OCR
RECOGNISING ACHIEVEMENT

OCR GCSE in Methods in Mathematics J926 (Pilot)

specification

July 2010

OCR
RECOGNISING ACHIEVEMENT

GCSE
MATHS 2010
Pilot

Why choose OCR GCSE Methods in Mathematics?

This exciting OCR pilot GCSE Methods in Mathematics is designed to be inspiring, motivating and challenging. In this pilot, the two qualifications – GCSE Methods in Mathematics and GCSE Applications of Mathematics – cover, between them, the entire Key Stage 4 programme of study for mathematics. Each GCSE is distinctive and contains some additional content.

Helping you bring mathematics to life

This specification aims to encourage awareness in learners of the links between different areas within mathematics and promote the development of an ability to reason logically and develop mathematical arguments.

With this pilot GCSE specification, we also want to promote the teaching and learning of mathematics at Key Stage 4 in schools and to provide a suitable one-year post-16 course. It has been designed to provide access to a Grade C in mathematics for all learners.

A carefully planned specification

Its aim is to encourage learners to develop knowledge, skills and understanding of mathematical methods, techniques and concepts and to develop and refine strategies for solving a range of mathematical problems.

It has been planned to help learners select and apply mathematical methods in mathematical contexts, reason mathematically, construct arguments and simple proofs, and make logical deductions and inferences. It is also designed to help them make connections between different areas of mathematics and communicate mathematical information in a variety of forms.

A firm foundation

Learners who successfully complete courses based on this specification will have a suitable basis for progression to further study in mathematics or related subjects or directly into employment.

Contents

1	**Introduction to GCSE Methods in Mathematics**	**4**
1.1	Overview of OCR GCSE Methods in Mathematics	4
1.2	Key aspects of GCSE Methods in Mathematics	5
1.3	Aims and learning outcomes	5
1.4	Guided learning hours	5
2	**Content of GCSE Methods in Mathematics**	**6**
2.1	Summary of GCSE Methods in Mathematics	6
2.2	Content – Foundation Tier (B391/01)	7
2.3	Content – Foundation Tier (B392/01)	18
2.4	Content – Higher Tier (B391/02)	28
2.5	Content – Higher Tier (B392/02)	43
3	**Assessment of GCSE Methods in Mathematics**	**55**
3.1	Overview of the assessment in GCSE Methods in Mathematics	55
3.2	Tiers	55
3.3	Assessment Objectives	56
3.4	Grading and awarding grades	57
3.5	Grade descriptions	58
3.6	Quality of Written Communication	59
4	**Support for GCSE Methods in Mathematics**	**60**
4.1	Free resources available from the OCR website	60
4.2	Training	60
4.3	OCR support services	60
5	**Access to GCSE Methods in Mathematics**	**61**
5.1	Disability Discrimination Act Information relating to GCSE Methods in Mathematics	61
5.2	Arrangements for candidates with particular requirements	61
6	**Administration of GCSE Methods in Mathematics**	**62**
6.1	Availability of assessment	62
6.2	Making entries	62
6.3	Terminal rule	63
6.4	Unit and qualification re-sits	63
6.5	Enquiries about Results	63
6.6	Shelf-life of units	63
6.7	Prohibited qualifications and classification code	63

7	**Other information about GCSE Methods in Mathematics**	**64**
7.1	Overlap with other qualifications	64
7.2	Progression from this qualification	64
7.3	Avoidance of bias	64
7.4	Code of practice/common criteria requirements/subject criteria	64
7.5	Language	64
7.6	Spiritual, moral, ethical, social, legislative, economic and cultural issues	65
7.7	Sustainable development, health and safety considerations and European developments, consistent with international agreements	65
7.8	Key Skills	66
7.9	ICT	66
7.10	Citizenship	66

1. Introduction to GCSE Methods in Mathematics

1.1 Overview of OCR GCSE Methods in Mathematics

Unit B391/01 *Methods in Mathematics 1 (Foundation)*		**Unit B391/02 *Methods in Mathematics 1 (Higher)***
Written paper 1 hour 60 marks 40% of the qualification Calculator **not** permitted	**or**	Written paper 1 hour 15 minutes 60 marks 40% of the qualification Calculator **not** permitted

AND

Unit B392/01 *Methods in Mathematics 2 (Foundation)*		**Unit B392/02 *Methods in Mathematics 2 (Higher)***
Written paper 1 hour 30 minutes 90 marks 60% of the qualification Calculator permitted	**or**	Written paper 2 hours 90 marks 60% of the qualification Calculator permitted

1.2 Key aspects of GCSE Methods in Mathematics

The broad objectives in designing the scheme have been to:

- Provide access to a Grade C in mathematics to all candidates.
- Encourage an awareness of the links between different areas within mathematics.
- Foster the development of the ability to reason logically and develop mathematical arguments.
- Provide, together with GCSE Applications of Mathematics, the best possible mathematics qualification offer currently available in the UK.

1.3 Aims and learning outcomes

The aims of this specification are to:

- Develop knowledge, skills and understanding of mathematical methods, techniques and concepts.
- Make connections between different areas of mathematics.
- Select and apply mathematical methods in mathematical contexts.
- Reason mathematically, construct arguments and simple proofs, and make logical deductions and inferences.
- Develop and refine strategies for solving a range of mathematical problems.
- Communicate mathematical information in a variety of forms.

1.4 Guided learning hours

GCSE Methods in Mathematics requires 120-140 guided learning hours in total.

2. Content of GCSE Methods in Mathematics

2.1 Summary of GCSE Methods in Mathematics

This specification comprises 2 mandatory units, Unit B391 and Unit B392, available at Foundation Tier and Higher Tier.

The content of Foundation Tier – Unit B391/01 and Unit B392/01 – is detailed in section 2.2 and 2.3. The content of Higher Tier – Unit B391/02 and Unit B392/02 – is detailed in Section 2.4 and 2.5.

The content of GCSE Applications of Mathematics and Methods in Mathematics **together** cover the Key Stage 4 programme of study plus some additional content.

There is some overlap in content between GCSE Applications of Mathematics and GCSE Methods in Mathematics. There is some content that is additional to the programme of study that is unique to GCSE Methods in Mathematics.

This is indicated in the content (Section 2.2 to 2.5) as follows:

- the content from the programme of study that is found in **both** GCSE Applications of Mathematics and Methods in Mathematics is shaded in grey;
- the content from the programme of study that is found only in GCSE Methods in Mathematics is in plain text;
- the content that is additional to the programme of study and is unique to GCSE Methods in Mathematics is in *italics.*

At both Foundation Tier and Higher Tier, the content listed for Unit B391 will **not** be the focus of a question for Unit B392. However, knowledge of it is assumed and may form part of the assessment for Unit B392.

The content for the Foundation Tier is subsumed in the content for the Higher Tier.

2.2 Content – Foundation Tier – Unit B391/01

F1A General problem solving skills		Notes and Examples
These skills should underpin and influence the learning experiences of all candidates in mathematics. They will be assessed within this specification.		
1. Solve problems using mathematical skills	Candidates should be able to:	
	a. select and use suitable problem solving strategies and efficient techniques to solve numerical problems;	
	b. identify what further information may be required in order to pursue a particular line of enquiry and give reasons for following or rejecting particular approaches;	
	c. break down a complex calculation into simpler steps before attempting to solve it and justify their choice of methods;	
	d. use notation and symbols correctly and consistently within a problem;	
	e. use a range of strategies to create numerical representations of a problem and its solution; move from one form of representation to another in order to get different perspectives on the problem;	
	f. interpret and discuss numerical information presented in a variety of forms;	
	g. present and interpret solutions in the context of the original problem;	
	h. review and justify their choice of mathematical presentation;	
	i. understand the importance of counter-example and identify exceptional cases when solving problems;	
	j. show step-by-step deduction in solving a problem;	
	k. recognise the importance of assumptions when deducing results; recognise the limitations of any assumptions that are made and the effect that varying those assumptions may have on the solution to a problem.	

F1B Number		Notes and Examples
1. Add, subtract, multiply and divide any number	Candidates should be able to:	
	a. understand and use positive numbers and negative integers, both as positions and translations on a number line;	
	b. add, subtract, multiply and divide integers and then any number;	
	c. multiply or divide any number by powers of 10;	
	d. multiply or divide any positive number by a number between 0 and 1;	
	e. multiply and divide by a negative number;	
	f. recall all positive integer complements to 100;	
	g. recall all multiplication facts to 10 × 10, and use them to derive quickly the corresponding division facts;	
	h. develop a range of strategies for mental calculation; derive unknown facts from those they know;	
	i. add and subtract mentally numbers with up to **two** decimal places;	
	j. multiply and divide numbers with no more than **one** decimal place, using place value adjustments, factorisation and the commutative, associative, and distributive laws, where possible;	
	k. add and subtract integers and decimals understanding where to position the decimal point;	
	l. perform a calculation involving division by a decimal (up to **two** decimal places) by transforming it to a calculation involving division by an integer.	

F1B Number		Notes and Examples
2. Approximate to a specified or appropriate degree of accuracy	Candidates should be able to:	• Write 13 066 using words and to the nearest 100. • Round 345·46 to the nearest integer, 1 decimal place, 2 significant figures. • Know that 3·5 on a calculator means 3·50 in money context. • Know that 3·66666667 on a calculator is a recurring decimal.
	a. use their previous understanding of integers and place value to deal with arbitrarily large positive numbers;	
	b. estimate answers to problems involving decimals;	
	c. use a variety of checking procedures, including working the problem backwards, and considering whether a result is of the right order of magnitude;	
	d. round to the nearest integer, to any number of decimal places, specified or appropriate, and to any number of significant figures;	
	e. give solutions in the context of the problem to an appropriate degree of accuracy, and recognise limitations on the accuracy of data and measurements.	
3. Understand and use Venn diagrams and set notation to solve problems	Candidates should be able to:	
	a. use 'two circle' Venn diagrams including in contexts other than number;	
	b. understand and use set notation, and be able to solve related problems.	

F1C Hierarchy of operations		
1. Hierarchy of operations	Candidates should be able to:	• Calculate $\dfrac{(6 + 8)^2}{2{\cdot}5^2 - 1{\cdot}5^2}$
	a. use brackets and the hierarchy of operations.	

F1D Factors, multiples and primes		
1. Factors, multiples and primes	Candidates should be able to:	• Write down a number between 25 and 30 that is (i) a multiple of 7, (ii) a prime number and (iii) a factor of 104. • Write 96 as a product of prime factors using indices.
	a. use the concepts and vocabulary of factor (divisor), multiple, common factor, common multiple, highest common factor, least common multiple, prime number and prime factor decomposition;	
	b. find the prime factor decomposition of positive integers;	
	c. understand that the number of factors of a number can be derived from its prime factorisation.	

F1E Fractions, decimals and percentages		Notes and Examples
1. Calculate with fractions	Candidates should be able to:	
	a. calculate a given fraction of a given quantity, expressing the answer as a fraction;	(1) Multiplication by $\frac{1}{5}$ is equivalent to division by 5
	b. express a given number as a fraction of another;	
	c. add and subtract fractions by writing them with a common denominator;	
	d. convert a simple fraction to a decimal;	
	e. multiply and divide a fraction by an integer and by a unit fraction;	
	f. understand and use unit fractions as multiplicative inverses(1);	
	g. use efficient methods to calculate with fractions, including cancelling common factors before carrying out a calculation.	
2. Order rational numbers	Candidates should be able to:	
	a. order integers;	
	b. order fractions;	
	c. order decimals.	
3. Understand equivalent fractions	Candidates should be able to:	
	a. understand and use equivalent fractions and simplify a fraction by cancelling all common factors.	
4. Relationship between fractions and decimals	Candidates should be able to:	
	a. use decimal notation and recognise that each terminating decimal is a fraction(1);	(1) $0{\cdot}137 = \frac{137}{1000}$
	b. distinguish between fractions with denominators that have only prime factors of 2 and 5 (which are represented by terminating decimals), and other fractions.	

F1F Indices and surds		Notes and Examples
1. Indices in common use	Candidates should be able to:	
	a. use the terms 'square', 'positive square root', 'negative square root', 'cube' and 'cube root';	
	b. recall integer squares from 11 × 11 to 15 × 15 and the corresponding square roots;	
	c. recall the cubes of 2, 3, 4, 5 and 10.	
2. Use index notation	Candidates should be able to:	
	a. use index notation for squares, cubes and powers of 10;	
	b. use index notation for simple positive integer powers;	
	c. use index laws for multiplication and division of integer powers;	
	d. use index laws to simplify, and calculate the value of, numerical expressions involving multiplication and division of integer powers.	

F1G Algebra		Notes and Examples
1. Symbols and notation	Candidates should be able to:	
	a. distinguish the different roles played by letter symbols in algebra, using the correct notational conventions for multiplying or dividing by a given number;	(1) $5x + 1 = 16$ (2) $V = IR$ (3) $y = 2x$
	b. know that letter symbols represent definite unknown numbers in equations[(1)] and defined quantities or variables in formulae[(2)];	
	c. know that in functions, letter symbols define new expressions or quantities by referring to known quantities[(3)].	

F1H Coordinates		Notes and Examples
1. Use the conventions for coordinates in the plane	Candidates should be able to:	
	a. use the conventions for coordinates in the plane; plot points in all four quadrants;	(1) Plot (3, 6) and (2, -4) on a grid.
	b. understand that **one** coordinate identifies a point on a number line and **two** coordinates identify a point in a plane, using the terms '1D' and '2D';	
	c. use axes and coordinates to specify points in all four quadrants;	
	d. locate points with given coordinates[(1)].	

F1I Sequences and formulae		Notes and Examples
1. Understand and use formulae	Candidates should be able to:	(1) For area of a triangle or a parallelogram, area enclosed by a circle, volume of a prism
	a. substitute numbers into formulae[(1)].	

F1J Linear equations		Notes and Examples
1. Manipulate algebraic expressions	Candidates should be able to:	
	a. understand that the transformation of algebraic expressions obeys and generalises the rules of arithmetic[1];	(1) $a(b + c) = ab + ac$
	b. manipulate algebraic expressions by collecting like terms[2], by multiplying a single term over a bracket, and by taking out common factors[3];	(2) $x + 5 - 2x - 1 = 4 - x$ (3) $9x - 3 = 3(3x - 1)$ or $x^2 - 3x = x(x - 3)$
	c. use index laws in algebra.	
2. Set up and solve simple equations	Candidates should be able to:	
	a. set up simple equations[1];	(1) Richard is x years, Julie is twice as old and their combined age is 24 years. Write an equation to show this information.
	b. solve simple equations[2] by transforming both sides in the same way;	(2) $11 - 4x = 2$; $3(2x + 1) = 8$; $2(1 - x) = 6(2 + x)$.
	c. solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation.	

F1K Functions and graphs		Notes and Examples
1. Recognise and plot equations that correspond to straight line graphs in the coordinate plane	Candidates should be able to:	
	a. plot graphs of functions in which y is given explicitly or implicitly in terms of x, where a table and/or axes are provided and where no table or axes are given;	
	b. read off values of x- or y-coordinates where two lines cross, where a line meets an axis, or where one coordinate is given.	
2. Use geometric information to complete diagrams on a coordinate grid	Candidates should be able to:	
	a. use geometric information about shapes, or parallel or perpendicular lines[1], to complete diagrams on a coordinate grid.	(1) Know that the lines represented by $y = 5x$ and $y = 3 + 5x$ are parallel, each having gradient 5

F1L Angles and properties of shapes		Notes and Examples
1. Lines and angles	Candidates should be able to:	
	a. recall and use properties of angles at a point, angles at a point on a straight line (including right angles), perpendicular lines, and vertically opposite angles;	
	b. distinguish between acute, obtuse, reflex and right angles; estimate the size of an angle in degrees.	
2. Properties of shapes	Candidates should be able to:	
	a. use angle properties of equilateral, isosceles and right-angled triangles;	
	b. recall the essential properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus;	
	c. classify quadrilaterals by their geometric properties;	
	d. recall the definition of a circle and the meaning of related terms, including centre, radius, chord, diameter, circumference, tangent, arc, sector and segment;	
	e. understand that inscribed regular polygons can be constructed by equal division of a circle.	

F1M Transformations		Notes and Examples
1. Transformations of 2D shapes	Candidates should be able to:	
	a. recognise and visualise rotations(1), reflections(2) and translations, including reflection symmetry of 2D and 3D shapes, and rotation symmetry of 2D shapes;	(1) Includes the order of rotation symmetry of a shape.
	b. understand that rotations are specified by a centre and an (anticlockwise) angle;	(2) Includes reflection in x-axis or y-axis or in a given mirror line.
	c. understand that reflections are specified by a mirror line, at first using a line parallel to an axis, then a mirror line such as $y = x$ or $y = -x$;	(3) Includes the single transformation equivalent to a combination of transformations.
	d. understand that translations are specified by a vector;	(4) Includes enlarging a shape on a grid and enlarging a shape by a scale factor given the centre of enlargement.
	e. transform triangles and other 2D shapes by translation, rotation and reflection and by combinations of these transformations(3);	
	f. recognise that these transformations preserve length and angle, and hence that any figure is congruent to its image under any of these transformations;	
	g. understand from this that any two circles and any two squares are mathematically similar, while, in general, two rectangles are not;	
	h. understand that enlargements(4) are specified by a centre;	
	i. describe and transform enlargements of shapes using positive scale factors;	
	j. distinguish properties that are preserved under particular transformations;	
	k. identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments and apply this to triangles;	
	l. understand and use vector notation for translations.	

F1N Area and volume		Notes and Examples
1. Perimeter, area and volume	Candidates should be able to:	
	a. find areas of rectangles, recalling the formula, understanding the connection to counting squares and how it extends this approach;	
	b. find the area of a parallelogram and a triangle;	
	c. work out the surface area of simple 3D shapes composed of triangles and rectangles;	
	d. calculate perimeters and areas of shapes made from triangles and rectangles;	
	e. find volumes of cuboids, recalling the formula and understanding the connection to counting cubes and how it extends this approach.	

F1O Probability		Notes and Examples
1. Probability	Candidates should be able to:	
	a. understand and use the vocabulary of probability and the probability scale[(1)];	(1) Use impossible, certain, evens, likely, unlikely.
	b. understand and use theoretical models of probabilities including the model of equally likely outcomes[(2)];	(2) Associate 0, 0·5, 1 with impossible, evens and certain and position events on a probability scale.
	c. understand and use estimates of probability from relative frequency;	
	d. use sample spaces for situations where outcomes are single events and for situations where outcomes are two successive events[(3)];	(3) Use a sample space or list combinations systematically eg for 2 dice.
	e. identify different mutually-exclusive and exhaustive outcomes and know that the sum of the probabilities of these outcomes is 1[(4)];	(4) Given the P(A) find P(not A), and given P(A) and P(B) find P(not A or B).
	f. understand that if they repeat an experiment, they may (and usually will) get different outcomes, and that increasing sample size generally leads to better estimates of probability[(5)];	(5) Compare the dice experiment results to theoretical and comment on possible bias.
	g. compare experimental data to theoretical probabilities, and make informal inferences about the validity of the model giving rise to the theoretical probabilities;	
	h. understand and use set notation to describe events and compound events;	
	i. use Venn diagrams to represent the number of possibilities and hence find probabilities.	

F2A General problem solving skills		Notes and Examples
These skills should underpin and influence the learning experiences of all candidates in mathematics. They are assessed within this specification.		
1. Solve problems using mathematical skills	Candidates should be able to:	
	a. select and use suitable problem solving strategies and efficient techniques to solve numerical problems;	
	b. identify what further information may be required in order to pursue a particular line of enquiry and give reasons for following or rejecting particular approaches;	
	c. break down a complex calculation into simpler steps before attempting to solve it and justify their choice of methods;	
	d. use notation and symbols correctly and consistently within a problem;	
	e. use a range of strategies to create numerical representations of a problem and its solution; move from one form of representation to another in order to get different perspectives on the problem;	
	f. interpret and discuss numerical information presented in a variety of forms;	
	g. present and interpret solutions in the context of the original problem;	
	h. review and justify their choice of mathematical presentation;	
	i. understand the importance of counter-example and identify exceptional cases when solving problems;	
	j. show step-by-step deduction in solving a problem;	
	k. recognise the importance of assumptions when deducing results; recognise the limitations of any assumptions that are made and the effect that varying those assumptions may have on the solution to a problem.	

F2B Number		Notes and Examples
1. Approximate to a specified or appropriate degree of accuracy	Candidates should be able to:	
	a. use their previous understanding of integers and place value to deal with arbitrarily large positive numbers;	
	b. use a variety of checking procedures, including working the problem backwards, and considering whether a result is of the right order of magnitude;	
	c. round to the nearest integer, to any number of decimal places, specified or appropriate, and to any number of significant figures;	
	d. give solutions in the context of the problem to an appropriate degree of accuracy, interpreting the solution shown on a calculator display, and recognising limitations on the accuracy of data and measurements;	
	e. understand the calculator display, knowing when to interpret the display, when the display has been rounded by the calculator, and not to round during the intermediate steps of a calculation.	
2. Use calculators effectively and efficiently	Candidates should be able to:	(1) Calculate $1{\cdot}6^3$, $\sqrt{7{\cdot}29}$ (2) $\sqrt[3]{6{\cdot}1^2 - 0{\cdot}81}$ (3) When using money interpret a calculator display of 2·6 as £2·60.
	a. use calculators effectively and efficiently(1);	
	b. know how to enter complex calculations and use function keys for reciprocals, squares and powers(2);	
	c. enter a range of calculations, including those involving measures(3).	

F2C Hierarchy of operations		Notes and Examples
1. Hierarchy of operations	Candidates should be able to:	
	a. understand and use number operations and the relationships between them, including inverse operations.	• Calculate $\dfrac{(6+8)^2}{2{\cdot}5^2 - 1{\cdot}5^2}$

F2D Ratio		Notes and Examples
1. Use ratio notation, including reduction to its simplest form and its various links to fraction notation	Candidates should be able to:	
	a. use ratio notation, including reduction to its simplest form expressed as 1:*n* or *n*:1 or *m*:*n*;	Write the ratio 24:60 in its simplest form.
	b. know and use the links between ratio notation and fraction notation.	
2. Divide a quantity in a given ratio	Candidates should be able to:	
	a. divide a quantity in a given ratio(1);	(1) Divide £120 in the ratio 3:7.
	b. determine the original quantity by knowing the size of one part of the divided quantity;	(2) 8 calculators cost £59·52. How much do 3 calculators cost?
	c. solve word problems about ratio, including using informal strategies and the unitary method of solution(2).	

F2E Fractions, decimals and percentages		Notes and Examples
1. Calculate with fractions	Candidates should be able to:	
	a. convert a simple fraction to a decimal;	
	b. multiply and divide a fraction by an integer and by a unit fraction;	
	c. understand and use unit fractions as multiplicative inverses;	
	d. use efficient methods to calculate with fractions, including cancelling common factors before carrying out a calculation;	
	e. recognise that, in some cases, only a fraction can express the exact answer;	
	f. understand ‘reciprocal’ as multiplicative inverse and know that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal, since division by zero is not defined).	
2. Relationship between fractions and decimals	Candidates should be able to:	
	a. recognise that recurring decimals are exact fractions;	
	b. know that some exact fractions are recurring decimals;	
	c. convert a recurring decimal to a fraction.	
3. Understand percentage	Candidates should be able to:	
	a. understand that ‘percentage’ means ‘number of parts per 100’ and use this to compare proportions;	
	b. know the fraction-to-percentage (or decimal) conversion of familiar simple fractions.	

F2E Fractions, decimals and percentages		Notes and Examples
4. Interpret fractions, decimals and percentages as operators	Candidates should be able to:	
	a. interpret percentage as the operator 'so many hundredths of';	(1) A 15% decrease in Y is calculated as $0{\cdot}85 \times Y$.
	b. convert between fractions, decimals and percentages;	
	c. understand the multiplicative nature of percentages as operators;	
	d. use multipliers for percentage change[(1)].	
5. Proportional change	Candidates should be able to:	
	a. find proportional change using fractions, decimals and percentages;	
	b. understand and use direct proportion.	

F2F Algebra		Notes and Examples
1. Symbols and notation	Candidates should be able to:	
	a. distinguish the different roles played by letter symbols in algebra, using the correct notational conventions for multiplying or dividing by a given number;	(1) $5x + 1 = 16$ (2) $V = IR$ (3) $y = 2x$
	b. know that letter symbols represent definite unknown numbers in equations[(1)] and defined quantities or variables in formulae[(2)];	
	c. know that in functions, letter symbols define new expressions or quantities by referring to known quantities[(3)];	
	d. understand the concept of an inequality.	
2. Proof	Candidates should be able to:	
	a. use algebra to support and construct arguments.	

F2G Coordinates		Notes and Examples
1. Use the conventions for coordinates in the plane	Candidates should be able to:	
	a. given the coordinates of the points A and B, find coordinates of the midpoint of the line segment AB;	
	b. given the coordinates of the points A and B, find the length of AB.	

F2H Sequences and formulae		Notes and Examples
1. Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	Candidates should be able to:	(1) Write down the first two terms of the sequence whose *n*th term is $3n - 5$.
	a. generate terms of a sequence using term-to-term and position-to-term[(1)] definitions of the sequence;	
	b. generate common integer sequences (including sequences of odd or even integers, squared integers, powers of 2, powers of 10, triangular numbers).	
2. Form linear expressions to describe the *n*th term of an arithmetic sequence	Candidates should be able to:	Foundation also includes simple sequence of odd or even numbers, squared integers and sequences derived from diagrams.
	a. use linear expressions to describe the *n*th term of an arithmetic sequence, justifying its form by referring to the activity or context from which it was generated.	
3. Derive a formula, substitute numbers into a formula and change the subject of a formula	Candidates should be able to:	• For area of a parallelogram, area enclosed by a circle, volume of a prism. • Wage earned = hours worked × rate per hour. • Find r given that $C = \pi r$, find x given $y = mx + c$.
	a. derive a formula for a given sequence;	
	b. derive a formula in a physical or everyday context;	
	c. substitute numbers into a formula;	
	d. change the subject of a formula.	

F2I Linear equations		Notes and Examples
1. Set up and solve simple equations and inequalities	Candidates should be able to:	
	a. solve linear equations that require prior simplification of brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;	
	b. understand that the point of intersection of two different lines in the same two variables that simultaneously describe a real situation is the solution to the simultaneous equations represented by the lines;	
	c. set up simple inequalities;	
	d. solve simple inequalities by transforming both sides in the same way.	

F2J Functions and graphs		Notes and Examples
1. Solve quadratic equations using a graph	Candidates should be able to:	
	a. understand that approximate solutions of quadratic equations can be found from their graphs;	
	b. draw graphs of quadratic equations and find their approximate solution.	
2. Recognise and use equivalence in numerical, algebraic and graphical representations	Candidates should be able to:	
	a. recognise that straight line graphs can be represented by equations, and vice versa;	
	b. interpret numerical data in graphical form.	

F2K Pythagoras in 2D		Notes and Examples
1. Use Pythagoras' theorem	Candidates should be able to:	
	a. understand, recall and use Pythagoras' theorem to solve simple cases in 2D.	

F2L Angles and properties of shapes		Notes and Examples
1. Lines and angles	Candidates should be able to:	
	a. distinguish between lines and line segments;	
	b. use parallel lines, alternate angles and corresponding angles;	
	c. understand the consequent properties of parallel and intersecting lines, triangles (including a proof that the angle sum of a triangle is 180°) and parallelograms;	
	d. understand a proof that an exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices;	
	e. explain why the angle sum of a quadrilateral is 360°.	
2. Angles and polygons	Candidates should be able to:	
	a. calculate and use the sums of the interior and exterior angles of polygons;	
	b. calculate and use the angles of regular polygons;	
	c. solve problems in the context of tiling patterns and tessellations.	

F2M Transformations		Notes and Examples
1. Congruence and similarity	Candidates should be able to:	
	a. understand congruence;	
	b. understand similarity of plane figures including the relationship between lengths and angles.	

F2N Area and volume		Notes and Examples
1. Perimeter, area (including circles), and volume	Candidates should be able to:	
	a. solve problems involving simple areas;	
	b. find circumferences of circles[1] and areas enclosed by circles, recalling relevant formulae;	(1) Could involve semicircles, and inverse problems eg find the diameter if the circumference is 60cm.
	c. find volumes of cuboids[2], recalling the formula and understanding the connection to counting cubes and how it extends this approach;	(2) Could involve inverse calculations - find the length of an edge given the volume and two other edges.
	d. calculate volumes of right prisms and of shapes made from cubes and cuboids.	

2.4 Content – Higher Tier – Unit B391/02

H1A General problem solving skills		Notes and Examples
These skills should underpin and influence the learning experiences of all candidates in mathematics. They will be assessed within this specification.		
1. Solve problems using mathematical skills	Candidates should be able to:	
	a. select and use suitable problem solving strategies and efficient techniques to solve numerical problems;	
	b. identify what further information may be required in order to pursue a particular line of enquiry and give reasons for following or rejecting particular approaches;	
	c. break down a complex calculation into simpler steps before attempting to solve it and justify their choice of methods;	
	d. use notation and symbols correctly and consistently within a problem;	
	e. use a range of strategies to create numerical representations of a problem and its solution; move from one form of representation to another in order to get different perspectives on the problem;	
	f. interpret and discuss numerical information presented in a variety of forms;	
	g. present and interpret solutions in the context of the original problem;	
	h. review and justify their choice of mathematical presentation;	
	i. understand the importance of counter-example and identify exceptional cases when solving problems;	
	j. show step-by-step deduction in solving a problem;	
	k. recognise the importance of assumptions when deducing results; recognise the limitations of any assumptions that are made and the effect that varying those assumptions may have on the solution to a problem.	

H1B Number		Notes and Examples
1 Add, subtract, multiply and divide any number	Candidates should be able to:	
	a. understand and use positive numbers and negative integers, both as positions and translations on a number line;	
	b. add, subtract, multiply and divide integers and then any number;	
	c. multiply or divide any number by powers of 10;	
	d. multiply or divide any positive number by a number between 0 and 1;	
	e. multiply and divide by a negative number;	
	f. recall all positive integer complements to 100;	
	g. recall all multiplication facts to 10 × 10, and use them to derive quickly the corresponding division facts;	
	h. develop a range of strategies for mental calculation; derive unknown facts from those they know;	
	i. add and subtract mentally numbers with up to **two** decimal places;	
	j. multiply and divide numbers with no more than **one** decimal place, using place value adjustments, factorisation and the commutative, associative, and distributive laws, where possible;	
	k. add and subtract integers and decimals understanding where to position the decimal point;	
	l. perform a calculation involving division by a decimal (up to **two** decimal places) by transforming it to a calculation involving division by an integer.	

H1B Number		Notes and Examples
2. Approximate to a specified or appropriate degree of accuracy	Candidates should be able to:	• Write 13 066 using words and to the nearest 100. • Round 345·46 to the nearest integer, 1 decimal place, 2 significant figures. • Know that 3·5 on a calculator means 3·50 in money context. • Know that 3·66666667 on a calculator is a recurring decimal.
	a. use their previous understanding of integers and place value to deal with arbitrarily large positive numbers;	
	b. estimate answers to problems involving decimals;	
	c. use a variety of checking procedures, including working the problem backwards, and considering whether a result is of the right order of magnitude;	
	d. round to the nearest integer, to any number of decimal places, specified or appropriate, and to any number of significant figures;	
	e. give solutions in the context of the problem to an appropriate degree of accuracy and recognise limitations on the accuracy of data and measurements.	
3. Understand and use Venn diagrams and set notation to solve problems	Candidates should be able to:	
	a. use 'two circle' or 'three circle' Venn diagrams including in contexts other than number;	
	b. understand and use set notation, and be able to solve related problems.	

H1C Hierarchy of operations		Notes and Examples
1. Hierarchy of operations	Candidates should be able to:	• Calculate $\frac{(6+8)^2}{2 \cdot 5^2 - 1 \times 5^2}$.
	a. use brackets and the hierarchy of operations.	

H1D Factors, multiples and primes		Notes and Examples
1. Factors, multiples and primes	Candidates should be able to:	
	a. use the concepts and vocabulary of factor (divisor), multiple, common factor, common multiple, highest common factor, least common multiple, prime number and prime factor decomposition;	Write down a number between 25 and 30 that is: (i) a multiple of 7, (ii) a prime number and (iii) a factor of 104. Write 96 as a product of prime factors using indices.
	b. find the prime factor decomposition of positive integers;	
	c. understand that the number of factors of a number can be derived from its prime factorisation.	

H1E Fractions, decimals and percentages		Notes and Examples
1. Calculate with fractions	Candidates should be able to:	(1) Multiplication by $\frac{1}{5}$ is equivalent to division by 5.
	a. calculate a given fraction of a given quantity, expressing the answer as a fraction;	
	b. express a given number as a fraction of another;	
	c. add and subtract fractions by writing them with a common denominator;	
	d. perform short division to convert a simple fraction to a decimal;	
	e. multiply and divide a fraction by an integer and by a unit fraction;	
	f. understand and use unit fractions as multiplicative inverses(1);	
	g. use efficient methods to calculate with fractions, including cancelling common factors before carrying out a calculation.	

H1E Fractions, decimals and percentages		Notes and Examples
2. Order rational numbers	Candidates should be able to:	
	a. order integers;	
	b. order fractions;	
	c. order decimals.	
3. Understand equivalent fractions	Candidates should be able to:	
	a. understand and use equivalent fractions and simplify a fraction by cancelling all common factors.	
4. Relationship between fractions and decimals	Candidates should be able to:	
	a. use decimal notation and recognise that each terminating decimal is a fraction(1);	(1) $0{\cdot}137 = \frac{137}{1000}$
	b. distinguish between fractions with denominators that have only prime factors of 2 and 5 (which are represented by terminating decimals), and other fractions(2).	(2) Convert $0{\cdot}\dot{3}$ to a fraction.

H1F Indices and surds		Notes and Examples
1. Indices in common use	Candidates should be able to:	
	a. use the terms ‘square’, ‘positive square root’, ‘negative square root’, ‘cube’ and ‘cube root’;	
	b. recall integer squares from 11 × 11 to 15 × 15 and the corresponding square roots;	
	c. recall the cubes of 2, 3, 4, 5 and 10.	
2. Index notation	Candidates should be able to:	
	a. use index notation for squares, cubes and powers of 10;	
	b. use index notation for simple integer powers;	
	c. use index laws for multiplication and division of integer powers;	
	d. use index laws to simplify, and calculate the value of, numerical expressions involving multiplication and division of integer, fractional and negative powers;	
	e. know that that $n^0 = 1$; understand that the inverse operation of raising a positive number to power n is raising the result of this operation to power $1/n$;	
	f. know that $n^{-1} = 1/n$ (undefined for $n = 0$), and that $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive number n.	
3. Use surds in exact calculations	Candidates should be able to:	
	a. use surds and π in exact calculations without a calculator;	(1) $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
	b. rationalise a denominator[1].	

H1G Standard index form		Notes and Examples
1. Standard index form	Candidates should be able to:	
	a. use and express standard index form expressed in conventional notation(1);	(1) $2 \cdot 4 \times 10^7 \times 5 \times 10^3$ $= 1 \cdot 2 \times 10^{11}$ OR $(2 \cdot 4 \times 10^7) \div (5 \times 10^3)$ $= 4 \cdot 8 \times 10^3$.
	b. calculate with standard index form(2);	(2) Write 165 000 in standard form; write $6 \cdot 32 \times 10^{-3}$ as an ordinary number.
	c. convert between ordinary and standard index form representations, converting to standard index form to make sensible estimates for calculations involving multiplication and/or division.	

H1H Algebra		Notes and Examples
1. Symbols and notation	Candidates should be able to:	
	a. distinguish the different roles played by letter symbols in algebra, using the correct notational conventions for multiplying or dividing by a given number;	(1) $5x + 1 = 16$ (2) $V = IR$ (3) $y = 2x$
	b. know that letter symbols represent definite unknown numbers in equations[(1)] and defined quantities or variables in formulae[(2)];	
	c. know that in functions, letter symbols define new expressions or quantities by referring to known quantities[(3)].	
2. Algebraic terminology	Candidates should be able to:	
	a. distinguish in meaning between the words 'equation', 'formula' and 'expression'.	

H1I Coordinates		Notes and Examples
1. Use the conventions for coordinates in the plane	Candidates should be able to:	
	a. use the conventions for coordinates in the plane; plot points in all four quadrants;	(1) Plot (3, 6) and (2, -4) on a grid.
	b. understand that **one** coordinate identifies a point on a number line, **two** coordinates identify a point in a plane and **three** coordinates identify a point in space, using the terms '1D', '2D' and '3D';	
	c. use axes and coordinates to specify points in all four quadrants;	
	d. locate points with given coordinates[(1)].	

H1J Sequences and formulae		Notes and Examples
1. Use formulae	Candidates should be able to:	• Formulae for the area of a triangle, the area enclosed by a circle, wage earned = hours worked × rate per hour.
	a. substitute numbers into formulae.	

H1K Linear equations		Notes and Examples
1. Manipulate algebraic expressions	Candidates should be able to:	
	a. understand that the transformation of algebraic expressions obeys and generalises the rules of arithmetic(1);	(1) $a(b + c) = ab + bc$
	b. manipulate algebraic expressions by collecting like terms(2), by multiplying a single term over a bracket, and by taking out common factors(3);	(2) $x + 5 – 2x – 1 = 4 – x$ (3) $9x – 3 = 3 (3x – 1)$ or $x^2 – 3x = x(x – 3)$
	c. use index laws in algebra.	
2. Set up and solve simple equations	Candidates should be able to:	
	a. set up simple equations(1);	(1) Richard is x years, Julie is twice as old and their combined age is 24 years. Write an equation to show this information.
	b. solve simple equations(2) by transforming both sides in the same way;	(2) $11 – 4x = 2$; $3(2x + 1) = 8$; $2(1 – x) = 6(2 + x)$
	c. solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation.	

H1L Functions and graphs		Notes and Examples
1. Recognise and plot equations that correspond to straight line graphs in the coordinate plane, including finding gradients	Candidates should be able to:	(1) Know that the lines represented by $y = 5x$ and $y = 3 + 5x$ are parallel, each having gradient 5. (2) Know that the line with equation $y = \frac{-x}{5}$ is perpendicular to these lines and has gradient $-\frac{1}{5}$.
	a. recognise (when values are given for *m* and *c*) that equations of the form $y = mx + c$ correspond to straight line graphs in the coordinate plane;	
	b. find the gradient of lines given by equations of the form $y = mx + c$ (when values are given for *m* and *c*); investigate the gradients of parallel lines[(1)];	
	c. plot graphs of functions in which *y* is given explicitly in terms of *x*, or implicitly, where no table or axes are given;	
	d. use $y = mx + c$ and understand the relationship between gradients of parallel and perpendicular lines[(2)].	
2. Use geometric information to complete diagrams on a coordinate grid	Candidates should be able to:	
	a. use geometric information about shapes, or parallel or perpendicular lines, to complete diagrams on a coordinate grid.	

H1M Angles and properties of shapes		Notes and Examples
1. Lines and angles	Candidates should be able to:	
	a. recall and use properties of angles at a point, angles at a point on a straight line (including right angles), perpendicular lines, and opposite angles;	
	b. distinguish between acute, obtuse, reflex and right angles; estimate the size of an angle in degrees.	
2. Properties of shapes	Candidates should be able to:	
	a. use angle properties of equilateral, isosceles and right-angled triangles;	
	b. recall the essential properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus;	
	c. classify quadrilaterals by their geometric properties;	
	d. understand that inscribed regular polygons can be constructed by equal division of a circle;	
	e. distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment.	

H1M Angles and properties of shapes		Notes and Examples
3. Understand, prove and use circle theorems	Candidates should be able to:	
	a. understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;	
	b. understand and use the fact that tangents meeting at an external point are equal in length;	
	c. explain why the perpendicular from the centre to a chord bisects that chord;	
	d. prove and use these facts: i. the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference; ii. the angle subtended at the circumference in a semicircle is a right angle; iii. angles in the same segment are equal; iv. the alternate segment theorem; v. the opposite angles of a cyclic quadrilateral sum to 180°.	

H1N Transformations		Notes and Examples
1. Transformations of 2D shapes	Candidates should be able to:	
	a. recognise and visualise rotations(1), reflections(2) and translations, including reflection symmetry of 2D and 3D shapes, and rotation symmetry of 2D shapes;	(1) Includes the order of rotation symmetry of a shape. (2) Includes reflection in x-axis or y-axis or in a given mirror line. (3) Includes the single transformation equivalent to a combination of transformations.
	b. understand that rotations are specified by a centre and an (anticlockwise) angle;	
	c. understand that reflections are specified by a mirror line, at first using a line parallel to an axis, then a mirror line such as $y = x$ or $y = -x$;	
	d. understand that translations are specified by a vector;	
	e. transform triangles and other 2D shapes by translation, rotation and reflection and by combinations of these transformations(3);	
	f. recognise that these transformations preserve length and angle, and hence that any figure is congruent to its image under any of these transformations;	
	g. understand that enlargements are specified by a centre;	
	h. describe transform and produce enlargements of shapes using positive scale factors;	
	i. understand from this that any **two** circles and any **two** squares are mathematically similar, while, in general, **two** rectangles are not;	
	j. distinguish properties that are preserved under particular transformations;	
	k. identify the scale factor of an enlargement as the ratio of the lengths of any **two** corresponding line segments and apply this to triangles;	
	l. enlarge shapes using positive fractional and negative scale factors.	

H1O Vectors		Notes and Examples
1. Use vectors	Candidates should be able to:	
	a. understand and use vector notation for translations;	
	b. solve simple geometrical problems using vector methods;	
	c. use vector methods to construct geometrical arguments.	

H1P Area and volume		Notes and Examples
1. Perimeter, area and volume	Candidates should be able to:	
	a. find areas of rectangles, recalling the formula, understanding the connection to counting squares and how it extends this approach;	
	b. find the area of a parallelogram and a triangle;	
	c. calculate perimeters and areas of shapes made from triangles and rectangles;	
	d. work out the surface area of simple shapes composed of triangles and rectangles;	
	e. find volumes of cuboids, recalling the formula.	
2. Use 2D representations of 3D shapes	Candidates should be able to:	• Use of isometric paper is included. • Cube, cuboid and simple pyramids. • Could include cylinders.
	a. use 2D representations of 3D shapes, including plans and elevations.	

H1Q Probability		Notes and Examples
1. Probability	Candidates should be able to:	
	a. understand and use the vocabulary of probability[1] and the probability scale[2];	(1) Use impossible, certain, evens, likely, unlikely.
	b. understand and use theoretical models of probabilities including the model of equally likely outcomes;	(2) Associate 0, 0·5, 1 with impossible, evens and certain and position events on a probability scale.
	c. understand and use estimates of probability from relative frequency;	(3) Use a sample space or list combinations systematically for 2 dice.
	d. use sample spaces[3] for situations where outcomes are single events and for situations where outcomes are two successive events;	(4) Given the P(A) find P(not A), and given P(A) and P(B) find P(not A or B).
	e. identify different mutually-exclusive and exhaustive outcomes and know that the sum of the probabilities of these outcomes is 1[4];	(5) Compare the dice experiment results to theoretical and comment on possible bias.
	f. understand that if they repeat an experiment, they may (and usually will) get different outcomes, and that increasing sample size generally leads to better estimates of probability;	(6) Probability of winning a match is 0·4. Probability of drawing is 0·3. Find probability of winning or drawing.
	g. compare experimental data to theoretical probabilities[5], and make informal inferences about the validity of the model giving rise to the theoretical probabilities;	(7) Two dice are thrown. Find the probability of getting two sixes.
	h. know when to add or multiply probabilities: • if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B)[6]; • if A and B are independent events, the probability of A and B occurring is P(A) × P(B)[7];	(8) There are 7 black and 4 white discs in a bag. Two are selected at random. Find the probability of getting one of each colour.
	i. use tree diagrams to represent outcomes of compound events, recognising when events are independent or dependent[8];	
	j. understand and use set notation to describe events and compound events;	
	k. use Venn diagrams to represent the number of possibilities and hence find probabilities;	

H2A General problem solving skills		Notes and Examples
These skills should underpin and influence the learning experiences of all candidates in mathematics. They will be assessed within this specification.		
1. Solve problems using mathematical skills	Candidates should be able to:	
	a. select and use suitable problem solving strategies and efficient techniques to solve numerical problems;	
	b. identify what further information may be required in order to pursue a particular line of enquiry and give reasons for following or rejecting particular approaches;	
	c. break down a complex calculation into simpler steps before attempting to solve it and justify their choice of methods;	
	d. use notation and symbols correctly and consistently within a problem;	
	e. use a range of strategies to create numerical representations of a problem and its solution; move from one form of representation to another in order to get different perspectives on the problem;	
	f. interpret and discuss numerical information presented in a variety of forms;	
	g. present and interpret solutions in the context of the original problem;	
	h. review and justify their choice of mathematical presentation;	
	i. understand the importance of counter-example and identify exceptional cases when solving problems;	
	j. show step-by-step deduction in solving a problem;	
	k. recognise the importance of assumptions when deducing results; recognise the limitations of any assumptions that are made and the effect that varying those assumptions may have on the solution to a problem.	

H2B Number		Notes and Examples
1. Approximate to a specified or appropriate degree of accuracy	Candidates should be able to:	(1) Round 345·46 to the nearest integer, 1 decimal place, 2 significant figures. (2) Know that 3·5 on a calculator means 3·50 in money context. (3) Know that 3·66666667 on a calculator is a recurring decimal.
	a. use their previous understanding of integers and place value to deal with arbitrarily large positive numbers;	
	b. use a variety of checking procedures, including working the problem backwards, and considering whether a result is of the right order of magnitude;	
	c. round to the nearest integer, to any number of decimal places, specified or appropriate, and to any number of significant figures[(1)];	
	d. give solutions in the context of the problem to an appropriate degree of accuracy, interpreting the solution shown on a calculator display, and recognising limitations on the accuracy of data and measurements;	
	e. understand the calculator display[(2)], knowing when to interpret the display[(3)], when the display has been rounded by the calculator, and not to round during the intermediate steps of a calculation.	
2. Use calculators effectively and efficiently, including trigonometrical functions	Candidates should be able to:	(1) $1{\cdot}6^3$, $\sqrt{7{\cdot}29}$. (2) $\sqrt[3]{6{\cdot}1^2 - 0{\cdot}81}$. (3) When using money interpret a calculator display of 2·6 as £2·60. (4) $\frac{5 \times \sin 35}{\sin 62}$.
	a. use calculators effectively and efficiently for simple calculations[(1)]	
	b. perform a calculation involving division by a decimal (up to **two** decimal places);	
	c. know how to enter complex calculations and use function keys for reciprocals, squares and powers[(2)];	
	d. know how to calculate with numbers expressed in standard index form, and be able to interpret calculator displays of such numbers;	
	e. perform a range of calculations, including those involving measures[(3)];	
	f. use an extended range of function keys, including trigonometrical[(4)] functions.	

H2C Hierarchy of operations		Notes and Examples
1. Hierarchy of operations	Candidates should be able to:	
	a. understand and use number operations and the relationships between them, including inverse operations.	• Calculate $\frac{(6+8)^2}{2{\cdot}5^2 - 1{\cdot}5^2}$.

H2D Ratio		Notes and Examples
1. Use ratio notation, including reduction to its simplest form and its various links to fraction notation	Candidates should be able to:	
	a. use ratio notation, including reduction to its simplest form expressed as 1:*n* or *n*:1 or *m*:*n*[(1)];	(1) Write the ratio 24:60 in its simplest form.
	b. know and use the links between ratio notation and fraction notation.	
2. Divide a quantity in a given ratio	Candidates should be able to:	
	a. divide a quantity in a given ratio[(1)];	(1) Divide £120 in the ratio 3:7.
	b. determine the original quantity by knowing the size of one part of the divided quantity;	(2) 8 calculators cost £59·52. How much do 3 calculators cost?
	c. solve word problems about ratio, including using informal strategies and the unitary method of solution[(2)].	

H2E Fractions, decimals and percentages		Notes and Examples
1. Calculate with fractions	Candidates should be able to:	
	a. perform short division to convert a simple fraction to a decimal;	
	b. multiply and divide a fraction by an integer and by a unit fraction;	
	c. understand and use unit fractions as multiplicative inverses;	
	d. use efficient methods to calculate with fractions, including cancelling common factors before carrying out a calculation;	
	e. recognise that, in some cases, only a fraction can express the exact answer;	
	f. understand 'reciprocal' as multiplicative inverse and know that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal, since division by zero is not defined).	
2. Relationship between fractions and decimals	Candidates should be able to:	
	a. recognise that recurring decimals are exact fractions[(1)];	(1) $0\cdot\dot{1}3\dot{7} = \frac{137}{999}$
	b. know that some exact fractions are recurring decimals;	
	c. convert a recurring decimal to a fraction[(2)].	(2) Convert $0\cdot\dot{3}$ to a fraction.

H2E Fractions, decimals and percentages		Notes and Examples
3. Understand percentage	Candidates should be able to:	
	a. understand that ‘percentage’ means ‘number of parts per 100’ and use this to compare proportions;	
	b. know the fraction to percentage (or decimal) conversion of familiar simple fractions.	
4. Interpret fractions, decimals and percentages as operators	Candidates should be able to:	(1) A 15% decrease in Y is calculated as $0{\cdot}85 \times Y$. (2) £5000 invested at 4% compound interest for 3 years is calculated as $5000 \times 1{\cdot}04^3$. (3) Given that a meal in a restaurant costs £136 with VAT at 17.5%, its price before VAT is calculated as £136/1·175.
	a. interpret percentage as the operator ‘so many hundredths of’;	
	b. convert between fractions, decimals and percentages;	
	c. understand the multiplicative nature of percentages as operators;	
	d. use multipliers for percentage change(1);	
	e. work with repeated percentage change(2);	
	f. solve reverse percentage problems(3).	
5. Proportional change	Candidates should be able to:	(1) 5 books cost £23·50, find the cost of 3 books; foreign currency conversion; recipes; best value for money problems. (2) $y \propto x^2$ and $x = 4$ when $y = 8$. Find y when $x = 12$. (3) A tank can be emptied using 6 pumps in 18 hours. How long will it take to empty the tank using 8 pumps?
	a. find proportional change using fractions, decimals and percentages(1);	
	b. understand and use direct(2) and inverse proportion(3);	
	c. set up and use equations to solve problems involving inverse proportion;	
	d. understand and use repeated proportional change.	

H2F Algebra		Notes and Examples
1. Symbols and notation	Candidates should be able to:	
	a. distinguish the different roles played by letter symbols in algebra, using the correct notational conventions for multiplying or dividing by a given number;	(1) $x^2 + 1 = 82$. (2) $(x + 1)^2 = x^2 + 2x + 1$ for all values of x. (3) $y = 2 - 7x$; $y = \frac{1}{x}$ with $x \neq 0$. f (x) notation may be used.
	b. know that letter symbols represent definite unknown numbers in equations(1), defined quantities or variables in formulae and general, unspecified independent numbers in identities(2);	
	c. know that in functions, letter symbols define new expressions or quantities by referring to known quantities(3).	
2. Algebraic terminology	Candidates should be able to:	
	a. distinguish in meaning between the words ‘equation’, ‘inequality’, ‘formula’, ‘identity’ and ‘expression’.	
3. Proof	Candidates should be able to:	
	a. use algebra to support and construct arguments and to construct proofs.	

H2G Coordinates		Notes and Examples
1. Use the conventions for coordinates in the plane	Candidates should be able to:	
	a. given the coordinates of the points A and B, find the coordinates of the midpoint of the line segment AB;	
	b. given the coordinates of the points A and B, find the length of AB.	

H2H Sequences and formulae		Notes and Examples
1. Derive a formula, substitute numbers into a formula and change the subject of a formula	Candidates should be able to: a. substitute numbers into a formula(1); b. derive a formula(2); c. change the subject of a formula(3).	(1) For area of a parallelogram, volume of a prism. (2) Wage earned = hours worked × rate per hour. (3) Find r given that $C = \pi r$, find x given $y = mx + c$
2. Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	Candidates should be able to: a. generate terms of a sequence using term-to-term and position-to-term(1) definitions of the sequence; b. generate common integer sequences (including sequences of odd or even integers, squared integers, powers of 2, powers of 10, triangular numbers).	(1) Write down the first two terms of the sequence whose nth term is $3n - 5$.
3. Form linear expressions to describe the *n*th term of an arithmetic sequence	Candidates should be able to: a. use linear expressions to describe the *n*th term of an arithmetic sequence, justifying its form by referring to the activity or context from which it was generated.	Foundation also includes simple sequence of odd or even numbers, squared integers and sequences derived from diagrams.
4. Form quadratic expressions to describe the *n*th term of a sequence	Candidates should be able to: a. form quadratic expressions to describe the *n*th term of a sequence.	

H2I Linear equations		Notes and Examples
1. Set up and solve simple equations and inequalities	Candidates should be able to:	
	a. set up simple inequalities;	
	b. solve simple inequalities by transforming both sides in the same way;	
	c. solve linear equations that require prior simplification of brackets and/or fractions, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;	
	d. understand that the point of intersection of **two** different lines in the same **two** variables that simultaneously describe a real situation is the solution to the simultaneous equations represented by the lines.	

H2J Algebraic manipulation		Notes and Examples
1. Manipulate algebraic expressions	Candidates should be able to:	
	a. set up and use equations that describe direct and indirect proportion;	(1) Expand $(2x - 5)(x + 7)$.
	b. expand the product of **two** linear expressions(1);	(2) Factorise $4x^2 - 9$.
	c. factorise quadratic expressions including the difference of **two** squares(2) and simplifying rational expressions(3);	(3) Simplify $\frac{x^2 + 3x + 2}{x^2 - 4x - 5}$
	d. solve quadratic equations exactly by factorising, completing the square and using the formula;	
	e. set up and solve simultaneous equations in **two** unknowns, where one of the equations might include squared terms in one or both unknowns.	

H2K Functions and graphs		Notes and Examples
1. Solve quadratic equations using a graph	Candidates should be able to:	
	a. understand that approximate solutions of quadratic equations can be found from their graphs;	Solve $3x^2 + 4 = 8$ from graph of $y = 3x^2 + 4$.
	b. draw graphs of quadratic equations and find their approximate solutions.	
2. Recognise and use equivalence in numerical, algebraic and graphical representations	Candidates should be able to:	
	a. recognise that straight line graphs can be represented by equations, and vice versa.	
3. Functions	Candidates should be able to:	
	a. draw, sketch and recognise graphs of linear, quadratic and simple cubic functions(1), the reciprocal function $y = 1/x$ with $x \neq 0$, the function $y = k^x$ for integer values of x and simple positive values of k, and the trigonometric functions $y = \sin x$, $y = \cos x$, and $y = \tan x$(2);	(1) Draw the graph of $y = x^3 - 5x + 2$ for $-3 \leq x \leq 3$. (2) Sketch the graph of (a) $y = 2\sin x$ and (b) $y = \cos(x - 90°)$.
	b. construct the graphs of simple loci;	
	c. sketch simple transformations of a given function;	
	d. understand and use the Cartesian equation of a circle centred at the origin and link to the trigonometric functions.	

H2L Pythagoras in 2D and 3D		Notes and Examples
1. Use Pythagoras' theorem	Candidates should be able to:	(1) Find the length of the 'body' diagonal in a cuboid.
	a. understand, recall and use Pythagoras' theorem to solve simple cases in 2D;	
	b. use Pythagoras' theorem to solve more complex cases in 2D;	
	c. use Pythagoras' theorem to calculate lengths in three dimensions[(1)];	
	d. use Pythagoras' theorem in 3D contexts.	

H2M Angles and properties of shape		Notes and Examples
1. Lines and angles	Candidates should be able to:	
	a. distinguish between lines and line segments;	
	b. use parallel lines, alternate angles and corresponding angles;	
	c. understand the consequent properties of parallel and intersecting lines, triangles (including a proof that the angle sum of a triangle is 180°) and parallelograms;	
	d. understand a proof that an exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices;	
	e. explain why the angle sum of a quadrilateral is 360°.	
2. Congruence and similarity	Candidates should be able to:	
	a. understand congruence;	
	b. understand similarity of plane figures including the relationship between lengths, areas and volumes.	

H2M Angles and properties of shapes		Notes and Examples
3. Angles and polygons	Candidates should be able to:	
	a. calculate and use the sums of the interior and exterior angles of polygons;	
	b. calculate and use the angles of regular polygons;	
	c. *solve problems in the context of tiling patterns and tessellations.*	
4. Understand and use midpoint and intercept theorems	Candidates should be able to:	
	a. understand and use midpoint and intercept theorems.	
5. Proof	Candidates should be able to:	
	a. understand and construct geometrical proofs using formal arguments, including proving the congruence, or non-congruence, of two triangles in all possible cases.	

H2N Area and volume		Notes and Examples
1. Perimeter, area (including circles), and volume	Candidates should be able to:	(1) Could involve semicircles, and inverse problems eg find the diameter if the circumference is 60cm.
	a. solve problems involving areas;	(2) Could involve inverse calculations – find the length of an edge given the volume and two other edges.
	b. find circumferences of circles and areas enclosed by circles(1), recalling relevant formulae;	(3) Calculate the volume of a sphere of radius 1·5cm.
	c. calculate volumes of right prisms(2) and of shapes made from cubes and cuboids;	(4) Calculate the arc length of the sector of a circle radius 5cm subtended by an angle of 65°.
	d. use π in exact calculations;	(5) A cone is 20cm high and has a base radius of 12cm. The top 15cm of the cone is removed. Find the volume of the remaining frustum.
	e. calculate volumes of objects made from pyramids, prisms and spheres(3);	
	f. calculate the lengths of arcs and the areas of sectors of circles(4);	
	g. solve problems involving more complex shapes and solids, including segments of circles and frustums of cones(5).	
2. Use 2D representations of 3D shapes	Candidates should be able to:	
	a. use 2D representations of 3D shapes, including plans and elevations.	

H2O Trigonometry		Notes and Examples
1. Trigonometry in 2D and 3D	Candidates should be able to:	(1) Use sin, cos and tan to find lengths and angles in right-angled and isosceles triangles.
	a. understand, recall and use trigonometrical relationships in right-angled triangles(1), and use these to solve problems, including those involving bearings;	(2) Find the angle between the longest diagonal and the base of a cuboid.
	b. use trigonometrical ratios to solve 2D and 3D problems;	
	c. use the sine and cosine rules to solve 2D and 3D problems(2);	
	d. calculate the area of a triangle using $\frac{1}{2}ab\sin C$.	

3. Assessment of GCSE Methods in Mathematics

3.1 Overview of the assessment of GCSE Methods in Mathematics

Units	Notes
Unit B391/01 ***Methods in Mathematics 1 (Foundation)*** 40% of the total GCSE marks 1 hour written paper (non-calculator) 60 marks	• All units are externally assessed. • Candidates answer **all** questions on each paper. • In some questions candidates have to decide for themselves what mathematics they need to use.
Unit B391/02 ***Methods in Mathematics 1 (Higher)*** 40% of the total GCSE marks 1 hour 15 minutes written paper (non-calculator) 60 marks	• In each question paper, candidates are expected to support their answers with appropriate working. • Quality of written communication (QWC) is assessed in both Units B391 and B392. Questions assessing QWC are indicated by an asterisk (*).
Unit B392/01 ***Methods in Mathematics 2 (Foundation)*** 60% of the total GCSE marks 1 hour 30 minutes written paper 90 marks	• Candidates are permitted to use a scientific or graphical calculator for Unit B392. All calculators must conform to the rules specified in the document *Instructions for Conducting Examinations,* published annually by the Joint Council for Qualifications (http://www.jcq.org.uk).
Unit B392/02 ***Methods in Mathematics 2 (Higher)*** 60% of the total GCSE marks 2 hour written paper 90 marks	• All candidates should have the usual geometric instruments available. Tracing paper can be used to aid with transformations etc, whether or not it is specified on the front of the question paper.

3.2 Tiers

This scheme of assessment consists of **two** tiers: Foundation Tier and Higher Tier. Foundation Tier papers assess Grades c to g and Higher Tier papers assess Grades a* to d (e).

Learners are not required to take both units at the same tier. For example, a learner may initially sit a Foundation Tier unit and sit the final unit at Higher Tier.

3.3 Assessment Objectives

Candidates are expected to demonstrate the following in the context of the content described:

	Assessment Objectives	Weighting (%)
AO1	• recall and use their knowledge of the prescribed content	50-60
AO2	• select and apply mathematical methods	15-25
AO3	• interpret and analyse problems and use mathematical reasoning to solve them	20-30

AO weightings – GCSE Methods in Mathematics

The relationship between the units and the assessment objectives in terms of **raw marks** is shown in the following grid:

Unit	GCSE Raw Marks			Total
	AO1	AO2	AO3	
Unit B391/01: *Methods in Mathematics 1 (Foundation)*	30-36	9-15	12-18	**60**
Unit B391/02: *Methods in Mathematics 1 (Higher)*	30-36	9-15	12-18	**60**
Unit B392/01: *Methods in Mathematics 2 (Foundation)*	45-54	13-23	18-27	**90**
Unit B392/02: *Methods in Mathematics 2 (Higher)*	45-54	13-23	18-27	**90**

3.4 Grading and awarding grades

GCSE results are awarded on the scale A* to G. Units are awarded a* to g, as applicable. Grades are indicated on certificates. However, results for candidates who fail to achieve the minimum grade (G or g) will be recorded as *unclassified* (U or u) and this is **not** certificated.

This GCSE is a unitised scheme. Candidates can take units across several different series provided the terminal rule is satisfied. They can also re-sit units. When working out candidates' overall grades OCR needs to be able to compare performance on the same unit in different series when different grade boundaries have been set, and between different units. OCR uses a Uniform Mark Scale to enable this to be done.

A candidate's uniform mark for each unit is calculated from the candidate's raw marks on that unit. Raw mark grade boundaries are converted to the equivalent uniform mark grade boundaries. Marks between grade boundaries are converted on a pro rata basis.

When unit results are issued, the candidate's unit grade and uniform mark are given. The uniform mark is shown out of the maximum uniform mark for the unit.

The uniform grade boundaries for each of the assessments are shown below:

Unit	Unit Weighting	Maximum Unit Uniform Mark	Unit Grade								
			a*	a	b	c	d	e	f	g	u
B391/01	40%	83				72	60	48	36	24	0
B391/02	40%	120	108	96	84	72	60	54			0
B392/01	60%	125				108	90	72	54	36	0
B392/02	60%	180	162	144	126	108	90	81			0

The written papers will have a total weighting of 100%. For Foundation Tier papers, candidates achieving less than the minimum mark for Grade g will be unclassified. For Higher Tier papers, candidates achieving marginally less than the minimum mark for Grade d will be awarded Grade e; those failing to achieve a Grade e will be unclassified.

A candidate's uniform mark for each unit will be combined to give a total uniform mark for the specification. The candidate's overall grade will be determined by the total uniform mark.

The following table shows the minimum total uniform mark required for each overall grade:

Qualification	Maximum Uniform Mark	Qualification Grade								
		A*	A	B	C	D	E	F	G	U
J926	300	270	240	210	180	150	120	90	60	0

3.5 Grade descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content 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 assessment may be balanced by better performance in others.

The grade descriptions have been produced by the regulatory authorities in collaboration with the awarding bodies.

Grade F

Candidates use some mathematical techniques, terminology, diagrams and symbols from the foundation tier consistently, appropriately and accurately. Candidates use some different representations effectively and can select information from them. They complete straightforward calculations competently with and without a calculator. They use simple fractions and percentages, simple formulae and some geometric properties, including symmetry.

Candidates work mathematically in everyday and meaningful contexts. They make use of diagrams and symbols to communicate mathematical ideas. Sometimes, they check the accuracy and reasonableness of their results.

Candidates test simple hypotheses and conjectures based on evidence. Candidates are able to use data to look for patterns and relationships. They state a generalisation arising from a set of results and identify counter-examples. They solve simple problems, some of which are non-routine.

Grade C

Candidates use a range of mathematical techniques, terminology, diagrams and symbols consistently, appropriately and accurately. Candidates are able to use different representations effectively and they recognise some equivalent representations eg numerical, graphical and algebraic representations of linear functions; percentages, fractions and decimals. Their numerical skills are sound and they use a calculator accurately. They apply ideas of proportionality to numerical problems and use geometric properties of angles, lines and shapes.

Candidates identify relevant information, select appropriate representations and apply appropriate methods and knowledge. They are able to move from one representation to another, in order to make sense of a situation. Candidates use different methods of mathematical communication.

Candidates tackle problems that bring aspects of mathematics together. They identify evidence that supports or refutes conjectures and hypotheses. They understand the limitations of evidence and sampling, and the difference between a mathematical argument and conclusions based on experimental evidence.

They identify strategies to solve problems involving a limited number of variables. They communicate their chosen strategy, making changes as necessary. They construct a mathematical argument and identify inconsistencies in a given argument or exceptions to a generalisation.

Grade A

Candidates use a wide range of mathematical techniques, terminology, diagrams and symbols consistently, appropriately and accurately. Candidates are able to use different representations effectively and they recognise equivalent representations for example numerical, graphical and algebraic representations. Their numerical skills are sound, they use a calculator effectively and they demonstrate algebraic fluency. They use trigonometry and geometrical properties to solve problems.

Candidates identify and use mathematics accurately in a range of contexts. They evaluate the appropriateness, effectiveness and efficiency of different approaches. Candidates choose methods of mathematical communication appropriate to the context. They are able to state the limitations of an approach or the accuracy of results. They use this information to inform conclusions within a mathematical or statistical problem.

Candidates make and test hypotheses and conjectures. They adopt appropriate strategies to tackle problems (including those that are novel or unfamiliar), adjusting their approach when necessary. They tackle problems that bring together different aspects of mathematics and may involve multiple variables. They can identify some variables and investigate them systematically; the outcomes of which are used in solving the problem.

Candidates communicate their chosen strategy. They can construct a rigorous argument, making inferences and drawing conclusions. They produce simple proofs and can identify errors in reasoning.

3.6 Quality of Written Communication

Quality of written communication (QWC) is assessed in Units B391 and B392.

Candidates are expected to:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- present information in a form that suits its purpose;
- use a suitable structure and style of writing.

Questions assessing QWC are indicated by an asterisk (*).

4. Support for GCSE Methods in Mathematics

In order to help you implement this GCSE Methods in Mathematics specification effectively, OCR offers a comprehensive package of support. This includes:

4.1 Free resources available from the OCR website

The specification and specimen assessment materials are available to download free of charge from the OCR website.

Mock examination papers are available to download free of charge from OCR Interchange.

4.2 Training

Events are available through our partner, Mill Wharf Training. It offers a range of courses on innovative teaching practice and whole-school issues - www.mill-wharf-training.co.uk.

4.3 OCR support services

Active Results

Active Results is available to all centres offering OCR's GCSE Mathematics specifications.

activeresults

Active Results is a free results analysis service to help teachers review the performance of individual candidates or whole schools.

Devised specifically for the UK market, data can be analysed using filters on several categories such as gender and other demographic information, as well as providing breakdowns of results by question and topic.

Active Results allows you to look in greater detail at your results:

- Richer and more granular data will be made available to centres including question level data available from e-marking
- You can identify the strengths and weaknesses of individual candidates and your centre's cohort as a whole
- Our systems have been developed in close consultation with teachers so that the technology delivers what you need.

Further information on Active Results can be found on the OCR website.

OCR Mathematics support team

A direct number gives access to a dedicated and trained support team handling all queries relating to GCSE Methods in Mathematics and other mathematics qualifications - 0300 456 3142.

OCR Interchange

OCR Interchange has been developed to help you to carry out day-to-day administration functions online, quickly and easily. The site allows you to register and enter candidates online. In addition, you can gain immediate and free access to candidate information at your convenience. Sign up at https://interchange.ocr.org.uk.

5. Access to GCSE Methods in Mathematics

5

5.1 Disability Discrimination Act Information relating to GCSE Methods in Mathematics

GCSEs often require assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare candidates for a wide range of occupations and higher level courses.

The revised GCSE qualifications and subject criteria were reviewed to identify whether any of the competences required by the subject presented a potential barrier to any disabled candidates. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability groups and with disabled people.

Reasonable adjustments are made for disabled candidates in order to enable them to access the assessments and to demonstrate what they know and can do. For this reason, very few candidates will have a complete barrier to the assessment. Information on reasonable adjustments is found in *Access Arrangements, Reasonable Adjustments and Special Consideration* produced by the Joint Council (www.jcq.org.uk).

Candidates who are unable to access part of the assessment, even after exploring all possibilities through reasonable adjustments, may still be able to receive an award based on the parts of the assessment they have taken.

The access arrangements permissible for use in this specification are in line with QCDA's GCSE subject criteria equalities review and are as follows:

	Yes/No
Readers	Yes
Scribes	Yes
Practical assistants	Yes
Word processors	Yes
Transcripts	Yes
BSL interpreters	Yes
Oral language modifiers	Yes
MQ papers	Yes
Extra time	Yes

5.2 Arrangements for candidates with particular requirements

Candidates who are not disabled under the terms of the DDA may be eligible for access arrangements to enable them to demonstrate what they know and can do. Candidates who have been fully prepared for the assessment but who are ill at the time of the examination, or are too ill to take part of the assessment, may be eligible for special consideration. Centres should consult the *Access Arrangements, Reasonable Adjustments and Special Consideration* produced by the Joint Council.

6. Administration of GCSE Methods in Mathematics

6.1 Availability of assessment

There are **two** examination series each year, in January and June. First certification of this qualification is in June 2011. Thereafter, certification will be available in January and June of each year for the duration of the qualification.

The availability of units is shown below:

Unit	Unit	Jan 2011	June 2011	Jan 2012	June 2012	Jan 2013	June 2013
Unit B391/01	*Methods in Mathematics 1 (Foundation)*	✓	✓	✓	✓	✓	✓
Unit B391/02	*Methods in Mathematics 1 (Higher)*	✓	✓	✓	✓	✓	✓
Unit B392/01	*Methods in Mathematics 2 (Foundation)*		✓	✓	✓	✓	✓
Unit B392/02	*Methods in Mathematics 2 (Higher)*		✓	✓	✓	✓	✓

The availability in subsequent years is the same as in 2013 subject to continuation of the pilot.

6.2 Making entries

Centres must be registered with OCR in order to make any entries, including estimated entries. It is essential that centres apply to OCR to become a registered centre well in advance of making their first entries.

It is essential that unit entry codes are quoted in all correspondence with OCR.

Candidates must be entered for either option F or H for each unit. In any examinations series centres must enter each candidate for ONE option only. It is not possible for candidates to be entered for both options. Candidates are permitted one re-sit of each unit at the same or a different tier in another series.

6.2.1 Making unit entries

Entry code and option	Assessment type	Unit code and titles
A391 option F	Written paper	A391/01: *Methods in Mathematics 1 (Foundation)*
A392 option F	Written paper	A392/01: *Methods in Mathematics 2 (Foundation)*
A391 option H	Written paper	A391/02: *Methods in Mathematics 1 (Higher)*
A392 option H	Written paper	A392/02: *Methods in Mathematics 2 (Higher)*

6.2.2 Qualification entries

GCSE candidates must be entered for both units.

Candidates must be entered for certification to claim their overall GCSE qualification grade. All candidates should be entered under the following certification code:

- OCR GCSE in Methods in Mathematics – J926

It is not necessary to stipulate Foundation or Higher as an option.

GCSE certification is available from June 2011.

6.3 Terminal rule

Candidates must take at least 40% of the assessment in the same series they enter for certification of the qualification. All unit entries satisfy the terminal rule.

6.4 Unit and qualification re-sits

Candidates may re-sit each unit once before entering for certification for a GCSE.

Candidates may enter for the qualification an unlimited number of times.

6.5 Enquiries about Results

Under certain circumstances, a centre may wish to query the result issued to one or more candidates. Enquiries about Results for GCSE units must be made immediately following the series in which the relevant unit was taken (by the Enquiries about Results deadline).

Please refer to the *JCQ Post-Results Services* booklet and the *OCR Admin Guide* for further guidance about action on the release of results. Copies of the latest versions of these documents can be obtained from the OCR website.

6.6 Shelf-life of units

Individual unit results, prior to certification of the qualification, have a shelf-life limited only by that of the qualification.

6.7 Prohibited qualifications and classification code

Every specification is assigned a national classification code indicating the subject area to which it belongs. The classification code for this specification is 2210.

In order to meet the statutory requirement of the Key Stage 4 programme of study for Mathematics, candidates must be entered for GCSE Methods in Mathematics **and** GCSE Applications of Mathematics. Alternatively candidates can be entered for GCSE Mathematics.

GCSE Methods in Mathematics will be counted for the purpose of the School and College Performance Tables as part of the 5 A*-C performance indicators, including English and mathematics.

7. Other information about GCSE Methods in Mathematics

7.1 Overlap with other qualifications

There is a small degree of overlap between the content of this specification and those for GCSE Statistics and Free Standing Mathematics Qualifications.

There is a significant overlap with the single GCSE in Mathematics.

7.2 Progression from this qualification

GCSE qualifications are general qualifications which enable candidates to progress either directly to employment, or to proceed to further qualifications.

Progression to further study from GCSE will depend upon the number and nature of the grades achieved. Broadly, candidates who are awarded mainly Grades D to G at GCSE could either strengthen their base through further study of qualifications at Level 1 within the National Qualifications Framework or could proceed to Level 2. Candidates who are awarded mainly Grades A* to C at GCSE would be well prepared for study at Level 3 within the National Qualifications Framework.

This specification provides progression from the Entry Level Certificate in Mathematics specification R448.

7.3 Avoidance of bias

OCR has taken great care in preparation of this specification and the assessment materials to avoid bias of any kind.

7.4 Code of practice/common criteria requirements/subject criteria

This specification complies in all respects with the current *GCSE, GCE and AEA Code of Practice* as available on the QCA website, *The Statutory Regulation of External Qualifications 2004,* and the subject criteria for GCSE Methods in Mathematics.

7.5 Language

This specification and associated assessment materials are in English only.

7.6 Spiritual, moral, ethical, social, legislative, economic and cultural issues

This specification offers opportunities which can contribute to an understanding of these issues in the following topics.

Issue	Opportunities for developing an understanding of the issue during the course
Spiritual issues	Spiritual development: helping candidates obtain an insight into the infinite, and explaining the underlying mathematical principles behind natural forms and patterns.
Moral issues	Moral development: helping candidates recognise how logical reasoning can be used to consider the consequences of particular decisions and choices and helping them learn the value of mathematical truth.
Social issues	Social development: helping candidates work together productively on complex mathematical tasks and helping them see that the result is often better than any of them could achieve separately.
Economic issues	Economic development: helping candidates make informed decisions about the management of money.
Cultural issues	Cultural development: helping candidates appreciate that mathematical thought contributes to the development of our culture and is becoming increasingly central to our highly technological future, and recognising that mathematicians from many cultures have contributed to the development of modern day mathematics.

7.7 Sustainable development, health and safety considerations and European developments, consistent with international agreements

This specification supports these issues, consistent with current EU agreements, through questions set in relevant contexts.

Sustainable development issues could be supported through questions set on carbon emissions or life expectancy, for example.

Health and safety considerations could be supported through questions on maximum safe loads or a nutrition analysis, for example.

European developments could be supported through questions on currency and foreign exchange, for example.

OCR encourages teachers to use appropriate contexts in the delivery of the subject content.

7.8 Key Skills

This specification provides opportunities for the development of the Key Skills of *Communication, Application of Number, Information Technology, Working with Others, Improving Own Learning and Performance and Problem Solving* at Levels 1 and/or 2. However, the extent to which this evidence fulfils the Key Skills criteria at these levels will be totally dependent on the style of teaching and learning adopted.

The following table indicates where opportunities may exist for at least some coverage of the various Key Skills criteria at Levels 1 and/or 2.

	C		AoN		IT		WwO		IoLP		PS	
	1	2	1	2	1	2	1	2	1	2	1	2
J926	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Detailed opportunities for generating Key Skills evidence through this specification are posted on the OCR website (www.ocr.org.uk). A summary document for Key Skills Coordinators showing ways in which opportunities for Key Skills arise within GCSE courses has been published.

7.9 ICT

In order to play a full part in modern society, candidates need to be confident and effective users of ICT. Where appropriate, candidates should be given opportunities to use ICT in order to further their study of mathematics.

The assessment of this course requires candidates to:

- Use calculators effectively and efficiently, knowing how to
  - enter complex calculations
  - use an extended range of function keys, including trigonometrical and statistical functions relevant to the programme of study

Questions will be set in Unit B392 that will specifically test the use of calculators.

In addition, the programme of study requires candidates to:

- Become familiar with a range of resources, including ICT such as spreadsheets, dynamic geometry, graphing software and calculators, to develop mathematical ideas.

7.10 Citizenship

Since September 2002, the National Curriculum for England at Key Stage 4 has included a mandatory programme of study for Citizenship. Parts of the programme of study for Citizenship (2007) may be delivered through an appropriate treatment of other subjects.

This Mathematics specification aids candidates in analysing **how information is used in public debate and policy formation, including information from the media and from pressure and interest groups,** through its statistical content.

The key process of **critical thinking and enquiry** can be developed, for example, where candidates have to decide for themselves how to solve a mathematical problem, or decide which information is relevant and redundant.

Printing this cover will produce a printer-friendly version

www.ocr.org.uk

OCR customer contact centre

General qualifications

Telephone 01223 553998

Facsimile 01223 552627

Email general.qualifications@ocr.org.uk

J926/1007