edexcel

GCSE
Methods in Mathematics (Pilot)

For use in pilot centres only

Specification

Edexcel GCSE in Methods in Mathematics (2MM01)

First certification 2014

Issue 2

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This specification is Issue 2. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website: www.edexcel.com

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Introduction

The Edexcel GCSE in Methods in Mathematics is designed for use in school and colleges. It is part of a suite of GCSE qualifications offered by Edexcel.

This qualification is available as part of a GCSE pilot, to approved pilot centres. This qualification should be offered alongside GCSE in Applications of Mathematics, as they share some common content and together meet the Key Stage 4 programme of study in Mathematics entitlement.

The GCSE in Methods in Mathematics is designed to provide a course in mathematics which consolidates the connections between mathematics and which approaches the subject in a purely mathematical manner.

This specification is aimed at teachers who plan the work holistically, that is around the specification content, but not necessarily in any pre-defined order, to support the learning style of some students.

This specification has particular benefits for teachers and learners:

- The topics can be chosen to reflect the needs of the students at the time.
- If the students are motivated by a particular topic (which could be linked to other subject work, see below), time and flexibility is available to continue that material.
- This specification may enable cross-curricular demands to be met, by mathematics servicing the needs of the curriculum. For example, whenever there is a mathematical need within Science, Geography, Business Studies, etc, this can be addressed within the mathematics course, at the most appropriate time for those subject areas. This specification introduces new content which can be used to support work in other subject areas.
- Although coursework is no longer part of the assessment for GCSE Mathematics, many schools and colleges still believe that task based project work has a function in mathematics teaching and are continuing to use it, internally, as a way of delivering mathematics content and developing skills of application. In order to facilitate this, flexibility is possible to plan the two-year programme of study around such project work. The use of project work alongside this specification can enhance the students' ability to solve problems in mathematics, utilising the skills, knowledge and understanding from different areas of mathematics.
- Some students do not learn well when spending too long on one topic. Some teachers therefore find that varying the topics as they move through the unit content enables their students to make better progress, and to reach a higher level.
- This specification favours those teachers who wish to build up a relationship over the two-year programme of study, being responsible for the design of the two-year course for those students.
- This two unit specification allows teachers to plan delivery and assess their students when it best serves the needs of the students. It also allows flexible delivery alongside GCSE Applications of Mathematics, and can provide co-teaching opportunities across the two pilot specifications and the 2010 GCSE Mathematics courses.

About this specification

- The assessment of both units is at the end of the one or two-year programme of study
- Accessible assessment for all students
- Written to meet the needs of the 2010 Key Stage 4 Programme of Study for mathematics alongside GCSE in Methods in Mathematics

Also available to support delivery:

- itemised assessment feedback through ResultsPlus
- advice from subject specialists available
- professional development support
- teacher support material
- online resources
- practice exam papers.

This specification is for use by approved pilot centres only. For more information on joining this pilot, please see our website, www.edexcel.com.

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Specification at a glance

The Edexcel GCSE in Methods in Mathematics comprises two units:

- Units 1 and 2.

Unit 1:	**Methods 1**	***Unit code 1F: 5MM1F** ***Unit code 1H: 5MM1H**
○ Externally assessed ○ Availability: June and November ○ First assessment: June 2014		**50% of the total GCSE**
Overview of content **1** Number **2** Algebra **3** Geometry **4** Probability		
Overview of assessment ○ One written paper ○ Tiered papers ○ Foundation Tier grades C-G available ○ Higher Tier grades A*-D available (E allowed) ○ 1 hour 45 minutes (Foundation paper) ○ 1 hour 45 minutes (Higher paper) ○ 100 marks ○ Non-calculator		

*See *Appendix 3* for description of this code and all other codes relevant to this qualification.

Unit 2:	**Methods 2**	***Unit code 2F: 5MM2F** ***Unit code 2H: 5MM2H**
○ Externally assessed ○ Availability: June and November ○ First assessment: June 2014		**50% of the total GCSE**
Overview of content **1** Number **2** Algebra **3** Geometry		
Overview of assessment ○ One written paper ○ Tiered papers ○ Foundation Tier grades C-G available ○ Higher Tier grades A*-D available (E allowed) ○ 1 hour 45 minutes (Foundation paper) ○ 1 hour 45 minutes (Higher paper) ○ 100 marks ○ Calculator allowed		

*See *Appendix 3* for description of this code and all other codes relevant to this qualification.

A Qualification content

National Qualifications Framework (NQF) criteria

This specification complies with the requirements of the common criteria, the GCSE qualification criteria, Draft Framework for Piloting for Methods in Mathematics and, together with GCSE Applications of Mathematics, the Key Stage 4 Programme of Study for Mathematics, which are prescribed by the regulatory authorities.

Key subject aims

This qualification in Methods in Mathematics encourages students to develop confidence in, and a positive attitude towards, mathematics so that they recognise the importance of mathematics in their own lives and to society. This qualification enables students to make informed decisions about the use of technology. This specification enables students to appreciate the coherence, creativity, elegance and power of mathematics, and to make informed choices about further learning opportunities and career choices.

Knowledge and understanding

This Edexcel GCSE in Methods in Mathematics qualification requires students to:

- develop knowledge, skills and understanding of mathematical methods and concepts, including:
  - Number
  - Algebra
  - Geometry
  - Probability
- use their knowledge and understanding to make connections between mathematical concepts.

Skills

This Edexcel GCSE in Methods in Mathematics qualification gives students the opportunity to develop the following skills:

- 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.

List of unit content

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1 Number 17

2 Algebra 20

3 Geometry 23

4 Probability 28

Unit 2: Methods 2 Foundation 31

1 Number 33

2 Algebra 37

3 Geometry 39

Unit 1: Methods 1 Higher 43

1 Number 46

2 Algebra 50

3 Geometry 54

4 Probability 61

Unit 2: Methods 2 Higher 65

1 Number 67

2 Algebra 72

3 Geometry 78

Subject content

The content of the specification has been grouped into areas:

- Number
- Algebra
- Geometry
- Probability.

The specification content consists of a reference (ref), a content descriptor and examples of concepts and skills.

Content that is Higher Tier only is indicated in **bold type**.

The content of Higher Tier subsumes the content of Foundation Tier.

The content of Unit 2 subsumes the content of Unit 1.

An overview of the content follow, showing in which units it is assessed.

The same content descriptors may appear in each unit but concepts and skills are developed through the units, so the concepts and skills may be different.

Ref	Content descriptor	Unit	
Number		**Foundation**	**Higher**
MN a	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	Unit 1, Unit 2	Unit 1, Unit 2
MN b	Arithmetic of real numbers, **including exact calculation with surds and π**	Unit 1, Unit 2	Unit 1, Unit 2
MN c	Numbers and their representations including powers, roots, indices (with integers, **fractional and negative** powers) **and standard index form**	Unit 1	Unit 1
MN d	Approximate to specified or appropriate degrees of accuracy including a given power of ten, number of decimal places and significant figures	Unit 1	Unit 1
MN e	Use the concepts and vocabulary of factor (divisor), multiple, common factor, common multiple, highest common factor, (HCF), least common multiple, (LCM), prime number and prime factor decomposition	Unit 1	Unit 1
MN f	Understand that factors of a number can be derived from its prime factorisation	Unit 1	Unit 1
MN g	understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	Unit 2	Unit 2
MN h	Use multipliers for percentage change, **work with repeated percentage change; solve reverse percentage problems**	Unit 2	Unit 2
MN i	Interpret fractions, decimals and percentages as operators	Unit 2	Unit 2
MN j	Understand and use the relationship between fractions and decimal representations including recurring and terminating decimals	Unit 2	Unit 2
MN k	Understand and use the relationship between ratio and fractions	Unit 2	Unit 2
MN l	Find proportional change **and repeated proportional change,** using fractions, decimals and percentages	Unit 2	Unit 2
MN m	Understand and use direct **and inverse** proportion	Unit 2	Unit 2
MN n	Divide a quantity in a given ratio	Unit 2	Unit 2

Ref	Content descriptor	Unit	
Number		**Foundation**	**Higher**
MN o	Use calculators effectively and efficiently, **including trigonometrical functions**	Unit 2	Unit 2
MN p	Understand and use Venn diagrams to solve problems	Unit 1	Unit 1

Ref	Content descriptor	Unit	
Algebra		**Foundation**	**Higher**
MA a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	Unit 1	Unit 1
MA b	Distinguish in meaning between the words equation, inequality, formula, **identity** and expression	Unit 1	Unit 1
MA c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, taking out common factors**, multiplying two linear expressions, factorising quadratic expressions including the difference of two squares, and simplifying rational expressions**	Unit 1	Unit 1
MA d	Set up, and solve simple equations and inequalities	Unit 1, Unit 2	Unit 1, Unit 2
MA e	**Set up and use equations that describe direct and inverse proportion**		Unit 2
MA f	**Set up, and solve simultaneous equations in two unknowns where one of the equations might include squared terms in one or both unknowns**		Unit 2
MA g	Solve quadratic equations approximately using a graph, **exactly by factorising, completing the square and using the formula**	Unit 2	Unit 2
MA h	Derive a formula, substitute numbers into a formula and change the subject of a formula	Unit 2	Unit 2
MA i	Generate terms of a sequence using term-to-term and position-to-term definitions	Unit 1	Unit 1
MA j	Form linear **and quadratic** expressions to describe the nth term of a sequence	Unit 1	Unit 1
MA k	Use algebra to support and construct arguments **and proofs**	Unit 1	Unit 1, Unit 2
MA l	Use the conventions for coordinates in the plane and plot points in all four quadrants	Unit 1, Unit 2	Unit 1, Unit 2
MA m	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane	Unit 1	Unit 1
MA n	Use geometric information to complete diagrams on a coordinate grid	Unit 1	Unit 1
MA o	**Use $y = mx + c$ and understand the relationship between gradients of parallel and perpendicular lines**		Unit 1, Unit 2

Ref	Content descriptor	Unit	
Algebra		**Foundation**	**Higher**
MA p	**Draw, sketch, recognise graphs of linear, quadratic, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, the function $y = kx$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$, $y = \cos x$ and $y = \tan x$**		Unit 2
MA q	**Understand and use the Cartesian equation of a circle centred at the orgin and link to the trigonometric functions**		Unit 2
MA r	**Construct the graphs of simple loci**		Unit 2
MA s	**Sketch simple transformations of a given function**		Unit 2
MA t	Recognise and use equivalence in numerical, algebraic and graphical representations	Unit 1, Unit 2	Unit 1, Unit 2

Ref	Content descriptor	Unit	
Geometry		**Foundation**	**Higher**
MG 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	Unit 1	Unit 1
MG b	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals	Unit 1, Unit 2	Unit 1, Unit 2
MG c	Recall the properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus	Unit 1	Unit 1
MG d	Recognise reflection and rotation symmetry of 2-D shapes	Unit 1	Unit 1
MG e	Calculate and use the sums of the interior and exterior angles of polygons	Unit 2	Unit 2
MG f	Solve problems in the context of tiling patterns and tessellation	Unit 2	Unit 2
MG g	**Understand, prove and use circle theorems, intersecting chords**		Unit 1
MG h	**Understand and use the midpoint and the intercept theorems**		Unit 2
MG i	**Understand and construct geometrical proofs using formal arguments, including proving the congruence, or non congruence of two triangles in all possible cases**		Unit 2
MG j	Describe and transform 2-D shapes using single or combined rotations, reflections, translations, or enlargements by a positive then **fractional and negative** scale factor and distinguish properties that are preserved under particular transformations	Unit 1	Unit 1
MG k	Use 2-D vectors to describe translations	Unit 1	Unit 1
MG l	**Use vectors to solve simple geometric problems and construct geometric arguments**		Unit 1
MG m	Understand congruence and similarity, including the relationship between lengths**, areas and volumes** in similar figures	Unit 1, Unit 2	Unit 1, Unit 2
MG n	Use Pythagoras' theorem in 2-D **and 3-D**	Unit 2	Unit 2
MG o	**Use the trigonometrical ratios to solve 2-D and 3-D problems**		Unit 2

Ref	Content descriptor	Unit	
Geometry		**Foundation**	**Higher**
MG p	**Use the sine and cosine rules to solve problems in 2-D and 3-D**		Unit 2
MG q	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	Unit 1	Unit 1
MG r	Find circumferences of circles and areas enclosed by circles	Unit 2	Unit 2
MG s	Calculate perimeters and areas of shapes made from triangles and rectangles **and other shapes**	Unit 1, Unit 2	Unit 1
MG t	**Calculate the area of a triangle using** $\frac{1}{2}ab\sin C$		Unit 2
MG u	Calculate volumes of right prisms and of shapes made from cubes and cuboids	Unit 2	Unit 2
MG v	**Solve mensuration problems involving more complex shapes and solids**		Unit 2

Ref	Content descriptor	Unit	
Probability		**Foundation**	**Higher**
MP a	Understand and use the vocabulary of probability and the probability scale	Unit 1	Unit 1
MP b	Understand and use theoretical models for probabilities including the model of equally likely outcomes	Unit 1	Unit 1
MP c	Understand and use estimates of probability from relative frequency	Unit 1	Unit 1
MP d	Use of sample spaces for situations where outcomes are single events and for situations where outcomes are two successive events	Unit 1	Unit 1
MP e	Identify different mutually exclusive and exhaustive outcomes and know that the sum of the probabilities of all these outcomes is 1	Unit 1	Unit 1
MP f	Understand and use set notation to describe events and compound events	Unit 1	Unit 1
MP g	Use Venn diagrams to represent the number of possibilities and hence find probabilities	Unit 1	Unit 1
MP h	**Use tree diagrams to represent outcomes of compound events, recognising when events are independent or dependent**		Unit 1
MP i	**Know when to add or multiply probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is $\mathrm{P}(A) + \mathrm{P}(B)$; if A and B are independent events, the probability of A and B occurring is $\mathrm{P}(A) \times \mathrm{P}(B)$**		Unit 1
MP j	Compare experimental data and theoretical probabilities, and make informal inferences about the validity of the model giving rise to the theoretical probabilities	Unit 1	Unit 1
MP k	Understand that when a statistical experiment or survey is repeated there will usually be different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	Unit 1	Unit 1

Unit 1: Methods 1

Foundation

Overview

Content overview

This unit contains:

1 Number

- Four operations
- Factors and multiples
- Indices, squares and roots
- Fractions and decimals
- Operations and accuracy
- Venn diagrams

2 Algebra

- Manipulating expressions
- Equations
- Formulae
- Sequences
- Coordinates
- Straight line graphs

3 Geometry

- Quadrilaterals
- Symmetry
- Transformations
- Vectors
- Congruence and similarity
- Circles
- Perimeter, area and volume

4 Probability

- Probability measures
- Relative probability
- Mutually exclusive outcomes
- Set theory and Venn diagrams

Assessment overview

- 50% of the qualification
- One written paper
- 1 hour 45 minutes in total
- 100 marks in total
- Non-calculator
- Grades C-G available
- Available in June and November

References

Each topic in this unit contains a specification reference (for example, **MP a** for Methods, Probability, Statement a), the content descriptor and examples of concepts and skills associated with that content descriptor.

1 Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
MN a	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	• Multiply and divide numbers using the commutative, associative and distributive laws and factorisation where possible, or place value adjustments • Use inverse operations • Use brackets and the hierarchy of operations • Use one calculation to find the answer to another
MN b	Arithmetic of real numbers	• Add, subtract, multiply and divide whole numbers, integers, negative numbers, fractions and decimals • Recall all multiplication facts to 10 × 10, and use them to derive quickly the corresponding division facts • Multiply or divide any number by powers of 10 • Multiply or divide by any number between 0 and 1 • Select a variety of methods for addition, subtraction, multiplication and division of integers and decimals • Solve a problem involving division by a decimal • Writing numbers in words • Writing numbers from words

Ref	Content descriptor	Concepts and skills
MN c	Numbers and their representations including powers, roots, indices (with integer powers)	• Recall integer squares from 2×2 to 15×15 and the corresponding square roots • Recall the cubes of 2, 3, 4, 5 and 10 • Select a square number, cube number from a list • Order integers, decimals and fractions • Understand and use positive numbers and negative integers, both as positions and translations on a number line • Order fractions by rewriting them with a common denominator or as decimals • Find equivalent fractions • Write a fraction in its simplest form by cancelling all common factors • Compare fractions • Convert between mixed numbers and improper fractions • Find the value of calculations using indices • Use index notation for squares and cubes • Use index notation for powers of 10 • Use index laws for multiplication and division of integer powers, and powers of a power

Ref	Content descriptor	Concepts and skills
MN d	Approximate to specified or appropriate degrees of accuracy including a given power of ten, number of decimal places and significant figures	• Round numbers to a given power of 10 • Round to the nearest integer and to any given number of significant figure(s) • Round to a given number of decimal places • Estimate answers to calculations
MN e	Use the concepts and vocabulary of factor (divisor), multiple, common factor, common multiple, highest common factor, (HCF), least common multiple, (LCM), prime number and prime factor decomposition	• Identify factors, multiples and prime numbers from a list of numbers • Find the common factors and common multiples of two or three numbers • Recognise odd and even numbers • Find the Highest Common Factor (HCF) and the Least Common Multiple (LCM) of two or three numbers
MN f	Understand that factors of a number can be derived from its prime factorisation	• Find the prime factor decomposition of positive integers • Understand that the number of factors relate to the type of number (square, prime etc) • Use prime factorisation to find HCF and LCM
MN p	Understand and use Venn diagrams to solve problems	• Use Venn diagrams to represent sets • Interpret Venn diagrams • Draw a Venn diagram using given information • Use a Venn diagram to solve a problem • Understand and be able to find the intersection and union of sets • Understand and use Venn diagrams to solve problems

2 Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
MA a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
MA b	Distinguish in meaning between the words equation, inequality, formula and expression	• Write an expression • Select an expression/equation/formulae from a list
MA c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, taking out common factors	• Manipulate algebraic expressions by collecting like terms • Multiply a single term over a bracket • Write expressions using squares and cubes • Use simple instances of index laws • Substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$ • Factorise algebraic expressions by taking out common factors • Write expressions to solve problems • Substitute numbers into simple formulae (NB: Multiplying two linear expressions, factorising quadratic expressions including the difference of two squares and simplifying rational expressions are assessed at Higher Tier only)

Ref	Content descriptor	Concepts and skills
MA d	Set up, and solve simple equations and inequalities	• Set up simple equations • Rearrange simple equations • Solve simple equations • Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation • Solve linear equations which include brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution • Solve linear equations in one unknown, with integer or fractional coefficients
MA i	Generate terms of a sequence using term-to-term and position-to-term definitions	• Recognise sequences of odd and even numbers • Generate simple sequences of numbers, squared integers and sequences derived from diagrams • Write the term-to-term definition in words for a sequence • Find a specific term in the sequence using position-to-term or term-to-term rules • Identify which terms cannot be in a sequence
MA j	Form linear expressions to describe the nth term of a sequence	• Find the nth term of an arithmetic sequence • Use the nth term of an arithmetic sequence

Ref	Content descriptor	Concepts and skills
MA k	Use algebra to support and construct arguments	• Describe a situation or expression algebraically • Write down an equation from a diagram
MA l	Use the conventions for coordinates in the plane and plot points in all four quadrants	• Use axes and coordinates to specify points in all four quadrants • Identify points with given coordinates (NB: Points may be in the first quadrant or all four quadrants) • Identify coordinates of given points • Find coordinates of points identified by geometrical information • Find the coordinates of the midpoint of the line segment AB, given the coordinates of A and B
MA m	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane	• Draw, label and scale axes • Plot and draw graphs of functions in which y is given explicitly in terms of x, or implicitly • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane • Recognise that, in a mathematical context, an equation in the form $y = mx + c$ is a straight line • Plot and draw graphs of straight lines with equations of the form $y = mx + c$ • Find the gradient of a straight line from a graph
MA n	Use geometric information to complete diagrams on a coordinate grid	• Find the coordinates of points identified by geometrical information
MA t	Recognise and use equivalence in numerical, algebraic and graphical representations	• Understand link between conversion graphs and associated formulae and equations • Use a graph to find approximate solutions to equations

3 Geometry

What students need to learn:

Ref	Content descriptor	Concepts and skills
MG a	Recall and use properties of angles at a point, angles at a point on a straight line (including right angles) and vertically opposite angles	• Recall and use properties of angles: – at a point – at a point on a straight line, including right angles – vertically opposite angles • Distinguish between acute, obtuse, reflex and right angles by identifying angles in a diagram • Name angles • Estimate sizes of angles • Give reasons for calculations • Use two letter notation for a line and three letter notation for an angle • Identify perpendicular lines
MG b	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals	• Distinguish between scalene, isosceles, equilateral, and right-angled triangles • Understand and use the angle properties of triangles • Understand the angle properties of intersecting lines • Give reasons for angle calculations • Identify parallel lines on a shape or diagram • Use the side/angle properties of isosceles and equilateral triangles • Understand and use the angle sum of a triangle is 180°

Ref	Content descriptor	Concepts and skills
MG c	Recall the properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus	• Draw sketches of shapes • Classify quadrilaterals by their geometric properties • Name all quadrilaterals that have a specific property • Use the symmetry properties of quadrilaterals • List the properties of each, or identify (name) a given shape from its properties • Recall the properties and definitions of special types of quadrilaterals
MG d	Recognise reflection and rotation symmetry of 2-D shapes	• Recognise reflection symmetry of 2-D shapes • Understand the concept of line symmetry and be able to identify and draw lines of symmetry on a shape • Draw and complete diagrams with a given number of lines of symmetry • State the line of reflective symmetry as a simple algebraic equation • Recognise rotational symmetry of 2-D shapes • Understand the concept of rotational symmetry • Be able to identify the order of rotational symmetry of a 2-D shape • Draw or complete diagrams with a given order of rotational symmetry

Ref	Content descriptor	Concepts and skills
MG j	Describe and transform 2-D shapes using single or combined rotations, reflections, translations, or enlargements by a positive scale factor and distinguish properties that are preserved under particular transformations	• Describe and transform 2-D shapes using single rotations • Understand that rotations are specified by a centre and an (anticlockwise) angle • Find the centre of rotation • Rotate a shape about the origin, or any other point • Describe and transform 2-D shapes using single reflections • Understand that reflections are specified by a mirror line • Identify the equation of a mirror line of symmetry • Describe and transform 2-D shapes using single translations • Describe and transform 2-D shapes using enlargements by a positive scale factor • Understand that an enlargement is specified by a centre and a scale factor • Scale a shape on a grid (centre not specified) • Find the centre of enlargement • Enlarge a shape using a centre other than (0, 0) • Describe and transform 2-D shapes using combined rotations, reflections, translations, or enlargements • Distinguish properties that are preserved under particular transformations • Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides • Describe a transformation • Understand that distances and angles are preserved under rotations, reflections and translations, so that the image is congruent under these transformations

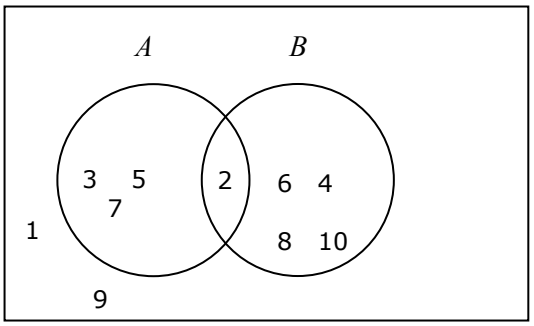
Ref	Content descriptor	Concepts and skills
MG k	Use 2-D vectors to describe translations	• Use vector notation to describe translations • Understand that translations are specified by a distance and direction (using a vector) • Translate a given shape by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$ • Describe a translation using a vector
MG m	Understand congruence and similarity, including the relationship between lengths in similar figures	• Understand congruence • Understand similarity • Identify shapes which are similar, including all circles or all regular polygons with an equal number of sides • Identify shapes which are congruent • Understand what makes two shapes congruent or similar • Understand the relationships between lengths in similar figures • Recognise that all corresponding angles in similar shapes are equal in size when the lengths of sides are not
MG q	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	• Recall the definition of a circle and identify (name) and draw the parts of a circle • Understand related circle terms such as semicircle and quarter circle • Draw a circle given the radius or diameter

Ref	Content descriptor	Concepts and skills
MG s	Calculate perimeters and areas of shapes made from triangles and rectangles	• Calculate perimeters of shapes made from triangles and rectangles • Find the perimeter of rectangles and/or triangles • Find area of rectangles, squares and triangles • Calculate areas of shapes made from triangles and rectangles • Recall and use the formulae for the area of a triangle, rectangle and a parallelogram • Find the area of a trapezium • Split a compound shape into constituent parts in order to find its area

4 Probability

What students need to learn:

Ref	Content descriptor	Concepts and skills
MP a	Understand and use the vocabulary of probability and the probability scale	• Distinguish between events which are; impossible, unlikely, even chance, likely, and certain to occur • Mark events and/or probabilities on a probability scale of 0 to 1 • Write probabilities using fractions, percentages and decimals
MP b	Understand and use theoretical models for probabilities including the model of equally likely outcomes	• Understand theoretical models to include outcomes using dice, spinners, coins • Calculate the probability of successive events, such as several throws of a single dice • Estimate the number of times an event will occur, given the probability and the number of trials • Recognise when events are equally likely to occur
MP c	Understand and use estimates of probability from relative frequency	• Understand and use estimates of probability • Find the probability of an event happening using relative frequency • Estimate the number of times an event will occur, given the relative frequency and the number of trials
MP d	Use of sample spaces for situations where outcomes are single events and for situations where outcomes are two successive events	• List all outcomes for single events, and for two successive events, in a systematic way • Use and draw sample space diagrams • Add simple probabilities using simple space diagrams

Ref	Content descriptor	Concepts and skills
MP e	Identify different mutually exclusive and exhaustive outcomes and know that the sum of the probabilities of all these outcomes is 1	• Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1 • Addition of simple probabilities • Use $1 - p$ as the probability of an event not occurring where p is the probability of the event occurring • Find a missing probability from a list or table
MP f	Understand and use set notation to describe events and compound events	• Understand that: ○ P(A) represents the probability of an event A happening ○ $\mathrm{P}(\overline{A})$ represents the probability of event A **not** happening ○ $\mathrm{P}(\overline{A})) = 1 - \mathrm{P}(A)$
MP g	Use Venn diagrams to represent the number of possibilities and hence find probabilities	*Example*: A ={prime numbers}, B ={even numbers} The Venn Diagram shows numbers 1 to 10  $\mathrm{P}(A) = \frac{4}{10}$ $\mathrm{P}(B) = \frac{5}{10}$ $\mathrm{P}(A \cup B) = \frac{8}{10}$ $\mathrm{P}(A \cap B) = \frac{1}{10}$
MP j	Compare experimental data and theoretical probabilities, and make informal inferences about the validity of the model giving rise to the theoretical probabilities	• Compare experimental data and theoretical probabilities

Ref	Content descriptor	Concepts and skills
MP k	Understand that when a statistical experiment or survey is repeated there will usually be different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	• Compare relative frequencies from samples of different sizes

Unit 2: Methods 2

Foundation

Overview

Content overview

This unit contains:

1 Number

- Four operations
- Decimals
- Percentages
- Ratio
- Using calculators

2 Algebra

- Formulae
- Inequalities
- Solving equations graphically
- Coordinates

3 Geometry

- Angles and lines
- Polygons
- Tessellations
- Congruency and similarity
- Pythagoras
- Area and circumference
- Perimeter, area and volume

Assessment overview

- 50% of the qualification
- One written paper
- 1 hour 45 minutes
- 100 marks
- Calculator allowed
- Grades C-G available
- The content of Unit 2 subsumes the content of Unit 1. However, the content of Unit 1 will not be the direct focus of the assessment
- Available June and November

References

Each topic in this unit contains a specification reference (for example, **MAP a** for Methods, Algebra, Statement a), the content descriptor and examples of concepts and skills associated with that content descriptor.

1 Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
MN a	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	• Understand 'reciprocal' as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal, because division by zero is not defined) • Find reciprocals • Use inverse operations • Understand and use unit fractions as multiplicative inverses • Solve word problems about ratio and proportions, including using informal strategies and the unitary method of solution
MN b	Arithmetic of real numbers	• Add, subtract, multiply and divide whole numbers, directed numbers, integers, fractions and decimals using a calculator • Multiply or divide any number by powers of 10 • Add, subtract, multiply and divide decimals with any number of decimal places, using a calculator
MN g	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Order fractions, decimals and percentages • Convert between fractional, decimal and percentage forms

Ref	Content descriptor	Concepts and skills
MN h	Use multipliers for percentage change	• Find a percentage of a quantity • Use percentages to solve problems • Use a multiplier to increase or decrease by a percentage (NB: Repeated proportional change is only on Higher Tier)
MN i	Interpret fractions, decimals and percentages as operators	• Interpret percentage as an operator • Find percentages of quantities • Calculate a given fraction of a given quantity • Express a given number as a fraction of another • Use decimals to find quantities • Express a given number as a percentage of another • Understand the multiplicative nature of percentages as operators

Ref	Content descriptor	Concepts and skills
MN j	Understand and use the relationship between fractions and decimal representations including recurring and terminating decimals	• Recall the fraction to decimal conversion of familiar simple fractions • Convert between fractions and decimals using a calculator • Convert a recurring decimal to a fraction and a fraction to a recurring decimal using a calculator • Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals • Use the decimal-to-fraction conversion of familiar simple fractions • Convert between recurring decimals and fractions • Understand a recurring fraction to decimal proof
MN k	Understand and use the relationship between ratio and fractions	• Represent a situation using fractions or a ratio • Move between fractions and ratios in a problem
MN l	Find proportional change, using fractions, decimals and percentages	• Use multiplier to increase or decrease by a percentage in any scenario where percentages, fractions or decimals are used • Use percentages, fractions and decimals to find proportions • Understand how fractions, decimals and percentages can be used to scale between proportions

Ref	Content descriptor	Concepts and skills
MN m	Understand and use direct proportion	• Calculate an unknown quantity from quantities that vary in direct proportion • Solve word problems about ratio and proportion, including using informal strategies and the unitary method of solution • Scale between quantities in direct proportions
MN n	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem
MN o	Use calculators effectively and efficiently	• Use a calculator effectively and efficiently • Know how to enter complex calculations and use function keys for squares, powers and reciprocals • Understand, and interpret, the calculator display, particularly when the display has been rounded by the calculator • Use an extended range of calculator functions, including $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, xy, x/y, brackets, reciprocals (NB: Trigonometrical functions are only assessed at Higher Tier)

2 Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
MA d	Set up, and solve simple equations and inequalities	• Set up linear inequalities in one variable • Solve simple linear inequalities in one variable • Use the correct notation to show inclusive and exclusive inequalities (NB: Linear inequalities in two variables, and represented in diagrammatic form are assessed at Higher Tier only)
MA g	Solve quadratic equations approximately using a graph	• Generate points and plot graphs of simple quadratic functions, then more general quadratic functions • Use the graph to solve approximate solutions of a quadratic equation from the graph of the corresponding quadratic function
MA h	Derive a formula, substitute numbers into a formula and change the subject of a formula	• Derive a formula, including those with cubes, squares and roots • Use formulae from mathematics and other subjects expressed initially in words and then using letters and symbols • Substitute numbers into a formula • Change the subject of a formula • Substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$

Ref	Content descriptor	Concepts and skills
MA l	Use the conventions for coordinates in the plane and plot points in all four quadrants	• Calculate the length of a line segment
MA t	Recognise and use equivalence in numerical, algebraic and graphical representations	• Understand connections between line graphs and associated formulae • Use graphs to solve simultaneous equations • Use graphs to solve quadratic equations

3 Geometry

What students need to learn:

Ref	Content descriptor	Concepts and skills
MG b	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals	• Understand and use the angle properties of parallel lines • Mark parallel lines on a diagram • Use the properties of corresponding and alternate angles • Understand and use the angle properties of quadrilaterals • Give reasons for angle calculations • Explain why the angle sum of a quadrilateral is 360° • Understand the proof that the angle sum of a triangle is 180° • Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices

Ref	Content descriptor	Concepts and skills
MG e	Calculate and use the sums of the interior and exterior angles of polygons	• Calculate and use the sums of the interior angles of polygons • Use geometrical language appropriately and recognise and name pentagons, hexagons, heptagons, octagons and decagons • Use the properties of irregular polygons • Calculate the angles of regular polygons • Use the sum of the interior angles of an n-sided polygon • Use the sum of the exterior angles of any polygon is 360° • Use the fact that the sum of the interior and exterior angle of a polygon is 180°
MG f	Solve problems in the context of tiling patterns and tessellation	• Tessellate regular polygons and other 2-D shapes • Tessellate combinations of polygons • Relate tessellation of shapes to geometric properties • Explain why some shapes tessellate while others do not
MG m	Understand congruence and similarity, including the relationship between lengths in similar figures	• Know the relationships between linear scale factors of mathematically similar shapes • Use congruence or similarity to solve problems • Recognise that all corresponding angles are equal in size when the corresponding lengths of sides are equal in size
MG n	Use Pythagoras' theorem in 2-D	• Understand, recall and use Pythagoras' theorem in 2-D • Calculate the length of a side of a right-angled triangle given the length of the other two sides

Ref	Content descriptor	Concepts and skills
MG r	Find circumferences of circles and areas enclosed by circles	• Find circumferences and areas enclosed by circles • Recall and use the formulae for the circumference of a circle and the area enclosed by a circle. • Use $\pi \approx 3.142$ or use the π button on a calculator • Find the perimeters and areas of semi circles and quarter circles
MG s	Calculate perimeters and areas of shapes made from triangles and rectangles	• Find the surface area of simple shapes (prisms) using the formulae for triangles and rectangles • Find the surface area of a cylinder
MG u	Calculate volumes of right prisms and of shapes made from cubes and cuboids	• Calculate volumes of right prisms, including the triangular prism, and shapes made from cubes and cuboids • Recall and use the formula for the volume of a cuboid • Find the volume of a compound solid • Find the volume of a cylinder

Unit 1: Methods 1

Higher

Overview

Content overview

This unit contains:

1 Number

- Four operations
- Multiples and factors
- Indices, roots and squares
- Index laws
- **Standard form**
- Fractions and decimals
- **Surds**
- Accuracy
- Venn diagrams

2 Algebra

- Manipulating expressions
- Equations
- **Quadratic equations**
- Sequences
- Coordinates
- Linear graphs
- **Gradient**

3 Geometry

- Angles
- Quadrilaterals
- Symmetry
- Congruence
- Circles
- **Circle theorems**
- Transformations
- Area and perimeter
- **Vectors**

4 Probability

- Probability measures
- Relative probability
- Mutually exclusive outcomes
- **Mutually exclusive and independent events**
- Set notation and Venn diagrams
- **Tree diagrams**

Assessment overview

- 50% of the qualification
- One written paper
- 1 hour 45 minutes
- 100 marks
- Non-calculator
- Grades A*-D available (E allowed)
- Available in June and November

References

Each topic in this unit contains a specification reference (for example, **MG a** for Methods, Geometry, Statement a), the content descriptor and examples of concepts and skills associated with that content descriptor.

Content that is Higher Tier only is indicated in **bold type**.

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

1 Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
MN a	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	• Use number operations to solve problems • Use inverse operations • Use brackets and the hierarchy of operations • Use one calculation to find the answer to another
MN b	Arithmetic of real numbers, **including exact calculation with surds and pi**	• Add, subtract, multiply and divide whole numbers, integers, negative numbers, fractions and decimals • Recall multiplication facts up to 10 x 10 and use them to quickly derive the corresponding division factors • Multiply and divide by powers of 10 • Multiply or divide by any number between 0 and 1 • **Use surds and π in exact calculations, without a calculator** • **Write $(3-\sqrt{3})^2$ in the form $a+b\sqrt{3}$** • **Rationalise a denominator**

Ref	Content descriptor	Concepts and skills
MN c	Numbers and their representations including powers, roots, indices (integers, **fractional and negative)**, and **standard index form**	• Recall integer squares from 2×2 to 15×15 and the corresponding square roots • Recall the cubes of 2, 3, 4, 5 and 10 • Select a square number, cube number from a list • Order integers, decimals and fractions • Understand and use positive numbers and negative integers, both as positions and translations on a number line • Order fractions by rewriting them with a common denominator or as decimals • Understand equivalent fractions • Write a fraction in its simplest form by cancelling all common factors • Convert between mixed numbers and improper fractions • Use index notation for integer powers of 10, cubes and squares • **Recall that $n^0 = 1$ and $n^{-1} = \frac{1}{n}$ for positive integers n as well as $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive number n** • Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer, **fractional and negative** powers, and where a power is raised to a power

Ref	Content descriptor	Concepts and skills
MN c	(*Continued*)	• **Use standard form, expressed in conventional notation** • **Be able to write very large and very small numbers presented in a context in standard form** • **Convert between ordinary and standard form representations, converting to standard form to make sensible estimates for calculations involving multiplication and/or division** • **Calculate with standard form**
MN d	Approximate to specified or appropriate degrees of accuracy including a given power of ten, number of decimal places and significant figures	• Use previous understanding of integers and place value to deal with arbitrarily large positive numbers and round them to a given power of 10 • Round to the nearest integer and to any number of significant figures • Rounding to a given number of decimal places • Estimate answers to calculations
MN e	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	• Identify factors, multiples and prime numbers from a list of numbers • Find the prime factor decomposition of positive integers • Find the common factors and common multiples of two or three numbers

Ref	Content descriptor	Concepts and skills
MN f	Understand that factors of a number can be derived from its prime factorisation	• Find the prime factor decomposition of positive integers • Understand the number of factors relate to the type of number (square, prime etc) • Use prime factorisation to find Highest Common Factor (HCF) and Lowest Common Factor (LCM)
MN p	Understand and use Venn diagrams to solve problems	• Use Venn diagrams to represent sets • Interpret Venn diagrams • Draw a Venn diagram using given information • Use a Venn diagram to solve a problem • **Understand and be able to find the intersection and union of sets**

2 Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
MA a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
MA b	Distinguish in meaning between the words equation, inequality, formula, **identity** and expression	• Write an expression • Select an expression/**identity/**equation/ formulae from a list
MA c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, taking out common factors, **multiplying two linear expressions, factorising quadratic expressions including the difference of two squares, and simplifying rational expressions**	• Multiply a single term over a bracket • Manipulate algebraic expressions by collecting like terms • Write expressions using squares and cubes • Use instances of index laws, including use of **fractional, zero and negative powers and power of a power** • Substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$ • Factorise algebraic expressions by taking out common factors • **Expand the product of two linear expressions** • **Factorise quadratic expressions** • **Factorise quadratic expressions using the difference of two squares** • **Simplifying rational expressions by adding, subtracting, multiplying and cancelling**

Ref	Content descriptor	Concepts and skills
MA d	Set up, and solve simple equations	• Set up simple equations • Solve simple equations • Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation • Solve linear equations which include brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution • Solve linear equations in one unknown, with integer or fractional coefficients, in which the unknown appears on either side or on both sides of the equation
MA g	Solve quadratic equations approximately using a graph, **exactly by factorising, completing the square**	• **Solve simple quadratic equations by factorisation and completing the square** • **Solve quadratic equations approximately by using a graph**
MA i	Generate terms of a sequence using term-to-term and position-to-term definitions	• Recognise odd and even sequences of numbers • Generate simple sequences of numbers, squared integers and sequences derived from diagrams • Describe the term-to-term definition in words for a sequence • Write the nth term of an arithmetic sequence • Generate specific terms in a sequence using the position-to-term and term-to-term definitions

Ref	Content descriptor	Concepts and skills
MA j	Form linear **and quadratic** expressions to describe the nth term of a sequence	• Find the nth term of an arithmetic sequence • Use the nth term of an arithmetic sequence • **Find the nth term of a quadratic sequence**
MA k	Use algebra to support and construct arguments **and proofs**	• Form an algebraic expression from a given statement and rearrange this **to arrive at a proof**
MA l	Use the conventions for coordinates in the plane and plot points in all four quadrants	• Use axes and coordinates to specify points in all four quadrants in 2–D **and 3–D** • Identify points with given coordinates • Identify coordinates of given points (Note: Points may be in the first quadrant or all four quadrants) • Find the coordinates of the midpoint of the line segment AB, given the coordinates of A and B

Ref	Content descriptor	Concepts and skills
MA m	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane	• Plot and draw graphs of functions in which y is given explicitly in terms of x, or implicitly • Draw, label and scale axes • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane • Recognise that, in a mathematical context, an equation in the form $y = mx + c$ is a straight line • Plot and draw graphs of straight lines with equations of the form $y = mx + c$
MA n	Use geometric information to complete diagrams on a coordinate grid	• Find the coordinates of points identified by geometrical information in 2-D
MA o	**Use $y = mx + c$ and understand the relationship between gradients of parallel and perpendicular lines**	• **Understand that the form $y = mx + c$ represents a straight line and that m is the gradient of the line and c is the value of the y-intercept** • **Find the gradient of a straight line** • **Find the gradient of lines given by equations of the form $y = mx + c$ (when values are given for m and c)** • **Find the gradient of a straight line from a graph**
MA t	Recognise and use equivalence in numerical, algebraic and graphical representations	• Understand the connections between graphs and associated formulae and equations • Use graphs to find approximate solutions to equations

3 Geometry

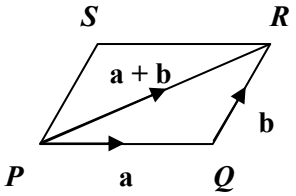
What students need to learn:

Ref	Content descriptor	Concepts and skills
MG 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	• Recall and use properties of angles – Angles at a point – Angles at a point on a straight line – Perpendicular lines – Vertically opposite angles • Find the size of missing angles • Use two letter notation for a line and three letter notation for an angle
MG b	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals	• Identify parallel lines on shape or diagram • Distinguish between scalene, isosceles, equilateral, and right-angled triangles • Understand and use the angle properties of triangles • Understand and use the angle properties of intersecting lines • Give reasons for angle calculations • **Recall and use these basic properties of angles in more complex problems**
MG c	Recall the properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus	• Recall the properties and definitions of special types of quadrilateral • List the properties of each, or identify (name) a given shape • Use symmetry properties of quadrilaterals • Classify quadrilaterals by their geometric properties

Ref	Content descriptor	Concepts and skills
MG d	Recognise reflection and rotation symmetry of 2D shapes	• Recognise reflection symmetry • Draw lines of reflection • State the line of symmetry as a simple algebraic equation • Recognise rotational symmetry • Identify the order of rotational symmetry
MG g	**Understand, prove and use circle theorems, intersecting chords**	• **Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point** • **Understand and use the fact that tangents from an external point are equal in length** • **Find missing angles on diagrams** • **Give reasons for angle calculations involving the use of tangent theorems** • **Prove and use the facts that:** – **The angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference** – **The angle in a semicircle is a right angle** – **Angles in the same segment are equal** – **Opposite angles of a cyclic quadrilateral sum to 180°** – **Alternate segment theorem** – **The perpendicular from the centre of a circle to a chord bisect the chord** • **Know and use the fact that for two chords AB and CD of a circle, intersecting at the point X; $AX \times XB = CX \times XD$**

Ref	Content descriptor	Concepts and skills
MG j	Describe and transform 2-D shapes using single or combined rotations, reflections, translations, or enlargements by a positive scale factor **then use positive fractional and negative scale factors** and distinguish properties that are preserved under particular transformations	• Describe and transform 2-D shapes using single rotations • Understand that rotations are specified by a centre and an (anticlockwise) angle • Find the centre of rotation • Rotate a shape about the origin, or any other point • Describe and transform 2-D shapes using single reflections • Understand that reflections are specified by a mirror line • Identify the equation of a mirror line of symmetry • Describe and transform 2-D shapes using single translations • Describe and transform 2-D shapes using enlargements by a positive and/or **a negative or fractional scale factor** • Understand that an enlargement is specified by a centre and a scale factor. • Enlarge a shape using a centre other than (0, 0) • Describe and transform 2-D shapes using combined rotations, reflections, translations, or enlargements • Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations

Ref	Content descriptor	Concepts and skills
MG j	(*Continued*)	• Distinguish properties that are preserved under particular transformations • Recognise that enlargements preserve angle but not length • Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides • Describe a transformation
MG k	Use 2-D vectors to describe translations	• Understand that translations are specified by a distance and direction (using a vector) • Describe translations fully using a column vector • Translate a given shape by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Ref	Content descriptor	Concepts and skills
MG I	**Use vectors to solve simple geometric problems and construct geometric arguments**	• **Understand and use vector notation** **(NB: the notation $\overrightarrow{AB}$ or a in bold type will be used)** • **Find equal and parallel vectors** • **Calculate, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector** • **Understand simple applications to geometry in two dimensions** • **Given a directed line segment representing a vector a, draw a directed line segment to represent $k\mathbf{a}$, where k is a scalar** • **Find the resultant of two vectors** • **Use the triangle law of vector addition** • **Understand that the resultant of the vectors $\mathbf{a}$ and $\mathbf{b}$ is the vector $\mathbf{a} + \mathbf{b}$ along the diagonal PR of the parallelogram $PQRS$**  • **Understand and use the commutative and associative properties of vector addition** • **Solve simple geometric problems in 2-D using vector methods** • **Join the midpoints of the sides of any quadrilateral to form a parallelogram** • **Prove three or more points are collinear**

Ref	Content descriptor	Concepts and skills
MG m	Understand congruence and similarity, including the relationship between lengths, **areas and volumes** in similar figures	• Identify similar shapes • Identify congruent shapes • Understand the relationships between lengths, **areas and volumes** in similar figures • **Identify similar solids** • **Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments and to verify standard straight edge and pair of compasses constructions** • Understand similarity of triangles and of other plane figures, and use this to make geometric inferences • Recognise that all corresponding angles in similar figures are equal in size when the lengths of sides are not • Use scale factors to find the length of a missing side in each of two similar triangles, given the lengths of a pair of corresponding sides • **Understand a formal geometric proof of similarity of two given triangles**
MG q	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	• Recall the definition of a circle and identify (name) and draw the parts of a circle • Understand also related terms such as semicircle and quarter circle • Draw a circle given the radius or diameter

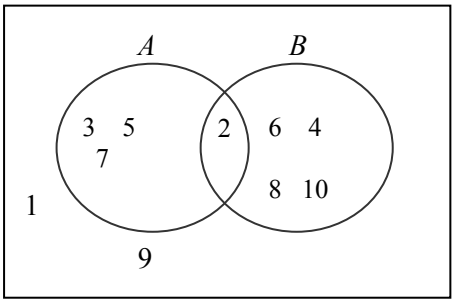
Ref	Content descriptor	Concepts and skills
MG s	Calculate perimeters and areas of shapes made from triangles and rectangles **and other shapes**	• Measure sides of a rectangle to find perimeter/area • Perimeter of simple shapes • Calculate perimeters of shapes made from triangles and rectangles • Calculate areas of shapes made from triangles and rectangles • Recall and use the formulae for the area of a triangle, a rectangle and a parallelogram • Find the area of a trapezium • Find the area of a compound shape, made from triangles, rectangles **and other shapes** • Find the area of a parallelogram, given formulae or derived from triangles and rectangles • Split a compound shape into constituent parts in order to find its area • Calculate perimeter and area of compound shapes made from triangles, rectangles **and other shapes**

4 Probability

What students need to learn:

Ref	Content descriptor	Concepts and skills
MP a	Understand and use the vocabulary of probability and the probability scale	• Use the vocabulary of probability appropriately • Write probabilities using fractions, percentages or decimals
MP b	Understand and use theoretical models for probabilities including the model of equally likely outcomes	• Use theoretical models of probability to include outcomes using dice, spinners, coins, etc • Find the probability of successive events, such as several throws of a single dice • Find an estimate for the number of times an event will occur, given the probability and the number of trials
MP c	Understand and use estimates of probability from relative frequency	• Understand and use estimates of measures of probability • Calculate the probability of successive events, such as several throws of a single dice • Use relative frequency to estimate the number of times an event occurs, given the number of trials
MP d	Use of sample spaces for situations where outcomes are single events and for situations where outcomes are two successive events	• List all outcomes for single events, and for two successive events, in a systematic way • Use and draw sample space diagrams

Ref	Content descriptor	Concepts and skills
MP e	Identify different mutually exclusive and exhaustive outcomes and know that the sum of the probabilities of all these outcomes is 1	• Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1 • Add simple probabilities • Use $1-p$ as the probability of an event not occurring where p is the probability of the event occurring • Find a missing probability from a list or table
MP f	Understand and use set notation to describe events and compound events	• Understand that: ○ $\mathrm{P}(A)$ represents the probability of an event A happening ○ $\mathrm{P}(\overline{A})$ represents the probability of event *A* **not** happening ○ $\mathrm{P}(\overline{A}) = 1 - \mathrm{P}(A)$ ○ **If A and B are mutually exclusive then $\mathrm{P}(A \cup B)$ represents the probability of either A or B happening** $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B)$ ○ **If A and B are independent, then $\mathrm{P}(A \cap B)$ represents the probability that both A and B happen** $\mathrm{P}(A \cap B) = \mathrm{P}(A) \times \mathrm{P}(B)$

Ref	Content descriptor	Concepts and skills
MP g	Use Venn diagrams to represent the number of possibilities and hence find probabilities	*Example*: A = {prime numbers}, B = {even numbers} The Venn Diagram shows numbers 1 to 10 ξ = {1, 2, 3,……10}  $P(A) = \frac{4}{10}$ $P(B) = \frac{5}{10}$ $P(A \cup B) = \frac{8}{10}$ $P(A \cap B) = \frac{1}{10}$
MP h	**Use tree diagrams to represent outcomes of compound events, recognising when events are independent or dependent**	• **Draw a probability tree diagram based on given information** • **Use of a tree diagram to calculate conditional probability**
MP i	**Know when to add or multiply probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is $P(A) + P(B)$; if A and B are independent events, the probability of A and B occurring is $P(A) \times P(B)$**	• **Understand conditional probabilities** • **Understand selection with or without replacement**
MP j	Compare experimental data and theoretical probabilities, and make informal inferences about the validity of the model giving rise to the theoretical probabilities	• Compare experimental data and theoretical probabilities

Ref	Content descriptor	Concepts and skills
MP k	Understand that when a statistical experiment or survey is repeated there will usually be different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	• Compare relative frequencies from samples of different sizes

Unit 2: Methods 2

Higher

Overview

Content overview

This unit contains:

1 Number

- Four operations
- Decimals
- Percentages and **repeated proportional change**
- **Direct and inverse proportion**
- Ratio
- **Surds**
- Using calculators

2 Algebra

- **Simultaneous equations**
- **Quadratic equations**
- Formulae
- Inequalities
- Coordinates
- Straight line graphs
- Gradients of lines
- **Graphs of functions**
- **Graphs of direct and indirect proportion**
- **Quadratic functions**
- **Graphs of loci**
- **Transformation of functions**

3 Geometry

- Angles and lines
- Polygons
- Tessellations
- Congruency and similarity
- **Proof using congruency**
- Pythagoras
- **Trigonometry**
- Circles
- Perimeter, area and volume of compound shapes
- Mensuration
- **Vectors**

Assessment overview

- 50% of the qualification
- One written paper
- 1 hour 45 minutes
- 100 marks
- Calculator allowed
- Grades A*-D available (E allowed)
- Available June and November

References

Each topic in this unit contains a specification reference (for example, **MP a** for Methods, Probability, Statement a), the content descriptor and examples of concepts and skills associated with that content descriptor.

Content that is Higher Tier only is indicated in **bold type**.

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

The content of Unit 2 subsumes the content of Unit 1. However, the content of Unit 1 will not be the direct focus of assessment.

1 Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
MN a	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	• Understand 'reciprocal' as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal, because division by zero is not defined) • Use inverse operations • **Understand that the inverse operation of raising a positive number to a power n is raising the result of this operation to the power $\frac{1}{n}$** • Understand and use unit fractions as multiplicative inverses • Solve word problems about ratio and proportion, including using formal strategies and the unitary method of solution
MN b	Arithmetic of real numbers, including **exact calculation with surds and pi**	• Add, subtract, multiply and divide whole numbers, directed numbers, integers, fractions and decimals using a calculator • Solve a problem involving division by a decimal • Recall the fraction-to-decimal conversion of familiar fractions • **Give an answer to a question involving the area of a circle as 25π** • **Give an answer to use of Pythagoras' theorem as $\sqrt{13}$**
MN g	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Convert between fractions, decimals and percentages • Compare proportions using percentages

Ref	Content descriptor	Concepts and skills
MN h	Use multipliers for percentage change; **work with repeated percentage change; solve reverse percentage problems**	• Use percentages to solve problems • **Compound interest** • Find amount after a percentage increase or decrease • **Calculate an original amount when given the transformed amount after a percentage change** • **Repeated proportional change** • **Reverse percentage calculations** • Use multiplier to increase or decrease by a percentage in any scenario where percentages are used
MN i	Interpret fractions, decimals and percentages as operators	• Find percentages of quantities • Calculate a given fraction of a given quantity • Express a given number as a fraction of another • Express a given number as a percentage of another • Understand the multiplicative nature of percentages as operators • **Represent repeated proportional change using a multiplier raised to a power**

Ref	Content descriptor	Concepts and skills
MN j	Understand and use the relationship between fractions and decimal representations including recurring and terminating decimals	• Recall the fraction-to-decimal conversion of familiar simple fractions • Convert between fractions and decimals using a calculator • Convert a recurring decimal to a fraction and a fraction to a recurring decimal using a calculator • Distinguish between fractions with denominators that have only prime factors of 2 and 5 (which are represented by terminating decimals), and other fractions (which are represented by recurring decimals) • Convert between recurring decimals and fractions • Understand the recurring fraction to decimal proof
MN k	Understand and use the relationship between ratio and fractions	• Represent a situation using fractions or ratios • Move between fractions and ratios in a problem

Ref	Content descriptor	Concepts and skills
MN l	Find proportional change and **repeated proportional change,** using fractions, decimals and percentages	• Use percentages, fractions and decimals to solve problems • Calculate an original amount when given the transformed amount after a percentage change • **Repeated proportional change using fractions, decimals or percentages** • Use a multiplier to increase or decrease by a percentage, fraction or decimal in any scenario where these are used • **Represent repeated proportional change using a multiplier raised to a power**
MN m	Understand and use direct **and inverse** proportion	• Calculate an unknown quantity from quantities that vary in direct **or inverse** proportion • Solve word problems about ratio and proportion, including using informal strategies and the unitary method of solution • Represent a situation using direct or **inverse** proportion
MN n	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem in a context

Ref	Content descriptor	Concepts and skills
MN o	Use calculators effectively and efficiently, including **trigonometrical** functions	• Use a calculator effectively and efficiently • Know how to enter complex calculations and use function keys for squares, powers and reciprocals • Understand, and interpret, the calculator display, particularly when the display has been rounded by the calculator • Use an extended range of calculator functions, including $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, x^y, $x^{1/y}$, brackets, **trigonometric** and reciprocal functions • **Use standard form display and know how to enter numbers in standard form** • **Use calculators for reverse percentage calculations by doing an appropriate division**

2 Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
MA d	Set up, and solve simple equations and inequalities	• Solve simple linear inequalities in one variable **or two variables** • **Use the correct notation to show inclusive and exclusive inequalities**
MA e	**Set up and use equations that describe direct and inverse proportion**	• **Set up and use equations to solve problems involving direct proportion or inverse proportion** • Relate algebraic solutions to graphical representation of the equations

Ref	Content descriptor	Concepts and skills
MA f	**Set up, and solve simultaneous equations in two unknowns where one of the equations might include squared terms in one or both unknowns**	• Find the exact solutions of two simultaneous equations in two unknowns • Use elimination or substitution to solve simultaneous equations • Interpret a pair of simultaneous equations as a pair of straight lines and their common solution as the point of intersection • Set up and solve a pair of simultaneous equations in two variables • **Solve exactly two simultaneous equations in two unknowns, one of which is linear in each unknown, and the other is linear in one unknown and quadratic in the other, or where the second equation is of the form $x^2 + y^2 = r^2$** • **Find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach** • **Select and apply algebraic and graphical techniques to solve simultaneous equations where one is linear and one quadratic**
MA g	Solve quadratic equations approximately using a graph, **exactly by factorising, completing the square and using the formula**	• **Solve simple quadratic equations by using the quadratic formula** • Generate points and plot graphs of simple quadratic functions, then more general quadratic functions • Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function • Select and use the correct mathematical techniques to draw quadratic graphs

Ref	Content descriptor	Concepts and skills
MA h	Derive a formula, substitute numbers into a formula and change the subject of a formula	• Derive a formula • Use formulae from mathematics and other subjects expressed initially in words and then using letters and symbols • Substitute positive and negative numbers into a formula and expression • **Change the subject of a formula including cases where the subject is on both sides of the original formula, or where a power of the subject appears**
MA k	Use algebra to support and construct arguments **and proofs**	• Form an algebraic expression from a given statement **and rearrange this to arrive at a proof**
MA l	Use the conventions for coordinates in the plane and plot points in all four quadrants	• Given the coordinates of points A and B, in 2-D calculate the length of AB

Ref	Content descriptor	Concepts and skills
MA o	**Use $y = mx + c$ and understand the relationship between gradients of parallel and perpendicular lines**	• **Use the method of finding a gradient to see how one variable increases in relation to another** • **Analyse problems and use gradients to interpret how one variable changes in relation to another** • **Explore the gradients of parallel lines and lines perpendicular to each other** • **Write down the equation of a line parallel or perpendicular to a given line** • **Select and use the fact that when $y = mx + c$ is the equation of a straight line then the gradient of a line parallel to it will have a gradient of m and a line perpendicular to this line will have a gradient of $-\frac{1}{m}$** • **Interpret and analyse a straight line graph and generate equations of lines parallel and perpendicular to the given line**

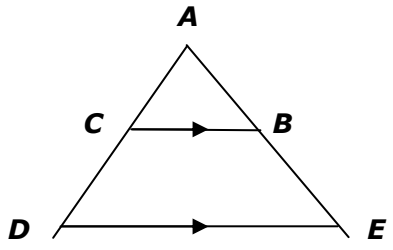
Ref	Content descriptor	Concepts and skills
MA p	**Draw, sketch, recognise graphs of linear, quadratic simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, the function $y = k^x$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$, $y = \cos x$ and $y = \tan x$**	• **Plot graphs of simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, the exponential function $y = k^x$ for integer values of x and simple positive values of k, the circular functions $y = \sin x$, $y = \cos x$ and $y = \tan x$ within the range -360° to +360°** • **Recognise the characteristic shapes of all these functions** • **Draw and plot a range of mathematical functions** • **Interpret and analyse a range of mathematical functions and be able to draw them, recognising that they were of the correct shape**
MA q	**Understand and use the Cartesian equation of a circle centred at the orgin and link to the trigonometric functions**	• **Know that $x^2 + y^2 = r^2$ represents the equation of a circle, centre (0,0), radius r** • **Be able to draw the graph of a circle of equation $x^2 + y^2 = r^2$** • **Understand that the graphs of the trigonometric functions can be generated from movement around a circle, centre (0,0), radius 1**

Ref	Content descriptor	Concepts and skills
MA r	**Construct the graphs of simple loci**	• **Construct the graphs of simple loci including the circle $x^2 + y^2 = r^2$ for a circle of radius r centred at the origin of coordinates** • **Find graphically the intersection points of a given straight line with this circle and know that this corresponds to solving the two simultaneous equations representing the line and the circle** • **Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendicular lines**
MA s	**Sketch simple transformations of a given function**	• **Apply to the graph of $y = \mathrm{f}(x)$ the transformations $y = \mathrm{f}(x) + a, y = \mathrm{f}(ax)$, $y = f(x + a), y = af(x)$ for linear, quadratic, sine and cosine functions $\mathrm{f}(x)$** • **Select, apply and sketch the transformations of reflection, rotation, enlargement and translation of functions expressed algebraically** • **Interpret and analyse transformations of functions and write the functions algebraically**
MA t	**Recognise and use equivalence in numerical, algebraic and graphical representations**	• Understand link between conversion graphs and associated formulae • **Recognise that simultaneous equations can be solved algebraically or graphically** • **Use linear and quadratic and other graphs to find approximate solutions to equations**

3 Geometry

What students need to learn:

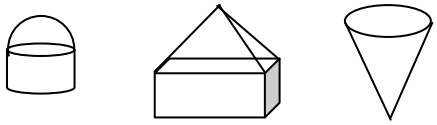
Ref	Content descriptor	Concepts and skills
MG b	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals	• Understand and use the angle properties of parallel lines • Mark parallel lines on a diagram • Find missing angles using properties of corresponding and alternate angles • Understand and use the angle properties of quadrilaterals • Give reasons for angle calculations • Explain why the angle sum of a quadrilateral is 360° • Understand the proof that the angle sum of a triangle is 180° • Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices

Ref	Content descriptor	Concepts and skills
MG e	Calculate and use the sums of the interior and exterior angles of polygons	• Calculate and use the sums of the interior angles of polygons • Recognise and name pentagons, hexagons, heptagons, octagons and decagons • Use the angle properties of irregular polygons • Calculate and use the angles of regular polygons • Use the sum of the interior angles of an n-sided polygon • Use the sum of the exterior angles of any polygon is 360° • Use the fact that the sum of the interior and exterior angle is 180° • Find the size of each interior angle or the size of each exterior angle or the number of sides of a regular polygon given one of the three pieces of information
MG f	Solve problems in the context of tiling patterns and tessellation	• Tessellate regular polygons and other 2-D shapes • Tessellate combinations of polygons and relate to real life situations • Explain why some shapes tessellate whilst others do not • Understand how properties of shapes connect to tessellations
MG h	**Understand and use the midpoint and the intercept theorems**	• **Know that when *CB* and *DE* are parallel,** $\frac{CD}{DA} = \frac{BE}{EA}$, $\frac{AC}{CD} = \frac{AB}{BE}$ 

Ref	Content descriptor	Concepts and skills
MG i	**Understand and construct geometrical proofs using formal arguments, including proving the congruence, or non congruence of two triangles in all possible cases**	• **Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments** • **Verify standard ruler and pair of compasses constructions**
MG m	Understand congruence and similarity, including the relationship between lengths, **areas and volumes** in similar figures	• **Understand the effect of enlargement for perimeter, area and volume of shapes and solids** • **Understand that enlargement does not have the same effect on area and volume** • **Use simple examples of the relationship between enlargement and areas and volumes of simple shapes and solids** • **Use the effect of enlargement on areas and volumes of shapes and solids** • **Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids**
MG n	**Use Pythagoras' theorem in 2-D and 3-D**	• Understand, recall and use Pythagoras' theorem in 2-D, **then in 3-D problems** • **Calculate the height (altitude) of an isosceles triangle given the lengths of all three sides** • **Understand the language of planes, and recognise the diagonals of a cuboid** • **Calculate the length of a diagonal of a cuboid**

Ref	Content descriptor	Concepts and skills
MG o	**Use the trigonometrical ratios to solve 2-D and 3-D problems**	• **Use the trigonometric ratios to solve 2-D and 3-D problems** • **Understand, recall and use trigonometric relationships in right-angled triangles, and use these to solve problems in 2-D and in 3-D configurations** • **Calculate the length of a side or the size of an angle of a right-angled triangle given the lengths of one side and an angle or the lengths of two sides** • **Find the angle between a line and a plane (but not the angle between two planes or between two skew lines)** • **Calculate the angle between the diagonal of a cuboid and the base of the cuboid or the angle between the sloping edge of a pyramid and the base of the pyramid** • **Find angles of elevation and angles of depression**
MG p	**Use the sine and cosine rule to solve problems in 2-D and 3-D**	• **Use the sine and cosine rules to solve 2-D and 3-D problems** • **Find the three angles of a scalene triangle given the length of each side** • **Find the length of a side of a scalene triangle given, the lengths of two sides and the size of the included angle, or the size of two angles and the length of one side**

Ref	Content descriptor	Concepts and skills
MG r	Find circumferences of circles and areas enclosed by circles	• Find circumferences of circles and areas enclosed by circles • Recall and use the formulae for the circumference of a circle and the area enclosed by a circle • Use $\pi \approx 3.142$ or use the π button on a calculator • Find the perimeters and areas of semi circles and quarter circles • **Calculate the lengths of arcs and the areas of sectors of circles** • Give answers in terms of π • Find the surface area of a cylinder
MG s	Calculate perimeters and areas of shapes made from triangles and rectangles **and other shapes**	• Find the surface area of simple shapes (prisms) using the formulae for triangles and rectangles, **and other shapes**
MG t	**Calculate the area of a triangle using $\frac{1}{2}ab\sin C$**	• **Calculate the area of a triangle given the length of two sides and the included angle**
MG u	Calculate volumes of right prisms and of shapes made from cubes and cuboids	• Calculate volumes of right prisms, including the triangular prism, and shapes made from cubes and cuboids • Find the volume of a compound solid constructed from cubes and cuboids • Recall and use the formula for the volume of a cuboid • Find the volume of a cylinder

Ref	Content descriptor	Concepts and skills
MG v	**Solve mensuration problems involving more complex shapes and solids**	• **Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones** • **Find the surface area and volumes of compound solids constructed from; cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinder eg**  • **Find the area of a segment of a circle given the radius and length of the chord**

B Assessment

Assessment summary

Unit 1 and Unit 2 are both externally assessed.

Summary of table of assessment

Unit 1:	Methods 1	Unit code 1F: 5MM1F Unit code 1H: 5MM1H

- Externally assessed
- One written paper
- 1 hour 45 minutes (Foundation)
- 1 hour 45 minutes (Higher)
- 100 marks
- Non-calculator
- Tiered papers:
  - Foundation Tier grades C-G available
  - Higher Tier grades A*-D available (E allowed)

Unit 2:	Methods 2	Unit code 2F: 5MM2F Unit code 2H: 5MM2H

- Externally assessed
- One written paper
- 1 hour 45 minutes (Foundation)
- 1 hour 45 minutes (Higher)
- 100 marks
- Calculator allowed
- Tiered papers:
  - Foundation Tier grades C-G available
  - Higher Tier grades A*-D available (E allowed)

Assessment Objectives and weightings

		% in GCSE
AO1:	Recall and use their knowledge of the prescribed content	50-60%
AO2:	Select and apply mathematical methods	15-35%
AO3:	Interpret and analyse problems and use mathematical reasoning to solve them	20-30%
	TOTAL	100%

Relationship of Assessment Objectives to units

Unit	Assessment objective			
	AO1	AO2	AO3	Total for AO1, AO2 and AO3
Unit 1: Methods 1	25-30%	7.5-12.5%	10-15%	50%
Unit 2: Methods 2	25-30%	7.5-12.5%	10-15%	50%
Total for GCSE	**50-60%**	**15-25%**	**20-30%**	**100%**

Entering your students for assessment

Student entry

From summer 2014 onwards, students will be required to sit all their examinations at the end of the course.

Students may enter a unit at any tier of entry.

Details of how to enter students for this qualification can be found in Edexcel's *Information Manual*, a copy is sent to all examinations officers. The information can also be found on Edexcel's website: www.edexcel.com. Further information will be made available from the Edexcel pilots team.

During the pilot, students must take both GCSE in Applications of Mathematics and GCSE in Methods in Mathematics, although the two GCSE qualifications do not have to be sat in the same series.

Forbidden combinations and classification code

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

Students should be advised that, if they take two qualifications with the same classification code, schools and colleges are very likely to take the view that they have achieved only one of the two GCSEs. The same view may be taken if students take two GCSE qualifications that have different classification codes but have significant overlap of content. Students who have any doubts about their subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

During the lifetime of the pilot, GCSE Applications of Mathematics and GCSE Methods in Mathematics will not be a forbidden combination.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, and Entry Level is designed to ensure equal access to qualifications for all students (in compliance with the Equality Act 2010) without compromising the assessment of skills, knowledge, understanding or competence.

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

- the JCQ policy Access Arrangements, Reasonable Adjustments and Special Consideration
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

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

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Equality Act 2010

Please see the Edexcel website (www.edexcel.com) for information with regard to the Equality Act 2010.

Assessing your students

The first assessment opportunity for Units 1 and 2 of this qualification will take place in the June 2014 series and in each following November and June series for the lifetime of the specification.

Assessment opportunities

Unit	June 2014	November 2014	June 2015
Unit 1	✓	✓	✓
Unit 2	✓	✓	✓

Please note, first certification of this qualification is in **June 2014** and thereafter.

Awarding and reporting

The grading, awarding and certification of this qualification will comply with the requirements of the GCSE/GCE Code of Practice, which is published by the Qualifications and Curriculum Authority. The GCSE qualification will be graded and certificated on an eight-grade scale from A* to G. Higher Tier units are awarded A*-D, with E allowed. Foundation Tier papers are awarded C-G. Individual unit results will be reported.

The first certification opportunity for the Edexcel GCSE in Methods in Mathematics will be June 2014.

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

Unit results

The minimum uniform marks required for each grade for each unit:

Units 1 and 2 (Foundation and Higher Tier)

Unit grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 200	180	160	140	120	100	80	60	40

The maximum uniform mark available for students entered for the Foundation Tier unit is 139.

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0-39.

Qualification results

The minimum uniform marks required for each grade:

GCSE in Methods in Mathematics cash-in code: 2MM01

Qualification grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 400	360	320	280	240	200	160	120	80

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0-79.

Students may enter a unit at any tier of entry. However, the overall grade calculation will be based upon their total uniform mark score.

Re-taking of qualifications

Students wishing to re-take a GCSE are required to re-take all the units in the qualification.

Language of assessment

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

Quality of written communication

Students will be assessed on their ability to:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
- select and use a form and style of writing appropriate to the purpose and the complexity of the subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate

Stretch and challenge

Students can be stretched and challenged in both units through the use of different assessment strategies, for example:

- using a variety of stems in questions – for example: explain, find, calculate, compare, prove
- ensuring connectivity between parts of questions
- use of a wider range of question types to address different skills – for example structured, unstructured, task-based questions, proof etc
- Students are challenged by the content, skills and knowledge defined in each unit of the specification.

Malpractice and plagiarism

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

Student recruitment

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

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

Prior learning

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

Progression

This GCSE in Methods in Mathematics provides progression to Level 3 qualifications in numerate disciplines, such as:

- GCE Mathematics
- GCE Further Mathematics
- GCEs in the Science subjects
- GCE Geography
- Other qualifications which require mathematical skills, knowledge and understanding.

This qualification also supports further training and employment where mathematical skills, knowledge and understanding is desirable.

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 candidates' performance in the assessment may be balanced by better performances in others.

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.

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 for example, 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 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.

C Resources, support and training

Edexcel Resources

Mathematics Emporium – an online filing cabinet with essential documents for teachers

Register online to gain access to our **Mathematics Emporium** – you'll find everything you need to support your students throughout the year. Sample papers, mock papers and mark schemes will be made available as the pilot progresses.

To request free access, please visit www.edexcelmaths.com

Online resources to support the GCSE Linked Pair specification will be made available as the pilot progresses.

Training

A programme of professional development and training courses covering various aspects of the specification and examination will be arranged by Edexcel each year.

Full details will be available from:

Training from Edexcel
Edexcel
One90 High Holborn
London WC1V 7BH

Telephone: 0844 576 0027
Email: trainingbookings@edexcel.com
Website: www.edexcel.com

Edexcel support services

We have a wide range of support services to help you plan, teach and manage this qualification successfully.

ResultsPlus – our free online analysis service provides you with an in-depth analysis of how students performed in their exams on a question-by-question basis. Quick and easy to use, you can download exam performance data in Excel spreadsheets and reference papers, examiner reports and mark schemes. At a glance, you'll be able to see how well a specification is understood across the whole department.

ResultsPlus Skills Maps will be available for the GCSE Linked Pair pilot and go one step further with the analysis by mapping performance to specific areas of knowledge that are being tested. You can pinpoint areas for improvement to help you tailor revision for individual students.

For further information or find out how to access and use this service, please call 0844 576 0024 or visit **www.edexcel.com/resultsplus**

Ask Edexcel is our online question and answer service. You can access it at **www.edexcel.com/ask** or by visiting our homepage and selecting 'contact us'.

The service allows you to search through a database of thousands of questions and answers on everything we offer. If you don't find an answer to your question, you can submit it straight to us. One of our customer services team will log your query, find an answer and send it to you. They'll also add it to the database if your question could help other customers. This way the volume of helpful information that the service has available is growing all the time.

Regional teams – Do you know your dedicated Curriculum Development Manager? Every school and college in the country has an allocated member of the Edexcel team, regionally based, who is available to provide support, help, advice and training for your curriculum offer.

Regional office telephone numbers are listed below:

Birmingham	0121 616 2585
Bristol	0117 950 1908
Cardiff	0292 079 4865
Manchester	0161 855 7560
Leeds	0115 224 2253

D Appendices

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Appendix 1 Key skills

Key skills (Level 2)	All units
Application of number	
N2.1	✓ **(grade C standard or above)**
N2.2	✓ **(grade C standard or above)**
N2.3	✓ **(grade C standard or above)**
Communication	
C2.1a	✓
C2.1b	✓
C2.2	✓
C2.3	✓
Information and communication technology (ICT)	
ICT2.1	✓
ICT2.2	✓
ICT2.3	✓
Improving own learning and performance	
LP2.1	✓
LP2.2	✓
LP2.3	✓
Problem solving	
PS2.1	✓
PS2.2	✓
PS2.3	✓
Working with others	
WO2.1	✓
WO2.2	✓
WO2.3	✓

Development suggestions

Please refer to the Edexcel website for key skills development suggestions.

Appendix 2 Wider curriculum

Signposting

Issue	All units
Spiritual	✓
Moral	✓
Ethical	✓
Social	✓
Legislative	✓
Economic	✓
Cultural	✓
Sustainable	✓
Health and safety	✓
European initiatives	✓

Development suggestions

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

Appendix 3 Codes

Type of code	Use of code	Code number
National classification codes	Every qualification is assigned to a national classification code indicating the subject area to which it belongs. Centres should be aware that students who enter for more than one GCSE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the school and college performance tables.	2214
National Qualifications Framework (NQF) codes	Each qualification title is allocated a National Qualifications Framework (NQF) code. The QCA National Qualifications Framework (NQF) code is known as a Qualification Number (QN). This is the code that features in the DfE Section 96, and on the LARA as being eligible for 16-18 and 19+ funding, and is to be used for all qualification funding purposes. The QN is the number that will appear on the student's final certification documentation.	The QN for the qualification in this publication is: GCSE – 500/7949/9
Unit codes	Each unit is assigned a unit code. This unit code is used as an entry code to indicate that a student wishes to take the assessment for that unit. Centres will need to use the entry codes only when entering students for their examination.	Unit 1F – 5MM1F Unit 1H – 5MM1H Unit 2F – 5MM2F Unit 2H – 5MM2H
Cash-in codes	The cash-in code is used as an entry code to aggregate the student's unit scores to obtain the overall grade for the qualification. Centres will need to use the entry codes only when entering students for their qualification.	GCSE – 2MM01
Entry codes	The entry codes are used to: ○ enter a student for the assessment of a unit ○ aggregate the student's unit scores to obtain the overall grade for the qualification.	Please refer to the Edexcel *Information Manual*, available on our website. (www.edexcel.com)

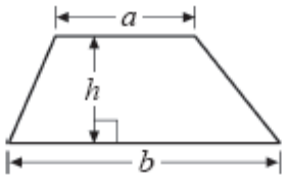
Appendix 4 Formulae sheets

Foundation Tier

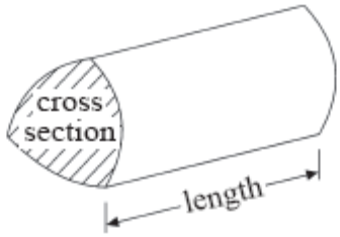
You must not write on this formulae page.

Anything you write on this formulae page will gain NO credit.

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



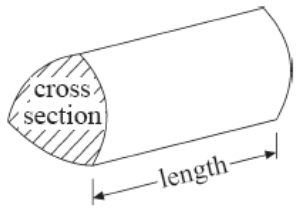
Volume of prism = area of cross section × length



GCSE Mathematics

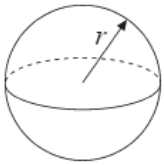
Formulae: Higher Tier

Volume of a prism = area of cross section × length



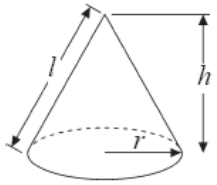
Volume of sphere $= \frac{4}{3}\pi r^3$

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

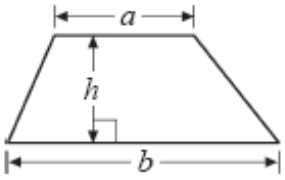


Volume of cone $= \frac{1}{3}\pi r^2 h$

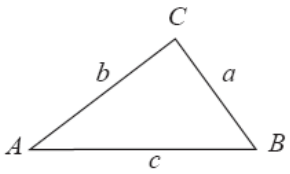
Curved surface area of cone $= \pi r l$



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



In any triangle ABC



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

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

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

The Quadratic Equation

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

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

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