objectives (AO)

Knowledge of the Foundation Tier content is assumed for students being prepared for the Higher Tier.

AO1: Number and algebra

- Numbers and the number system
- Equations, formulae and identities
- Sequences, functions and graphs

AO2: Geometry

- Shape, space and measure
- Vectors and transformation geometry

AO3: Handling data

- Statistics
- Probability

Assessment overview

- Two written papers taken at the end of the course.
- Each paper is assessed through a two-hour examination set and marked by Edexcel.
- The total number of marks for each paper is 100.
- Each paper is weighted at 50% of the qualification, targeted at grades A*–D.

Detailed unit content

AO1 Number and algebra		
1 Numbers and the number system		
	Students should be taught to:	**Notes**
1.1 Integers	**See Foundation Tier.**	
1.2 Fractions	**See Foundation Tier.**	
1.3 Decimals	convert recurring decimals into fractions	$0.\dot{3} = \frac{1}{3}$, 0.2333… = $\frac{21}{90}$
1.4 Powers and roots	understand the meaning of surds	
	manipulate surds, including rationalising the denominator where the denominator is a pure surd	Express in the form $a\sqrt{2}$: $\frac{2}{\sqrt{8}}$, $\sqrt{18} + 3\sqrt{2}$
		Express in the form $a + b\sqrt{2}$: $(3 + 5\sqrt{2})^2$
	use index laws to simplify and evaluate numerical expressions involving integer, fractional and negative powers	Evaluate: $\sqrt[3]{8^2}$, $625^{-\frac{1}{2}}$, $\left(\frac{1}{25}\right)^{\frac{3}{2}}$
	evaluate Highest Common Factors (HCF) and Lowest Common Multiples (LCM)	
1.5 Set language and notation	understand sets defined in algebraic terms	
	understand and use subsets	If A is a subset of B, then $A \subset B$
	understand and use the complement of a set	Use the notation A'
	use Venn diagrams to represent sets and the number of elements in sets	
	use the notation $n(A)$ for the number of elements in the set A	
	use sets in practical situations	

1 Numbers and the number system		
1.6 Percentages	use reverse percentages	In a sale, prices were reduced by 30%. The sale price of an item was £17.50. Calculate the original price of the item
	repeated percentage change	Calculate the total percentage increase when an increase of 30% is followed by a decrease of 20%
	solve compound interest problems	To include depreciation
1.7 Ratio and proportion	**See Foundation Tier.**	
1.8 Degree of accuracy	solve problems using upper and lower bounds where values are given to a degree of accuracy	The dimensions of a rectangle are 12cm and 8cm to the nearest cm. Calculate, to 3 significant figures, the smallest possible area as a percentage of the largest possible area
1.9 Standard form	express numbers in the form $a \times 10^n$ where n is an integer and $1 \leq a < 10$ solve problems involving standard form	150 000 000 $= 1.5 \times 10^8$
1.10 Applying number	**See Foundation Tier.**	
1.11 Electronic calculators	**See Foundation Tier.**	

2 Equations, formulae and identities		
	Students should be taught to:	**Notes**
2.1 Use of symbols	use index notation involving fractional, negative and zero powers	Simplify: $\left(64t^3\right)^{\frac{2}{3}}$, $\frac{a^{\frac{1}{2}} \times a^{\frac{3}{4}}}{a^{\frac{1}{3}}}$
2.2 Algebraic manipulation	expand the product of two linear expressions understand the concept of a quadratic expression and be able to factorise such expressions manipulate algebraic fractions where the numerator and/or the denominator can be numeric, linear or quadratic	$(2x + 3)(3x - 1)$ $(2x - y)(3x + y)$ Factorise: $x^2 + 12x - 45$ $6x^2 - 5x - 4$ Express as a single fraction: $\frac{x+1}{3} + \frac{x-3}{4}$ $\frac{3(4x-1)}{2} - \frac{2(5x+3)}{3}$ $\frac{3}{2x} - \frac{4}{3x}$ $\frac{3}{1-x} + \frac{2}{1+x}$ $\frac{x+1}{x+2} - \frac{x-2}{x-1}$ Factorise and simplify: $\frac{x^2 - 4x}{x^2 - x - 12}$
2.3 Expressions and formulae	understand the process of manipulating formulae to change the subject, to include cases where the subject may appear twice, or a power of the subject occurs	$v^2 = u^2 + 2gs$; make s the subject $m = \frac{1+at}{1-at}$; make t the subject $V = \frac{4}{3}\pi r^3$; make r the subject $T = 2\pi\sqrt{\frac{l}{g}}$; make l the subject

2 Equations, formulae and identities		
2.4 Linear equations	**See Foundation Tier.**	$\frac{17-x}{4} = 2 - x$, $\frac{(2x-3)}{6} + \frac{(x+2)}{3} = \frac{5}{2}$
2.5 Proportion	set up problems involving direct or inverse proportion and relate algebraic solutions to graphical representation of the equations	To include only the following: $y \propto x$, $y \propto 1/x$, $y \propto x^2$, $y \propto 1/x^2$, $y \propto x^3$, $y \propto \sqrt{x}$
2.6 Simultaneous linear equations	calculate the exact solution of two simultaneous equations in two unknowns interpret the equations as lines and the common solution as the point of intersection	$3x - 4y = 7$ $2x - y = 8$ $2x + 3y = 17$ $3x - 5y = 35$
2.7 Quadratic equations	solve quadratic equations by factorisation solve quadratic equations by using the quadratic formula form and solve quadratic equations from data given in a context solve simultaneous equations in two unknowns, one equation being linear and the other being quadratic	$2x^2 - 3x + 1 = 0$, $x(3x - 2) = 5$ $y = 2x - 11$ and $x^2 + y^2 = 25$ $y = 11x - 2$ and $y = 5x^2$
2.8 Inequalities	solve quadratic inequalities in one unknown and represent the solution set on a number line identify harder examples of regions defined by linear inequalities	$x^2 \leqslant 25$, $4x^2 > 25$ Shade the region defined by the inequalities $x \leq 4$, $y \leq 2x + 1$, $5x + 2y \leq 20$

3 Sequences, functions and graphs		
	Students should be taught to:	**Notes**
3.1 **Sequences**	use linear expressions to describe the *n*th term of an arithmetic sequence	1, 3, 5, 7, 9, … nth term = $2n - 1$
3.2 **Function notation**	understand the concept that a function is a mapping between elements of two sets use function notations of the form f(x) = … and f : $x \mapsto$ … understand the terms domain and range and which values may need to be excluded from the domain understand and find the composite function fg and the inverse function f^{-1}	 f(x) = $\frac{1}{x}$, exclude $x = 0$ f(x) = $\sqrt{x+3}$, exclude $x < -3$ 'fg' will mean '*do* g *first, then* f'

3 Sequences, functions and graphs		
3.3 Graphs	plot and draw graphs with equation: $y = Ax^3 + Bx^2 + Cx + D$ in which: (i) the constants are integers and some could be zero (ii) the letters x and y can be replaced with any other two letters or: $y = Ax^3 + Bx^2 + Cx + D + E/x + F/x^2$ in which: (i) the constants are numerical and at least three of them are zero (ii) the letters x and y can be replaced with any other two letters find the gradients of non-linear graphs	$y = x^3$, $y = 3x^3 - 2x^2 + 5x - 4$, $y = 2x^3 - 6x + 2$, $V = 60w(60 - w)$ $y = \frac{1}{x}$, $x \neq 0$, $y = 2x^2 + 3x + 1/x$, $x \neq 0$, $y = \frac{1}{x}(3x^2 - 5)$, $x \neq 0$, $W = \frac{5}{d^2}$, $d \neq 0$ By drawing a tangent

3 Sequences, functions and graphs		
3.3 Graphs *continued*	find the intersection points of two graphs, one linear (y_1) and one non-linear (y_2), and recognise that the solutions correspond to the solutions of $y_2 - y_1 = 0$	The x-values of the intersection of the two graphs: $y = 2x + 1$ $y = x^2 + 3x - 2$ are the solutions of: $x^2 + x - 3 = 0$ Similarly, the x-values of the intersection of the two graphs: $y = 5$ $y = x^3 - 3x^2 + 7$ are the solutions of: $x^3 - 3x^2 + 2 = 0$
	calculate the gradient of a straight line given the Cartesian coordinates of two points	
	recognise that equations of the form $y = mx + c$ are straight line graphs with gradient m and intercept on the y axis at the point $(0, c)$	Find the equation of the straight line through (1, 7) and (2, 9)
	find the equation of a straight line parallel to a given line	

3 Sequences, functions and graphs		
3.4 Calculus	understand the concept of a variable rate of change differentiate integer powers of x determine gradients, rates of change, turning points (maxima and minima) by differentiation and relate these to graphs distinguish between maxima and minima by considering the general shape of the graph apply calculus to linear kinematics and to other simple practical problems	 $y = x + \frac{9}{x}$ Find the Cartesian coordinates of the maximum and minimum points The displacement, *s* metres, of a particle from a fixed point *O* after *t* seconds is given by: $s = 24t^2 - t^3$, $0 \leq t \leq 20$ Find expressions for the velocity and the acceleration

AO2 Shape, space and measures		
4 Geometry		
	Students should be taught to:	**Notes**
4.1 Lines and triangles	**See Foundation Tier.**	
4.2 Polygons	**See Foundation Tier.**	
4.3 Symmetry	**See Foundation Tier.**	
4.4 Measures	**See Foundation Tier.**	
4.5 Construction	**See Foundation Tier.**	
4.6 Circle properties	understand and use the internal and external intersecting chord properties recognise the term *cyclic quadrilateral* understand and use angle properties of the circle including: • angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the remaining part of the circumference • angle subtended at the circumference by a diameter is a right angle • angles in the same segment are equal • the sum of the opposite angles of a cyclic quadrilateral is 180° • the alternate segment theorem	Formal proof of these theorems is not required
4.7 Geometrical reasoning	provide reasons, using standard geometrical statements, to support numerical values for angles obtained in any geometrical context involving lines, polygons and circles	

4 Geometry		
4.8 Trigonometry and Pythagoras' Theorem	understand and use sine, cosine and tangent of obtuse angles understand and use angles of elevation and depression understand and use the sine and cosine rules for any triangle use Pythagoras' Theorem in 3 dimensions understand and use the formula ½ absin C for the area of a triangle apply trigonometrical methods to solve problems in 3 dimensions, including finding the angle between a line and a plane	The angle between two planes will not be required
4.9 Mensuration	find perimeters and areas of sectors of circles	Radian measure is excluded
4.10 3-D shapes and volume	find the surface area and volume of a sphere and a right circular cone using relevant formulae convert between volume measures	$m^3 \rightarrow cm^3$ and vice versa
4.11 Similarity	understand that areas of similar figures are in the ratio of the square of corresponding sides understand that volumes of similar figures are in the ratio of the cube of corresponding sides use areas and volumes of similar figures in solving problems	

5 Vectors and transformation geometry		
	Students should be taught to:	**Notes**
5.1 Vectors	understand that a vector has both magnitude and direction	
	understand and use vector notation	The notations $\overrightarrow{OA}$ and $\mathbf{a}$ will be used
	multiply vectors by scalar quantities	
	add and subtract vectors	
	calculate the modulus (magnitude) of a vector	
	find the resultant of two or more vectors	$\overrightarrow{OA} = 3\mathbf{a}$, $\overrightarrow{AB} = 2\mathbf{b}$, $\overrightarrow{BC} = \mathbf{c}$ so: $\overrightarrow{OC} = 3\mathbf{a} + 2\mathbf{b} + \mathbf{c}$ $\overrightarrow{CA} = -\mathbf{c} - 2\mathbf{b}$
	apply vector methods for simple geometrical proofs	
5.2 Transformation geometry	**See Foundation Tier.**	Column vectors may be used to define translations

AO3 Handling data		
6 Statistics		
	Students should be taught to:	**Notes**
6.1 Graphical representation of data	construct and interpret histograms	For continuous variables with unequal class intervals
	construct cumulative frequency diagrams from tabulated data	
	use cumulative frequency diagrams	
6.2 Statistical measures	estimate the median from a cumulative frequency diagram	
	understand the concept of a measure of spread	
	find the interquartile range from a discrete data set	The terms 'upper quartile' and 'lower quartile' may be used
	estimate the interquartile range from a cumulative frequency diagram	
6.3 Probability	draw and use tree diagrams	
	determine the probability that two or more independent events will both occur	
	use simple conditional probability when combining events	Picking two balls out of a bag, one after the other, without replacement
	apply probability to simple problems.	

Assessment

Assessment summary

Papers 1F, 2F, 3H and 4H are externally assessed through examination papers each lasting two hours.

Summary of table of assessment

Foundation Tier (Papers 1F and 2F) **Paper code: KMA0/1F and KMA0/2F**
• Two written papers. • Each paper is assessed through a two-hour examination set and marked by Edexcel. • The total number of marks for each paper is 100. • Each paper weighted at 50% of the qualification, targeted at grades C–G.

Higher Tier (Papers 3H and 4H) **Paper code: KMA0/3H and KMA0/4H**
• Two written papers. • Each paper is assessed through a two-hour examination set and marked by Edexcel. • The total number of marks for each paper is 100. • Each paper is weighted at 50% of the qualification, targeted at grades A*–D.

Assessment objectives and weightings

	% in Level 1/ Level 2 Certificate
AO1: demonstrate knowledge, understanding and skills in number and algebra: – numbers and the numbering system – calculations – solving numerical problems – equations, formulae and identities – sequences, functions and graphs.	**50 – 60%**
AO2: demonstrate knowledge, understanding and skills in shape, space and measures: – geometry – vectors and transformation geometry.	**20 - 30%**
AO3: demonstrate knowledge, understanding and skills in handling data: – statistics. – probability	**15 - 25%**
TOTAL	**100%**

Relationship of assessment objectives to papers for Level 1/Level 2 Certificate

Paper number	Assessment objective			
	AO1	AO2	AO3	Total for AO1, AO2 and AO3
Paper 1F	50 - 60%	20 - 30%	15 - 25%	100%
Paper 2F	50 - 60%	20 - 30%	15 - 25%	100%
Total for Level 1 /Level 2 Certificate	50 - 60%	20 - 30%	15 - 25%	100%

	Assessment objective			
Paper number	AO1	AO2	AO3	Total for AO1, AO2 and AO3
Paper 3H	50 - 60%	20 - 30%	15 - 25%	100%
Paper 4H	50 - 60%	20 - 30%	15 - 25%	100%
Total for Level 1 /Level 2 Certificate	50 - 60%	20 - 30%	15 - 25%	100%

Entering your students for assessment

Student entry

Students are entered at either Foundation Tier or Higher Tier.

Details of how to enter students for this qualification can be found in Edexcel's *Information Manual*, copies of which (in CD format) are sent to all active Edexcel centres. The information can also be found on Edexcel's website: www.edexcel.com

Forbidden combinations

It is forbidden for students to take this qualification at the same time as the Edexcel IGCSE in Mathematics A qualification.

Classification code

Centres should be aware that students who enter for more than one qualification with the same classification code will have only one grade (the highest) counted for the purpose of the school and college performance tables.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, IGCSE, and Entry Level qualifications aims to enhance access to the qualifications for students with disabilities and other difficulties without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com/sfc) for:

- the Joint Council for Qualifications (JCQ) policy *Access Arrangements, Reasonable Adjustments and Special Considerations 2010-2011*
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Disability Discrimination Act (DDA)

Please see the Edexcel website (www.edexcel.com) for information with regard to the Disability Discrimination Act.

Assessing your students

This is a linear qualification and students are expected to take **either** Paper 1F and Paper 2F **or** Paper 3H and Paper 4H. Paper 1F and 2F, or 3H and 4H must be taken together in the **same examination session**.

The first assessment opportunity for Paper 1F and Paper 2F **or** Paper 3F and 4H of this qualification will take place in the June 2012 series and in each January and June series thereafter for the lifetime of the qualification.

Your student assessment opportunities

Paper	June 2012	Jan 2013	June 2013	Jan 2014
All papers	✓	✓	✓	✓

Awarding and reporting

The grading, awarding and certification of this qualification will comply with the current GCSE/GCE Code of Practice, which is published by the Office of Qualifications and Examinations Regulation (Ofqual). The Level 1/Level 2 Certificate qualification will be graded and certificated on an eight-grade scale from A* to G.

Students on Foundation tier whose level of achievement is below the minimum standard for Grade G will receive an unclassified (U). Where unclassified is received it will not be recorded on the certificate.

Students on Higher tier whose level of achievement is below the minimum standard for Grade E will receive an unclassified (U). Where unclassified is received it will not be recorded on the certificate.

The first certification opportunity for the Edexcel Level 1/Level 2 Certificate in Mathematics will be 2012.

Students whose level of achievement is below the minimum judged by Edexcel to be of sufficient standard to be recorded on a certificate will receive an unclassified (U) result.

Language of assessment

Assessment of this qualification will be available in English only. Assessment materials will be published in English only and all work submitted for examination must be produced in English.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the JCQ's *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website: www.jcq.org.uk.

Student recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all students.

Prior learning

This qualification builds on the content, knowledge and skills developed in the Key Stage 3 Programme of Study for Mathematics as defined by the National Curriculum Orders for England.

Progression

This qualification supports progression to:

- IGCSE in Further Pure Mathematics
- GCE AS and Advanced Level in Mathematics
- GCE AS and Advanced Level in Further Mathematics
- GCE AS and Advanced Level in Pure Mathematics
- GCE and other further qualifications in numerate disciplines, such as the sciences, economics or business
- further education or employment where mathematics skills are required.

Grade descriptions

The following grade descriptions indicate the level of attainment characteristic of the given grade at IGCSE. They give a general indication of the required learning outcomes at each specified grade. The descriptions should be interpreted in relation to the content outlined in the specification; they are not designed to define that content. The grade awarded will depend in practice upon the extent to which the candidate has met the Assessment Objectives overall. Shortcomings in some aspects of the examination may be balanced by better performance in others.

Grade A

Candidates understand and use direct and inverse proportion. They manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions. In simplifying algebraic expressions, they use rules of indices for negative and fractional values. In finding formulae that approximately connect data, candidates express general laws in symbolic form. They solve problems using intersections and gradients of graphs. Candidates use Pythagoras' Theorem when solving problems in two and three dimensions. They calculate lengths of circular arcs and areas of sectors, and calculate the surface area of cylinders and volumes of cones and spheres.

Candidates interpret and construct histograms. They recognise when and how to work with probabilities associated with independent and mutually exclusive events.

Grade C

In making estimates, candidates round to one significant figure and multiply and divide mentally. They solve numerical problems involving multiplication and division, with numbers of any size, using a calculator efficiently and appropriately. They understand and use the equivalences between fractions, decimals and percentages and calculate using ratios in appropriate situations. They understand and use proportional changes. Candidates find and describe in symbols the next term or the nth term of a sequence, where the rule is linear.
They multiply two expressions of the form $(x + n)$; they simplify the corresponding quadratic expressions. They represent inequalities using a number line. They formulate and solve linear equations with whole number coefficients. They manipulate simple algebraic formulae, equations and expressions. Candidates use algebraic and graphical methods to solve simultaneous linear equations in two variables.

Candidates solve problems using angle and symmetry properties of polygons and properties of intersecting and parallel lines. They understand and apply Pythagoras' Theorem when solving problems in two dimensions. Candidates find areas and circumferences of circles. They calculate lengths, areas and volumes in plane shapes and right prisms. Candidates enlarge shapes by positive whole number or fractional scale factor. They appreciate the imprecision of measurement and recognise that a measurement given to the nearest whole number may be inaccurate by up to one half in either direction. They understand and use compound measures such as speed.

Candidates construct and interpret frequency diagrams. They determine the modal class and estimate the mean, median and range of a set of grouped data, selecting the statistic most appropriate to a line of enquiry. They use measures of average and range with associated frequency polygons, as appropriate, to compare distributions and make inferences. Candidates understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.

Grade F

In order to carry through tasks and solve mathematical problems, candidates identify and obtain necessary information; they check their results, considering whether these are sensible. Candidates show understanding of situations by describing them mathematically, using symbols, words and diagrams. They draw simple conclusions of their own and give an explanation of their reasoning.

Candidates use their understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000. They order, add and subtract negative numbers in context. They use all four operations with decimals to two places. They reduce a fraction to its simplest form by cancelling common factors and solve simple problems involving ratio and direct proportion. They calculate fractional or percentage parts of quantities and measurements. Candidates explore and describe number patterns and relationships including multiple, factor and square. They construct, express in symbolic form and use simple formulae involving one or two operations.

When constructing models and when drawing or using shapes, candidates measure and draw angles as accurately as practicable, and use language associated with angle. They know the angle sum of a triangle and that of angles at a point. They identify all the symmetries of 2-D shapes. They convert from one metric unit to another. They make sensible estimates of a range of measures in relation to everyday situations. Candidates calculate areas of rectangles and right-angled triangles, and volumes of cuboids.

Candidates understand and use the mean of discrete data. They compare two simple distributions using the range and one of the mode, median or mean. They interpret graphs and diagrams, including pie charts, and draw conclusions. They understand and use the probability scale from 0 to 1. Candidates make and justify estimates of probability by selecting and using a method based on equally likely outcomes or on experimental evidence as appropriate. They understand that different outcomes may result from repeating an experiment.

Support and training

Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus – ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams, and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in 'one-click'. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert – To make it easier for you to raise a query with us online, we have merged our **Ask Edexcel** and **Ask the Expert** services.

There is now one easy-to-use web query form that will allow you to ask any question about the delivery or teaching of Edexcel qualifications. You'll get a personal response, from one of our administrative or teaching experts, sent to the email address you provide.

We'll also be doing lots of work to improve the quantity and quality of information in our FAQ database, so you'll be able find answers to many questions you might have by searching before you submit the question to us.

Examzone – The Examzone site is aimed at students sitting external examinations and gives information on revision, advice from examiners and guidance on results, including remarking, resitting and progression opportunities. Further services for students – many of which will also be of interest to parents – will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses, covering various aspects of the specification and examination, will be arranged by Edexcel. Full details can be obtained from our website: www.edexcel.com

Appendices

Appendix 1: Suggested resources

Textbooks

For this Edexcel Level 1/Level 2 Certificate, the following suggested titles could be used as teaching aids.

The books listed are not to be regarded as either recommended by Edexcel or as mandatory for Level 1/Level 2 Certificate qualifications. The internet is also valuable as a tool for research and learning.

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation at any time.

Endorsed books

- Appleton M, Demetriou D, Huby D and Kranat J – *IGCSE Mathematics for Edexcel* (Oxford University Press, 2007) ISBN 9780199152629
- Johnson T and Clough T – *Edexcel IGCSE Mathematics Practice* (Hodder Murray 2008) ISBN 9780340966273
- Metcalf P – *IGCSE Mathematics for Edexcel* (Collins Education, 2006) ISBN 9780007755486
- Smith A – *IGCSE Mathematics for Edexcel* (Hodder Murray 2008) ISBN 9780340945414
- Turner D, Potts I, Waite W and Hony V – *Longman Mathematics for IGCSE Book 1* (Longman, 2005) ISBN 9781405802116
- Turner D, Potts I, Waite W and Hony V – *Longman Mathematics for IGCSE Book 2* (Longman, 2005) ISBN 9781405802123
- Turner D and Potts I – *Longman Mathematics for IGCSE Practice Book 2* (Longman, 2007) ISBN 9781405865043
- Turner D and Potts I – *Longman Mathematics for IGCSE Practice Book 1* (Longman, 2007) ISBN 9781405865036
- Turner D, Potts I, Waite W and Hony V – *Longman Mathematics for IGCSE ActiveTeach 1*(Longman, 2007) ISBN 9781405865876
- Turner D, Potts I, Waite W and Hony V – *Longman Mathematics for IGCSE ActiveTeach 2* (Longman, 2007) ISBN 9781405865883
- *Revision Guide for IGCSE Maths Higher Tier* (ZigZag Education)

Appendix 2: Calculators

The range of functions on calculators is increasing all the time. Current models can be used to answer questions on a number of topics including fractions, surds, standard form, recurring decimals and equations. It would clearly be unfair if sophisticated calculators gave candidates an advantage in the examination.

In addition to ensuring fairness to candidates, another of our aims as examiners is to encourage good classroom practice. Appropriate and efficient use of calculators is desirable but reliance on them at the expense of understanding and learning mathematical techniques is not.

The style of some questions on certain topics and the way in which they are marked help us achieve these aims. To assist teachers preparing students for the examination, examples of such questions are given below; model solutions, which are not unique, are also provided.

Fractions

Example 1 ***(Foundation/Higher)***

Show that $\frac{2}{3}+\frac{3}{4}=1\frac{5}{12}$

(2 marks)

Solution $(\frac{2}{3}+\frac{3}{4}) = \frac{8}{12}+\frac{9}{12}$

$= \frac{17}{12}$

$= (1\frac{5}{12})$

Comment

The marks would be awarded for the unbracketed steps of the solution. Obviously, when the answer is given, candidates must give every necessary step in the working and it is better for them to err on the side of giving too much working rather than too little.

Surds

Example 2 ***(Higher)***

Show that $(2+\sqrt{3})^2 = 7+4\sqrt{3}$

(2 marks)

Solution $(2+\sqrt{3})^2 = 4+2\sqrt{3}+2\sqrt{3}+(\sqrt{3})^2$

$= 4+4\sqrt{3+3}$

$(= 7+4\sqrt{3})$

Comment

$\sqrt{3}\times\sqrt{3}$ and $\sqrt{9}$ would be acceptable alternatives to $(\sqrt{3})^2$ in the expansion but, as the answer is given, 3 would not.

Standard form

Example 3 ***(Higher)***

$x = 4\times10^n$ where n is an integer.

Find an expression, in standard form, for x^2

Give your expression as simply as possible.

(3 marks)

Solution $x^2 = (4\times10^n)^2$

$= 16\times(10^n)^2$

$= 16\times10^{2n}$

$= 1.6\times10\times10^{2n}$

$= 1.6\times10^{2n+1}$

Equations

"Spotting" a solution and showing, by substitution, that it satisfies an equation will not, in general, qualify as "sufficient working". The example below shows two possible methods and there will often be more than one acceptable method. We advise teachers to consult past mark schemes for more examples of different methods.

Example 4 ***(Higher)***

Solve $\frac{7y-2y}{4}=2y+3$

(4 marks)

Solution 1

Step	Notes
$4\times\frac{7-2y}{4}=4(2y+3)$ or $7-2y=4(2y+3)$	Demonstrates clear intention to multiply both sides by 4 or a multiple of 4, for example, $4\times\frac{7-2y}{4}$ **or** $7-2y$ = 4 × 2y + 3 or 8y + 3 or 2y + 3 × 4 or 2y + 12
$7-2y=8y+12$ **or simpler**	Correct expansion of brackets (usually $8y+2y=7-12$) or correct rearrangement of correct terms eg 8y + 2y = 7 − 12
$10y=-5$ **or** $-10y=5$	Reduction to correct equation of form $ay = b$
$y=\frac{1}{2}$	$-\frac{5}{10}$ and −0.5 are acceptable equivalents but not −5 ÷ 10 etc

Solution 2

Step	Notes
$\frac{7}{4}-\frac{2y}{4}=2y+3$	Division of both terms on LHS by 4
$\frac{7}{4}-3=2y+\frac{2y}{4}$	Correct rearrangement of correct terms
$\frac{10y}{4}=-\frac{5}{4}$ or equivalent	Reduction to correct equation of form $ay = b$
$y=-\frac{1}{2}$	$-\frac{5}{10}$ and −0.5 are acceptable equivalents but not −5 ÷ 10 etc

Example 5 (Higher)

Solve $3x^2 - 8x + 2 = 0$

Give your solutions correct to 3 significant figures.

(3 marks)

Solution

Step	Notes
$x = \frac{8 \pm \sqrt{(-8)^2 - 4 \times 3 \times 2}}{2 \times 3}$	Correct substitution in the quadratic formula
$x = \frac{8 \pm \sqrt{64 - 24}}{6}$	Correct simplification of the quadratic formula
$x = \frac{8 \pm \sqrt{40}}{6}$	
$x = 2.39$ or $x = 0.279$	Statement of solutions correct to 3 significant figures

2. Geometrical Reasoning

Centres should ensure that candidates are aware that the terms *F* angles, *Z* angles and *C* angles will receive no credit when given in geometrical reasons. The terms accepted are corresponding angles, alternate angles and allied (or co-interior) angles respectively, although knowledge of only the first two of these is required by the specifications.

3. Set Language and Notation

Centres should also ensure that candidates are aware that, in lists of the members of the union of sets, the repetition of members is penalised.

Appendix 3: Wider curriculum

Signposting and development suggestions

Issue	Paper	Opportunities for development
Spiritual	All papers	This qualification will enable centres to provide courses in mathematics that will allow students to discriminate between truth and falsehood. As candidates explore mathematical models of the real world there will be many naturally arising moral and cultural issues, environmental and health and safety considerations and aspects of European developments for discussion, for example: • use and abuse of statistics in the media • financial and business mathematics • how mathematics is used to communicate climate change • cultural and historical roots of mathematics • use of mathematics in cultural symbols and patterns.
Moral	All papers	
Ethical	All papers	
Social	All papers	
Legislative	All papers	
Economic	All papers	
Cultural	All papers	
Sustainable	All papers	
Health and safety	All papers	
European initiatives	All papers	

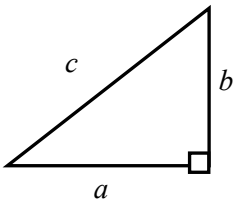
Appendix 4: Codes

Type of code	Use of code	Code number
National classification codes	Every qualification is assigned to a national classification code indicating the subject area to which it belongs. Centres should be aware that students who enter for more than one qualification with the same classification code will have only one grade (the highest) counted for the purpose of the school and college performance tables.	2210
National Qualifications Framework (NQF) codes	Each qualification title is allocated a National Qualifications Framework (NQF) code. The National Qualifications Framework (NQF) code is known as a Qualification Accreditation Number (QAN). This is the code that features in the DfE Funding Schedule, Sections 96 and 97, and is to be used for all qualification funding purposes. The QAN is the number that will appear on the student's final certification documentation.	The QAN for the qualification in this publication is: 600/0475/7
Cash-in codes	The cash-in code is used as an entry code to aggregate the student's scores to obtain the overall grade for the qualification. Centres will need to use the entry codes only when entering students for their qualification.	KMAO
Entry codes	The entry codes are used to: • enter a student for assessment • aggregate the student's paper scores to obtain the overall grade for the qualification.	Please refer to the Edexcel *Information Manual*, available on the Edexcel website.

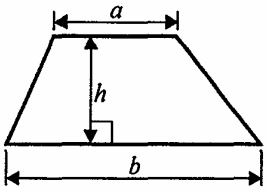
Appendix 5: Formulae sheet for Foundation Tier

Pythagoras' Theorem

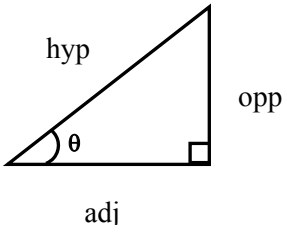
$a^2+b^2=c^2$



Area of trapezium = $\frac{1}{2}(a+b)h$



adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

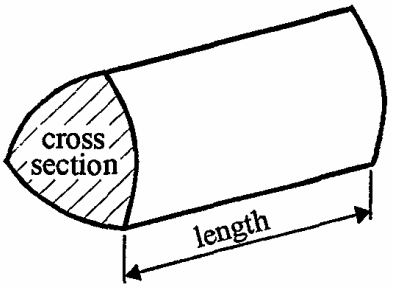


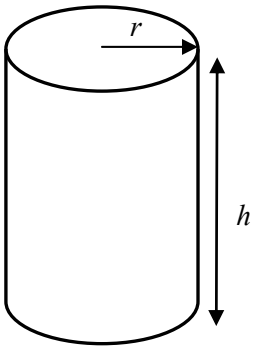
$$or\ \sin\theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan\theta = \frac{\text{opp}}{\text{adj}}$$

Volume of prism = area of cross section × length



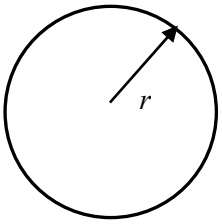


Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

Circumference of circle = $2\pi r$

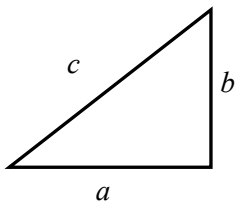
Area of circle = πr^2



Appendix 6: Formulae sheet for Higher Tier

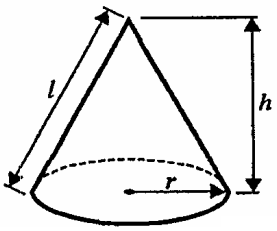
Pythagoras' theorem

$a^2+b^2=c^2$



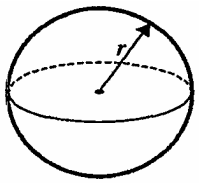
Volume of cone = $\frac{1}{3}\pi r^2 h$

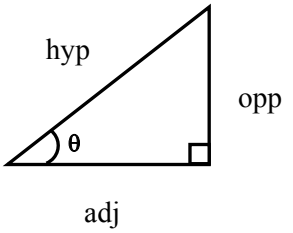
Curved surface area of cone = $\pi r l$



Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$





adj = hyp × cos θ

opp = hyp × sin θ

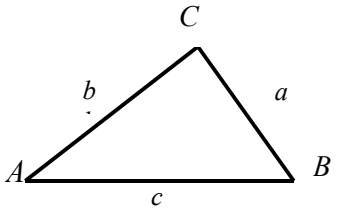
opp = adj × tan θ

$$\text{or } \sin\theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan\theta = \frac{\text{opp}}{\text{adj}}$$

In any triangle *ABC*

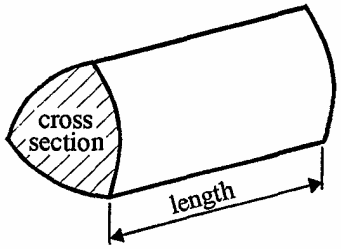


Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

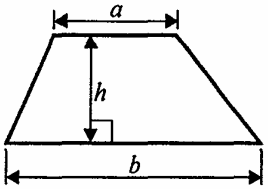
Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$

Volume of prism =
area of cross section × length

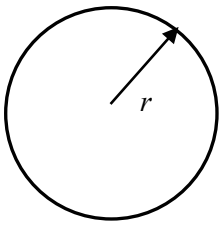


Area of trapezium = $\frac{1}{2}(a+b)h$



Circumference of circle = $2\pi r$

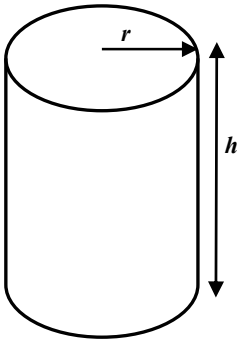
Area of circle = πr^2



The quadratic equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

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