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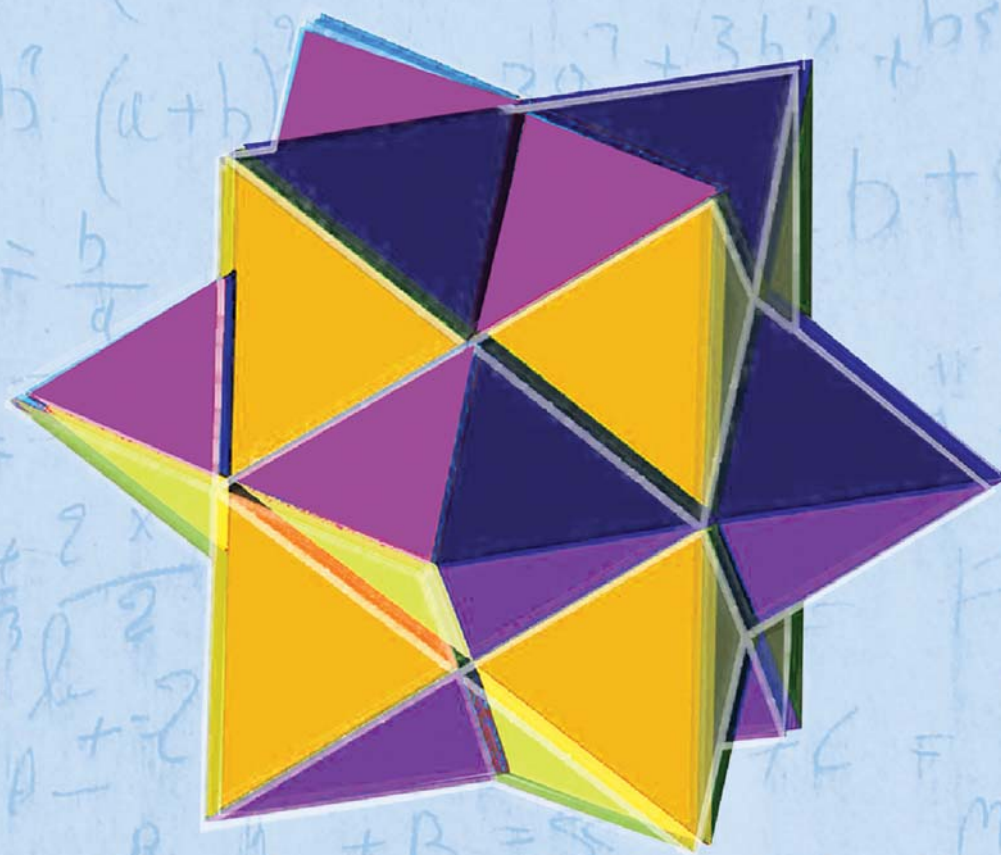advancing learning, changing lives

Specification

Edexcel GCSE in Mathematics B – Modular (2MB01)

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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Introduction

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

This specification is designed so that the assessment is by unit tests, with a terminal test at the end of the two-year programme of study.

Specification B serves those who teach and learn in a modular way, tackling smaller units of assessment at different times throughout the course, and who benefit from positive reinforcement of their success through results banked as they progress. It also serves those centres prepared to enter students for re-sits as and when required.

This specification comprises three units:

- Unit 1, which focuses on statistics and probability content
- Unit 2, which focuses on number, algebra and geometry
- Unit 3, which focuses on number, algebra and geometry and builds on the content of Unit 2.

This specification has particular benefits for teachers and learners:

Advantages for the centre

- Content can be taught in discrete units with focused content areas for assessment.
- Centres can use different teachers to deliver units as the model supports different teaching and learning styles.
- Unit 1 contains all the statistics and probability found in the Key Stage 4 programme of study.
- Unit 1 may also be taught alongside material for GCSE statistics and can be used to support learning in science and geography.
- Support will be available from Edexcel through one- and two-year schemes of work.

Advantages for the student

- Allows assessment throughout the course; results analysis identifies students' strengths and weaknesses enabling them to take remedial action.
- There is the opportunity for different areas of mathematics to be attempted at different tiers by students, enhancing motivation particularly at Foundation tier.
- There is an opportunity to re-sit each unit once.
- Students are motivated through success achieved throughout the course.
- A lesser amount of non-calculator assessment, which suits some students who benefit from the support of calculator-based assessment.
- Results analysis allows centres to identify strengths and weaknesses of their students and take remedial action.

About this specification

- Flexible assessment through the unit tests.

- Accessible assessment for all students.

- Written to meet the needs of the Key Stage 4 Programme of Study from September 2010.

Also available to support delivery:

- Itemised assessment feedback through ResultsPlus.

- Advice from subject specialists.

- Professional development support days.

- Teacher support material.

- Endorsed textbooks and online resources.

Contents

Specification at a glance

The Edexcel GCSE in Mathematics B comprises three units:

- Units 1, 2, and 3

Unit 1	Statistics and Probability	*Unit code 1F: 5MB1F
		*Unit code 1H: 5MB1H
• Externally assessed • Availability: March, June and November • First assessment: November 2010		**30% of the total GCSE**
Overview of content 1. Statistics 2. Probability 3. Number 4. Algebra 5. Geometry and Measures		

Overview of assessment
• One written paper
• Tiered papers
   o Foundation Tier grades C-G available
   o Higher Tier grades A*-D available (E allowed)
• 1 hour 15 minutes Foundation tier
• 1 hour 15 minutes Higher tier
• 60 marks
• Calculator allowed
• Tiered papers
   o 30-40% of Foundation Tier paper assesses the functional elements of mathematics.
   o 20-30% of Higher Tier paper assesses the functional elements of mathematics.		

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

Unit 2	Number, Algebra, Geometry 1	*Unit code 2F: 5MB2F
		*Unit code 2H: 5MB2H

• Externally assessed	
• Availability: March, June and November	**30% of the total GCSE**
• First assessment: November 2010	

Overview of content

1. Number

2. Algebra

3. Geometry

4. Measures

Overview of assessment

- One written paper

- Tiered papers

  o Foundation Tier grades C-G available

  o Higher Tier grades A*-D available (E allowed)

- 1 hour 15 minutes Foundation tier

- 1 hour 15 minutes Higher tier

- 60 marks

- Non-calculator

- Tiered papers

  o 30-40% of Foundation Tier paper assesses the functional elements of mathematics.

  o 20-30% of Higher Tier paper assesses the functional elements of mathematics.

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

| Unit 3 | Number, Algebra, Geometry 2 | *Unit code 3F: 5MB3F |
| | | *Unit code 3H: 5MB3H |

• Externally assessed • Availability: March, June and November • First assessment: June 2012	**40% of the total GCSE**

Overview of content

1. Number

2. Algebra

3. Geometry

4. Measures

Overview of assessment

- One written paper

- Tiered papers

    o Foundation Tier grades C-G available

    o Higher Tier grades A*-D available (E allowed)

- 1 hour 30 minutes Foundation tier

- 1 hour 45 minutes Higher tier

- 80 marks

- Calculator allowed

- Tiered papers

    o 30-40% of Foundation Tier paper assesses the functional elements of mathematics.

    o 20-30% of Higher Tier paper assesses the functional elements of mathematics.

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

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

A   Qualification content

National Qualifications Framework (NQF) criteria

This specification complies with the requirements of the common criteria, the GCSE qualification criteria, subject criteria for Mathematics and the Key Stage 4 Programme of Study for Mathematics, which are prescribed by the regulatory authorities.

Key subject aims

This qualification in Mathematics encourages students to develop confidence in, and have a positive attitude towards, mathematics and they recognise the importance of mathematics in their own lives and to society. This qualification prepares students to make informed decisions about the use of technology, the management of money, further learning opportunities and career choices.

Knowledge and understanding

This Edexcel GCSE in Mathematics B qualification requires students to:

- Develop knowledge, skills and understanding of mathematical methods and concepts, including:
  - Number
  - Algebra
  - Geometry
  - Measures
  - Statistics
  - Probability.
- Use their knowledge and understanding to make connections between mathematical concepts.
- Be able to apply the functional elements of mathematics to solve problems in real-life situations.

Skills

This Edexcel GCSE in Mathematics B gives students the opportunity to develop the ability to:

- acquire and use problem-solving strategies

- select and apply mathematical techniques and methods in mathematical, every day and real-world situations

- reason mathematically, make deductions and inferences and draw conclusions

- interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

 Specification

List of unit contents

Subject content

The content of the specification has been grouped into topic areas:

- Number

- Algebra

- Geometry

- Measures

- Statistics

- 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.

Concepts and skills develop through the units, under the same content descriptor.

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

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

Ref	Content descriptor	Unit	
Number		**Foundation**	**Higher**
N a	Add, subtract, multiply and divide any number	Unit 1, Unit 2, Unit 3	Unit 1, Unit 2, Unit 3
N b	Order rational numbers	Unit 2	Unit 2
N c	Use the concepts and vocabulary of factor (divisor), multiple, common factor, Highest Common Factor (HCF), Least Common Multiple (LCM), prime number and prime factor decomposition	Unit 2	Unit 2
N d	Use the terms square, positive and negative square root, cube and cube root	Unit 2	Unit 2
N e	Use index notation for squares, cubes and powers of 10	Unit 2	Unit 2
N f	Use index laws for multiplication and division of integer, **fractional and negative** powers	Unit 2	Unit 2
N g	**Interpret, order and calculate with numbers written in standard index form**		Unit 2, Unit 3
N h	Understand equivalent fractions, simplifying a fraction by cancelling all common factors	Unit 1, Unit 2	Unit 1, Unit 2
N i	Add and subtract fractions	Unit 2	Unit 2
N j	Use decimal notation and recognise that each terminating decimal is a fraction	Unit 1, Unit 2	Unit 1, Unit 2
N k	Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals	Unit 2	Unit 2, Unit 3
N l	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	Unit 1, Unit 2	Unit 1, Unit 2
N m	Use percentage, **repeated proportional change**	Unit 1, Unit 3	Unit 1, Unit 3
N n	**Understand and use direct and indirect proportion**		Unit 3
N o	Interpret fractions, decimals and percentages as operators	Unit 1, Unit 2, Unit 3	Unit 1, Unit 2, Unit 3
N p	Use ratio notation, including reduction to its simplest form and its various links to fraction notation	Unit 1, Unit 2	Unit 1, Unit 2

 Specification

Ref	Content descriptor	Unit	
Number		**Foundation**	**Higher**
N q	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations	Unit 1, Unit 2, Unit 3	Unit 1, Unit 2, Unit 3
N r	**Use surds and π in exact calculations**		Unit 2
N s	**Calculate upper and lower bounds**		Unit 3
N t	Divide a quantity in a given ratio	Unit 1, Unit 2	Unit 1, Unit 2
N u	Approximate to specified or appropriate degrees of accuracy including a given power of ten, number of decimal places and significant figures	Unit 1, Unit 2	Unit 1, Unit 2
N v	Use calculators effectively and efficiently, **including trigonometrical** and statistical functions	Unit 1, Unit 3	Unit 1, Unit 3

Ref	Content descriptor	Unit	
Algebra		**Foundation**	**Higher**
A a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	Unit 1, Unit 2	Unit 1, Unit 2
A b	Distinguish in meaning between the words 'equation', 'formula', **'identity'** and 'expression'	Unit 1, Unit 2	Unit 1, Unit 2
A c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors, **multiplying two linear expressions, factorising quadratic expressions including the difference of two squares and simplifying rational expressions**	Unit 2, Unit 3	Unit 2, Unit 3
A d	Set up and solve simple equations **including simultaneous equations in two unknowns**	Unit 3	Unit 3
A e	**Solve quadratic equations**		Unit 3
A f	Derive a formula, substitute numbers into a formula and change the subject of a formula	Unit 2, Unit 3	Unit 2, Unit 3
A g	Solve linear inequalities in one or two variables, and represent the solution set on a number line **or on a suitable diagram**	Unit 3	Unit 3
A h	Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them	Unit 3	Unit 3
A i	Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	Unit 2	Unit 2
A j	Use linear expressions to describe the nth term of an arithmetic sequence	Unit 2	Unit 2
A k	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information	Unit 2, Unit 3	Unit 2, Unit 3
A l	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding gradients	Unit 1, Unit 2	Unit 1, Unit 2, Unit 3
A m	**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**		Unit 1, Unit 2
A n	**Understand the gradients of parallel lines**		Unit 2

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Ref	Content descriptor	Unit	
	Algebra	**Foundation**	**Higher**
A o	**Find the intersection points of the graphs of a linear and quadratic function, knowing that these are the approximate solutions of the corresponding simultaneous equations representing the linear and quadratic functions**		Unit 3
A p	**Draw, sketch, recognise graphs of simple cubic functions, the reciprocal function** $y = \dfrac{1}{x}$ **with** $x \neq 0$**, the function** $y = k^x$ **for integer values of** x **and simple positive values of** k**, the trigonometric functions** $y = \sin x$ **and** $y = \cos x$		Unit 1, Unit 3
A q	**Construct the graphs of simple loci**		Unit 3
A r	Construct linear**, quadratic and other** functions from real-life problems and plot their corresponding graphs	Unit 2	Unit 2, Unit 3
A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	Unit 1, Unit 2, Unit 3	Unit 1, Unit 2, Unit 3
A t	Generate points and plot graphs of simple quadratic functions, and use these to find approximate solutions	Unit 3	Unit 3
A u	**Direct and inverse proportion**		Unit 3
A v	**Transformation of functions**		Unit 3

Ref	Content descriptor	Unit	
Geometry		**Foundation**	**Higher**
GM a	Recall and use properties of angles at a point, angles on a straight line (including right angles), perpendicular lines, and opposite angles at a vertex	Unit 1, Unit 2	Unit 1, Unit 2
GM b	Understand and use the angle properties of intersecting lines, triangles and quadrilaterals	Unit 2	Unit 2
GM c	Calculate and use the sums of the interior and exterior angles of polygons	Unit 3	Unit 2
GM d	Recall the properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus	Unit 2	Unit 2
GM e	Recognise reflection and rotation symmetry of 2-D shapes	Unit 2	Unit 2
GM f	Understand congruence and similarity	Unit 2, Unit 3	Unit 3
GM g	Use Pythagoras' theorem in 2-D **and 3-D**	Unit 3	Unit 3
GM h	**Use the trigonometric ratios and the sine and cosine rules to solve 2-D and 3-D problems**		Unit 3
GM i	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	Unit 2	Unit 2
GM j	**Understand and construct geometrical proofs using circle theorems**		Unit 2, Unit 3
GM k	Use 2-D representations of 3-D shapes	Unit 2, Unit 3	Unit 2
GM l	Describe and transform 2-D shapes using single or combined rotations, reflections, translations, or enlargements by a positive **then fractional or negative** scale factors and distinguish properties that are preserved under particular transformations	Unit 3	Unit 3
GM v	Use straight edge and a pair of compasses to do constructions	Unit 3	Unit 3
GM w	Construct loci	Unit 3	Unit 3
GM x	Calculate perimeters and areas of shapes made from triangles and rectangles **and other shapes**	Unit 2	Unit 2

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Ref	Content descriptor	Unit	
Geometry		**Foundation**	**Higher**
GM y	**Calculate the area of a triangle using** $\frac{1}{2}ab\sin C$		Unit 3
GM z	Find circumferences and areas of circles	Unit 3	Unit 3
GM aa	Calculate volumes of right prisms and shapes made from cubes and cuboids	Unit 2, Unit 3	Unit 2, Unit 3
GM bb	**Solve mensuration problems involving more complex shapes and solids**		Unit 3
GM cc	**Use vectors to solve problems**		Unit 3

Ref	Content descriptor	Unit	
Measures		**Foundation**	**Higher**
GM m	Use and interpret maps and scale drawings	Unit 3	Unit 3
GM n	Understand **and use** the effect of enlargement for perimeter, area and volume of shapes and solids	Unit 3	Unit 3
GM o	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements	Unit 1, Unit 2	Unit 1, Unit 2
GM p	Convert measurements from one unit to another	Unit 1, Unit 2, Unit 3	Unit 1, Unit 2, Unit 3
GM q	Make sensible estimates of a range of measures	Unit 1, Unit 2	Unit 1, Unit 2
GM r	Understand and use bearings	Unit 3	Unit 3
GM s	Understand and use compound measures	Unit 2	Unit 2, Unit 3
GM t	Measure and draw lines and angles	Unit 1, Unit 2	Unit 1, Unit 2
GM u	Draw triangles and other 2-D shapes using ruler and protractor	Unit 3	Unit 3

Ref	Content descriptor	Unit	
Statistics		**Foundation**	**Higher**
SP a	Understand and use statistical problem solving process/handling data cycle	Unit 1	Unit 1
SP b	Identify possible sources of bias	Unit 1	Unit 1
SP c	Design an experiment or survey, **including sampling**	Unit 1	Unit 1
SP d	Design data-collection sheets distinguishing between different types of data	Unit 1	Unit 1
SP e	Extract data from printed tables and lists	Unit 1	Unit 1
SP f	Design and use two-way tables for discrete and grouped data	Unit 1	Unit 1
SP g	Produce charts and diagrams for various data types	Unit 1	Unit 1
SP h	Calculate median, mean, range, **quartiles and interquartile range,** mode and modal class	Unit 1	Unit 1
SP i	Interpret a wide range of graphs and diagrams and draw conclusions	Unit 1	Unit 1
SP j	Look at data to find patterns and exceptions	Unit 1	Unit 1
SP k	Recognise correlation and draw and/or use lines of best fit by eye, understanding what these represent	Unit 1	Unit 1
SP l	Compare distributions and make inferences	Unit 1	Unit 1
SP u	Use calculators efficiently and effectively, including statistical functions	Unit 1	Unit 1

Ref	Content descriptor	Unit	
Probability		**Foundation**	**Higher**
SP m	Understand and use the vocabulary of probability and probability scale	Unit 1	Unit 1
SP n	Understand and use estimates or measures of probability from theoretical models (including equally likely outcomes), or from relative frequency	Unit 1	Unit 1
SP o	List all outcomes for single events, and for two successive events, in a systematic way and derive relative probabilities	Unit 1	Unit 1
SP p	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1	Unit 1	Unit 1
SP q	**Know when to add or multiply two probabilities: when A and B are mutually exclusive, then the probability of A or B occurring is $\mathrm{P}(A) + \mathrm{P}(B)$, whereas when A and B are independent events, the probability of A and B occurring is $\mathrm{P}(A) \times \mathrm{P}(B)$**		Unit 1
SP r	**Use tree diagrams to represent outcomes of compound events, recognising when events are independent**		Unit 1
SP s	Compare experimental data and theoretical probabilities	Unit 1	Unit 1
SP t	Understand that if they repeat an experiment, they may − and usually will − get different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	Unit 1	Unit 1

Unit 1: Statistics and Probability

Foundation

Overview

Content overview

This unit contains:

1. Statistics

- Handling data cycle
- Data collection
- Data representation
- Analysing data
- Interpreting data

2. Probability

- Probability measures
- Relative frequency and theoretical probability
- Mutually exclusive outcomes

3. Number

- Four operations
- Decimals
- Percentages
- Equivalent fractions
- Accuracy
- Use of calculators

4. Algebra

- Notation
- Graphs

5. Geometry and Measures

- Angles at a point
- Scales and units

Assessment overview

- 30% of the qualification
- One written paper
- 1 hour 15 minutes
- 60 marks
- Answer all questions
- Calculator allowed
- Grades C-G available
- Available March, June and November
- 30–40% of the paper assesses the functional elements of Mathematics

References

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

1   Statistics

What students need to learn:

Ref	Content descriptor	Concepts and skills
SP a	Understand and use statistical problem solving process/handling data cycle	• Specify the problem and plan • Decide what data to collect and what statistical analysis is needed • Collect data from a variety of suitable primary and secondary sources • Use suitable data collection techniques • Process and represent the data • Interpret and discuss the data
SP b	Identify possible sources of bias	• Understand how sources of data may be biased
SP c	Design an experiment or survey	• Identify which primary data they need to collect including grouped data • Consider fairness • Understand sample and population • Design a question for a questionnaire • Criticise questions for a questionnaire
SP d	Design data-collection sheets distinguishing between different types of data	• Design and use data-collection sheets for grouped, discrete and continuous data • Collect data using various methods • Sort, classify and tabulate data and discrete or continuous quantitative data • Group discrete and continuous data into class intervals of equal width
SP e	Extract data from printed tables and lists	• Extract data from lists and tables
SP f	Design and use two-way tables for discrete and grouped data	• Design and use two-way tables for discrete and grouped data • Use information to complete a two-way table

Ref	Content descriptor	Concepts and skills

SP g	Produce charts and diagrams for various data types	• Produce
		  – Pictograms
		  – Bar charts
		  – Pie charts
		  – Histograms with equal class intervals
		  – Frequency diagrams for grouped discrete data
		  – Scatter graphs
		  – Line graphs
		  – Frequency polygons for grouped data
		  – Ordered stem and leaf diagrams
		  – Composite bar charts
		  – Comparative and dual bar charts

SP h	Calculate median, mean, range, mode and modal class	• Calculate:
		  – mean
		  – mode
		  – median
		  – range
		  – modal class
		  – interval containing the median
		• Estimate the mean of grouped data using the mid-interval value
		• Find the median for large data sets with grouped data
		• Estimate the mean for large data sets with grouped data
		• Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values
		
		(NB: Quartiles and interquartile range are Higher Tier only)

Ref	Content descriptor	Concepts and skills
SP i	Interpret a wide range of graphs and diagrams and draw conclusions	• Interpret: – composite bar charts – comparative and dual bar charts – pie charts – stem and leaf diagrams – scatter graphs – frequency polygons • Recognise simple patterns, characteristics and relationships in bar charts, line graphs and frequency polygons • From pictograms, bar charts, line graphs, frequency polygons and frequency diagrams – read off frequency values – calculate total population – find greatest and least values • From pie charts – find the total frequency – find the size of each category • Find range, mode, median and greatest and least values from stem and leaf diagrams
SP j	Look at data to find patterns and exceptions	• Present findings from databases, tables and charts • Look at data to find patterns and exceptions
SP k	Recognise correlation and draw and/or use lines of best fit by eye, understanding what these represent	• Draw lines of best fit by eye, understanding what these represent • Distinguish between positive, negative and zero correlation using lines of best fit • Understand that correlation does not imply causality • Use a line of best fit to predict values of a variable given the values of another variable

Ref	Content descriptor	Concepts and skills
SP l	Compare distributions and make inferences	• Compare the mean and range of two distributions • Understand that the frequency represented by corresponding sectors in two pie charts is dependent on the total populations represented by each of the pie charts • Use dual or comparative bar charts to compare distributions • Recognise the advantages and disadvantages between measures of average
SP u	Use calculators efficiently and effectively, including statistical functions	• Calculate the mean of a small data set, using the appropriate key on a scientific calculator

2   Probability

What students need to learn:

Ref	Content descriptor	Concepts and skills
SP m	Understand and use the vocabulary of probability and probability scale	• Distinguish between events which are; impossible, unlikely, equal chance, likely, and certain to occur • Mark events and/or probabilities on a probability scale of 0 to 1 • Write probabilities in words or fractions, decimals and percentages
SP n	Understand and use estimates or measures of probability from theoretical models (including equally likely outcomes), or from relative frequency	• Find the probability of an event happening using theoretical probability • Find the probability of an event happening using relative frequency • Estimate the number of times an event will occur, given the probability and the number of trials • Use theoretical models to include outcomes using dice, spinners, coins
SP o	List all outcomes for single events, and for two successive events, in a systematic way and derive relative probabilities	• List all outcomes for single events systematically • List all outcomes for two successive events systematically • Use and draw sample space diagrams
SP p	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1	• Add simple probabilities • Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1 • 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
SP s	Compare experimental data and theoretical probabilities	• Compare experimental data and theoretical probabilities
SP t	Understand that if they repeat an experiment, they may — and usually will — get different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	• Compare relative frequencies from samples of different sizes

3   Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, negative numbers, integers and decimals • Add and subtract mentally numbers with up to two decimal places • Recall all multiplication facts to 10×10, and use them to derive quickly the corresponding division facts • Multiply and divide any number by powers of 10 • Multiply or divide by any number between 0 and 1 • Solve a problem involving division by a decimal (up to two decimal places)
N h	Understand equivalent fractions, simplifying a fraction by cancelling all common factors	• Find equivalent fractions • Write a fraction in its simplest form • Compare fractions
N j	Use decimal notation and recognise that each terminating decimal is a fraction	• Understand place value • Convert between fractions and decimals using a calculator
N l	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Order fractions, decimals and percentages • Convert between fractions, decimals and percentages
N m	Use percentage	• Use percentage to solve problems • Simple interest
N o	Interpret fractions, decimals and percentages as operators	• Find a fraction of a quantity • Find a percentage of a quantity • Use decimals to find quantities • Use a multiplier to increase or decrease

Ref	Content descriptor	Concepts and skills
N p	Use ratio notation, including reduction to its simplest form and its various links to fraction notation	• Use ratios • Write ratios in their simplest form
N q	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 • Solve word problems
N t	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem in context
N u	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 a given number of significant figures • Round to a given number of decimal places • Estimate answers to calculations, including use of rounding
N v	Use calculators effectively and efficiently	• Know how to enter complex calculations • Enter a range of calculations including those involving time and money • Understand and interpret the calculator display, knowing when the display has been rounded by the calculator, and know not to round during the intermediate steps of a calculation • Use a range of calculator functions including $+, -, \times, \div, x^2, \sqrt{x}$, memory, $x^y, x^{1/y}$ and brackets

4   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
A b	Distinguish in meaning between the words 'equation', 'formula' and 'expression'	• Write an expression • Select an expression/equation/formula from a list
A l	Recognise and plot equations that correspond to straight line graphs in the coordinate plane, including finding gradients	• Recognise that equations in the form $y = mx + c$ corresponds to straight line graphs in the coordinate plane • Find the gradient of a straight line from a graph

A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Interpret straight-line graphs for real-life situations
		  – Ready reckoner graphs
		  – Conversion graphs
		  – Fuel bills
		  – Fixed charge (standing charge) and cost per unit

5 Geometry and Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM a	Recall and use properties of angles at a point	• Recall and use properties of angles at a point
GM o	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements	• Interpret scales on a range of measuring instruments – seconds, minutes, hours, days, weeks, months and years • Use correct notation for time, 12- and 24-hour clock • Work out time intervals • Recognise the inaccuracy of measurements • Know that measurements using real numbers depend on the choice of unit • Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction
GM p	Convert measurements from one unit to another	• Convert between metric units
GM q	Make sensible estimates of a range of measures	• Make sensible estimates of a range of measures in everyday settings • Choose appropriate units for estimating or carrying out measurements
GM t	Measure and draw lines and angles	• Measure and draw lines to the nearest mm • Measure and draw angles to the nearest degree

Specification Edexcel GCSE
in Mathematics B

Unit 2: Number, Algebra, Geometry 1

Foundation

Overview

Content overview

This unit contains:

1. Number

- The four operations
- Factors and multiples
- Squares, cubes and roots
- Index laws
- Fractions, decimals and percentages
- Inverse operations
- Recurring decimals
- Finding percentages
- Ratio
- Accuracy

2. Algebra

- Expressions
- Factorising
- Sequences
- Formulae
- Coordinates in 2-D
- Straight line graphs
- Real-life graphs

3. Geometry

- Angles and triangles
- Symmetry
- Parallel lines
- Quadrilaterals
- Perimeter and area
- 3-D shapes
- Area and volume
- Parts of a circle

4. Measures

- Scales and units

- Compound measures

Assessment overview

- 30% of the qualification

- One written paper

- 1 hour 15 minutes

- 60 marks

- Answer all questions

- Non-calculator

- Grades G-C available

- Available March, June and November

- 30-40% of the paper assesses the functional elements of Mathematics

References

Each topic in this unit contains a specification reference (for example, **SP a** for Statement a, Statistics and Probability), 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
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, integers, fractions and decimals • Derive and use positive integer complements to 100 • Add and subtract mentally numbers with up to two decimal places • Recall all multiplication facts to 10×10, and use them to derive quickly the corresponding division facts • Multiply and divide any number by powers of 10 • Multiply or divide by any number between 0 and 1 • Solve a problem involving division by a decimal (up to two decimal places) • Add, subtract, multiply and divide negative numbers • Write numbers in words • Write numbers from words
N b	Order rational numbers	• Order integers, decimals and fractions • Understand and use positive numbers and negative integers, both as positions and translations on a number line
N c	Use the concepts and vocabulary of factor (divisor), multiple, common factor, Highest Common Factor (HCF), Least Common Multiple (LCM), prime number and prime factor decomposition	• Recognise even and odd numbers • Identify factors, multiples and prime numbers from a list of numbers • Find the prime factor decomposition of positive integers • Find common factors and common multiples of two numbers • Find the Lowest common multiple (LCM) and Highest common factor (HCF) of two numbers

Ref	Content descriptor	Concepts and skills
N d	Use the terms square, positive and negative square root, cube and cube root	• Recall integer squares from 2×2 up to 15×15 and the corresponding square roots • Recall the cubes of 2, 3, 4, 5 and 10 • Find squares and cubes • Find square roots and cube roots
N e	Use index notation for squares, cubes and powers of 10	• Use index notation for squares and cubes • Use index notation for powers of 10 • Find the value of calculations using indices
N f	Use index laws for multiplication and division of integer powers	• Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, and of powers of a power (NB: Fractional, zero and negative powers are only assessed on Higher Tier)
N h	Understand equivalent fractions, simplifying a fraction by cancelling all common factors	• Find equivalent fractions • Write a fraction in its simplest form • Convert between mixed numbers and improper fractions • Compare fractions
N i	Add and subtract fractions	• Add and subtract fractions
N j	Use decimal notation and recognise that each terminating decimal is a fraction	• Understand place value • Identify the value of digits in a decimals • Write terminating decimals as fractions • Recall the fraction-to-decimal conversion of familiar simple fractions • Convert between fractions and decimals
N k	Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals	• Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals • Convert between recurring decimals and fractions
N l	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Order fractions, decimals and percentages • Convert between fractions, decimals and percentages

Ref	Content descriptor	Concepts and skills
N o	Interpret fractions, decimals and percentages as operators	• Calculate a fraction of a given quantity • Find a percentage of a quantity • Use decimals to find quantities • Use a multiplier to increase or decrease
N p	Use ratio notation, including reduction to its simplest form and its various links to fraction notation	• Use ratios • Write ratios in their simplest form
N q	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 • Solve word problems
N t	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem in context
N u	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 a given number of significant figures • Round to a given number of decimal places • Estimate answers to calculations, including use of rounding

2   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
A b	Distinguish in meaning between the words 'equation', 'formula' and 'expression'	• Write an expression • Select an expression/equation/formula from a list
A c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors	• Manipulate algebraic expressions by collecting like terms • Multiply a single algebraic term over a bracket • Write expressions to solve problems • Write expressions using squares and cubes • Factorise algebraic expressions by taking out common factors • Use simple instances of index laws (NB: Multiplying two linear expressions, factorising quadratic expressions including the difference of two squares and simplifying rational expressions are assessed at Higher Tier only)
A f	Derive a formula, substitute numbers into a formula	• Derive a simple formula, including those with squares, cubes and roots • Use formulae from mathematics and other subjects expressed initially in words and then using letters and symbols • Substitute numbers into a linear formula or simple formulae using indices • Substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$
A i	Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	• 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 of a sequence in words • Find a specific term in the sequence using position-to-term or term-to-term rules • Identify which terms cannot be in a sequence

Ref	Content descriptor	Concepts and skills
A j	Use linear expressions to describe the nth term of an arithmetic sequence	• Find the nth term of an arithmetic sequence • Use the nth term of an arithmetic sequence
A k	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information	• Use axes and coordinates to specify points in all four quadrants • Identify points with given coordinates • Identify coordinates of given points (NB: Points may be in the first quadrant or all four quadrants) • Find the coordinates of points identified by geometrical information in 2-D • Find the coordinates of the midpoint of a line segment
A l	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding gradients	• Draw, label and scale axes • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane • Plot and draw graphs of functions • Plot and draw graphs of straight lines of the form $y = mx + c$ • Find the gradient of a straight line from a graph
A r	Construct linear functions from real-life problems and plot their corresponding graphs	• Draw straight line graphs for real-life situations – Ready reckoner graphs – Conversion graphs – Fuel bills – Fixed charge (standing charge) and cost per unit • Draw distance-time graphs (NB: Quadratic functions from real-life situations are assessed at Higher Tier only)

Ref	Content descriptor	Concepts and skills
A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Interpret straight-line graphs for real-life situations – Ready reckoner graphs – Conversion graphs – Fuel bills – Fixed charge (standing charge) and cost per unit • Interpret distance-time graphs

3   Geometry

What students need to learn:

Ref	Content descriptor	Concepts and skills

GM a	Recall and use properties of angles at a point, angles on a straight line (including right angles), perpendicular lines, and opposite angles at a vertex	• Recall and use properties of:
		  – angles at a point
		  – angles at a point on a straight line, including right angles
		  – perpendicular lines
		  – vertically opposite angles
		• Find the size of the missing angles at a point or at a point on a straight line
		• Distinguish between acute, obtuse, reflex and right angles
		• Name angles
		• Estimate sizes of angles
		• Give reasons for calculations
		• Use two letter notation for a line and three letter notation for an angle
		• Mark perpendicular lines on a diagram
		• Identify a line perpendicular to a given line
		• Use geometric language appropriately
		• Use letters to identify points, lines and angles

Ref	Content descriptor	Concepts and skills
GM 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 • Use the fact that angle sum of a quadrilateral is 360° • Understand the proof that the angle sum of a triangle is 180° • Find a missing angle in a triangle, using 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 • Distinguish between scalene, equilateral, isosceles and right-angled triangles • Understand and use the angle properties of triangles • Understand and use the angle properties of intersecting lines • Use the side/angle properties of isosceles and equilateral triangles
GM d	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 quadrilaterals, including symmetry properties • List the properties of each, or identify (name) a given shape • Draw sketches of shapes • Name all quadrilaterals that have a specific property • Identify quadrilaterals from everyday usage • Classify quadrilaterals by their geometric properties

Ref	Content descriptor	Concepts and skills
GM e	Recognise reflection and rotation symmetry of 2-D shapes	• Recognise reflection symmetry of 2-D shapes • Identify and draw lines of symmetry on a shape • Recognise rotation symmetry of 2-D shapes • Identify the order of rotational symmetry of a 2-D shape • Draw or complete diagrams with a given number of lines of symmetry • State the line symmetry as a simple algebraic equation • Draw or complete diagrams with a given order of rotational symmetry
GM f	Understand congruence and similarity	• Understand similarity • Recognise that all corresponding angles are equal in size when the lengths of the sides are not
GM i	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	• Recall the definition of a circle and identify (name) and draw these parts of a circle • Understand related terms of a circle • Draw a circle given the radius or diameter
GM k	Use 2-D representations of 3-D shapes	• Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone • Know the terms face, edge and vertex • Use 2-D representations of 3-D shapes • Use isometric grids

Ref	Content descriptor	Concepts and skills
GM x	Calculate perimeters and areas of shapes made from triangles and rectangles	• Measure shapes to find perimeters and areas • Find the perimeter of rectangles and triangles • Find the perimeter of compound shapes • Find the area of a rectangle and triangle • Calculate areas of compound shapes • Find the area of a trapezium • Find the area of a parallelogram • Find surface area using rectangles and triangles • Find the surface area of a prism
GM aa	Calculate volumes of right prisms and shapes made from cubes and cuboids	• Find the volume of prisms, including a triangular prism, cube and cuboid • Recall and use the formula for the volume of a cuboid

4   Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills

GM o	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements	• Indicate given values on a scale
		
		• Interpret scales on a range of measuring instruments
		
		  – seconds, minutes, hours, days, weeks, months and years
		
		  – mm, cm, m, km, ml, cl, l, mg, g, kg, tonnes, °C
		
		• Use correct notation for time, 12- and 24-hour clock
		
		• Work out time intervals
		
		• Know that measurements using real numbers depend on the choice of unit
		
		• Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction

GM p	Convert measurements from one unit to another	• Convert between units of measure within one system • Convert metric units to metric units (Metric equivalents should be known) • Convert imperial units to imperial units (NB: Conversion between imperial units will be given) • Know rough metric equivalents of pounds, feet, miles, pints and gallons

Metric	Imperial
1 kg	2.2 pounds
1 l	$1\frac{3}{4}$ pints
4.5 l	1 gallon
8 km	5 miles
30 cm	1 foot

• Convert between metric and imperial measures

• Estimate conversions

• Convert between speed measures, using metric units

Ref	Content descriptor	Concepts and skills
GM q	Make sensible estimates of a range of measures	• Make sensible estimates of a range of measures in everyday settings • Choose appropriate units for estimating or carrying out measurement
GM s	Understand and use compound measures	• Understand and use compound measures, including speed (NB: Density is Higher Tier only)
GM t	Measure and draw lines and angles	• Measure and draw lines to the nearest mm • Measure and draw angles to the nearest degree

Unit 3: Number, Algebra, Geometry 2

Foundation

Overview

Content overview

This unit contains:

1. Number
- Using percentages
- Reciprocals
- Using calculators

2. Algebra
- Equations
- Changing the subject of a formula
- Inequalities
- Trial and improvement
- Coordinates
- Straight line graphs
- Quadratic graphs

3. Geometry
- Polygons
- Pythagoras' theorem
- Congruence and similarity
- Transformations
- Constructions
- Drawing 3-D shapes
- Loci
- Circles and mensuration
- Prisms

4. Measures
- Bearings
- Scale drawings

Assessment overview

- 40% of the qualification
- One written paper
- 1 hour 30 minutes
- 80 marks
- Answer all questions
- Calculator allowed
- Grades C-G available
- Available in March, June and November
- 30-40% of the paper assesses the Functional elements of Mathematics

References

Each topic in this unit contains a specification reference (for example, **SP a** for Statement a, Statistics and Probability), 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
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, integers, negative numbers, fractions, decimals and numbers in index form • Recall the fraction-to-decimal conversion of familiar simple fractions
N m	Use percentage	• Find a percentage of a quantity in order to increase or decrease • Use percentages in real-life situations – VAT – Value of profit or loss – Simple Interest – Income tax calculations – Annual rate of inflation (NB: Repeated proportional change is only assessed at Higher Tier)
N o	Interpret fractions, decimals and percentages as operators	• Express a given number as a fraction of another • Express a given number as a percentage of another number • Interpret percentage as an operator • Understand the multiplicative nature of percentages as operators • Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used
N q	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

Ref	Content descriptor	Concepts and skills
N v	Use calculators effectively and efficiently	• Use a calculator effectively and efficiently by entering a range of calculations including those involving time and money • Know how to enter complex calculations and use function keys, including $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, x^y, $x^{1/y}$ and brackets

2   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors	• Use algebraic manipulation to solve problems (NB: Multiplying two linear expressions, factorising quadratic expressions including the difference of two squares and simplifying rational expressions are assessed at Higher Tier only)
A d	Set up and solve simple equations	• 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 contain 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 and fractional coefficients (NB: Simultaneous equations in two unknowns is assessed at Higher Tier only)
A f	Substitute numbers into a formula and change the subject of a formula	• Substitute numbers into a formula • Change the subject of a formula (Having the new subject on both sides of the original formula is Higher Tier only) (NB: Rearranging of formula using square roots or squares is Higher Tier only)

Ref	Content descriptor	Concepts and skills
A g	Solve linear inequalities in one variable, and represent the solution set on a number line	• Solve simple linear inequalities in one variable, and represent the solution set on a number line • Use the correct notation to show inclusive and exclusive inequalities (NB: Linear inequalities in two variables with suitable diagrammatic representation is assessed at Higher Tier only)
A h	Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them	• Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them
A k	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information	• Calculate the length of a line segment
A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Plot a linear graph • Interpret information presented in a range of linear and non-linear graphs
A t	Generate points and plot graphs of simple quadratic functions, and use these to find approximate solutions	• 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

3   Geometry

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM c	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 sum of angles in 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 360º • Use the sum of the interior angle and the exterior angle is 180º • Use tessellations of regular and irregular polygons • Tessellate combinations of polygons • Explain why some shapes tessellate and why other shapes do not
GM f	Understand congruence and similarity	• Understand congruence • Identify shapes which are congruent • Understand similarity • Identify shapes which are similar; including all circles or all regular polygons with equal number of sides
GM g	Use Pythagoras' theorem in 2-D	• Understand, recall and use Pythagoras' theorem in 2-D
GM k	Use 2-D representations of 3-D shapes	• Use 2-D representations of 3-D shapes • Draw nets and show how they fold to make a 3-D solid • Understand and draw front and side elevations and plans of shapes made from simple solids • Given the front and side elevations and the plan of a solid, draw a sketch of the 3-D solid

Ref	Content descriptor	Concepts and skills
GM l	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 line of reflection • Describe and transform 2-D shapes using single 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 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) • Draw an enlargement • Enlarge a shape using (0, 0) as the centre of enlargement • Enlarge shapes with a centre other than (0, 0) • Find the centre of enlargement • Describe and transform 2-D shapes using combined rotations, reflections, translations, or enlargements • 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

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Ref	Content descriptor	Concepts and skills
GM l	(*Continued*)	• Understand that distances and angles are preserved under rotations, reflections and translations, so that any figure is congruent under any of these transformations
GM v	Use straight edge and a pair of compasses to do constructions	• Use straight edge and a pair of compasses to complete standard constructions
		• Construct a triangle
		• Construct an equilateral triangle
		• Understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not
		• Construct the perpendicular bisector of a given line
		• Construct the perpendicular from a point to a line
		• Construct the perpendicular from a point on a line
		• Construct the bisector of a given angle
		• Construct angles of 60°, 90°, 30°, 45°
		• Draw parallel lines
		• Draw circles and arcs to a given radius
		• Construct a regular hexagon inside a circle
		• Construct diagrams of everyday 2-D situations involving rectangles, triangles, perpendicular and parallel lines
		• Draw and construct diagrams from given instructions

Ref	Content descriptor	Concepts and skills
GM w	Construct loci	• Construct: – a region bounded by a circle and an intersecting line – a given distance from a point and a given distance from a line – equal distances from two points or two line segments – regions which may be defined by 'nearer to' or 'greater than' • Find and describe regions satisfying a combination of loci (NB: All loci restricted to two dimensions only)
GM z	Find circumferences and areas of 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 semicircles and quarter circles • Find the surface area of a cylinder
GM aa	Calculate volumes of right prisms and shapes made from cubes and cuboids	• Find the volume of a cylinder • Use volume to solve problems

 Specification Edexcel GCSE
in Mathematics B

4 Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM m	Use and interpret maps and scale drawings	• Use and interpret maps and scale drawings • Read and construct scale drawings • Draw lines and shapes to scale • Estimate lengths using a scale diagram
GM n	Understand the effect of enlargement for perimeter, area and volume of shapes and solids	• Understand the effect of enlargement on 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
GM p	Convert measurements from one unit to another	• Convert between measures in the same system • Convert between area measures, using metric units • Convert between volume measures, using metric units • Convert between metric units of volume and units of capacity eg 1ml = 1 cm³
GM r	Understand and use bearings	• Use three figure-bearings to specify direction • Mark on a diagram the position of point B given its bearing from point A • Draw or measure a bearing between the points on a map or scaled plan • Given the bearing of a point A from point B, work out the bearing of B from A
GM u	Draw triangles and other 2D shapes using ruler and protractor	• Make accurate drawing of triangles and other 2-D shapes using a ruler and a protractor • Make an accurate scale drawing from a diagram • Use accurate drawing to solve bearings problems

Unit 1: Statistics and Probability

Higher

Overview

Content overview

This unit contains:

1. Statistics
- Handling data cycle
- Data collection
- Data Representation
- Analysing data
- Interpreting data
- **Sampling**
- **Box plots, histograms and cumulative frequency**

2. Probability
- Probability measures
- Relative probability
- Mutually exclusive outcomes
- **Mutually exclusive and independent events**
- **Tree diagrams**
- **Addition and multiplication of probabilities**

3. Number
- Four operations
- Decimals
- Percentages
- Equivalent fractions
- **Compound interest**
- Accuracy
- Use of calculators

4. Algebra
- Notation
- Graphs
- **Graphs of functions**

5. Geometry and Measures

- Angles at a point
- Scales and units

Assessment overview

- 30% of the qualification
- One written paper
- 1 hour 15 minutes
- 60 marks
- Answer all questions
- Calculator allowed
- Grades A*-D available (E allowed)
- Available in March, June and November
- 20-30% of the paper assesses the functional elements of Mathematics

References

Each topic in this unit contains a specification reference (for example, **SP a** for Statement a, Statistics and Probability), 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 for that content descriptor.

1   Statistics

What students need to learn:

Ref	Content descriptor	Concepts and skills
SP a	Understand and use statistical problem solving process/handling data cycle	• Specify the problem and plan • Decide what data to collect and what statistical analysis is needed • Collect data from a variety of suitable primary and secondary sources • Use suitable data collection techniques • Process and represent the data • Interpret and discuss the data
SP b	Identify possible sources of bias	• **Discuss how data relate to a problem, identify possible sources of bias and plan to minimise it** • **Understand how different sample sizes may affect the reliability of conclusions drawn**
SP c	Design an experiment or survey	• Identify which primary data they need to collect including grouped data • Consider fairness • Understand sample and population • Design a question for a questionnaire • Criticise questions for a questionnaire • **Design an experiment or survey** • **Select and justify a sampling scheme and a method to investigate a population, including random and stratified sampling** • **Use stratified sampling**
SP d	Design data-collection sheets distinguishing between different types of data	• Design and use data-collection sheets for grouped, discrete and continuous data • Collect data using various methods • Sort, classify and tabulate data and discrete or continuous quantitative data • Group discrete and continuous data into class intervals of equal width
SP e	Extract data from printed tables and lists	• Extract data from lists and tables

Ref	Content descriptor	Concepts and skills
SP f	Design and use two-way tables for discrete and grouped data	• Design and use two-way tables for discrete and grouped data • Use information provided to complete a two-way table
SP g	Produce charts and diagrams for various data types	• Produce: – Composite bar charts – Comparative and dual bar charts – Pie charts – Frequency polygons – Histograms with equal class intervals – Frequency diagrams for grouped discrete data – Scatter graphs – Line graphs – Frequency polygons for grouped data – **Grouped frequency tables for continuous data** – Ordered stem and leaf diagrams – **Cumulative frequency tables** – **Cumulative frequency graphs** – **Box plots from raw data and when given quartiles, median** – **Histograms from class intervals with unequal width** • **Use and understand frequency density**

Ref	Content descriptor	Concepts and skills

SP h	Calculate median, mean, range, **quartiles and interquartile range**, mode and modal class	• Calculate:
		   – mean,
		   – mode,
		   – median,
		   – range,
		   – modal class,
		   – interval containing the median
		
		• Estimate the mean of grouped data using the mid-interval value
		
		• Find the median, **quartiles and interquartile range** for large data sets with grouped data
		
		• Estimate the mean for large data sets with grouped data
		
		• Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values
		
		• **Use cumulative frequency graphs to find median, quartiles and interquartile range**
		
		• **Interpret box plots to find median, quartiles, range and interquartile range**

Ref	Content descriptor	Concepts and skills

SP i	Interpret a wide range of graphs and diagrams and draw conclusions	• Interpret:
		  – composite bar charts
		  – comparative and dual bar charts
		  – pie charts
		  – stem and leaf diagrams
		  – scatter graphs
		  – frequency polygons
		  – **box plots**
		  – **cumulative frequency diagrams**
		  – **histograms**
		• Recognise simple patterns, characteristics and relationships in line graphs and frequency polygons
		• **Find the median from a histogram or any other information from a histogram, such as the number of people in a given interval**
		• From line graphs, frequency polygons and frequency diagrams
		  – read off frequency values
		  – calculate total population
		  – find greatest and least values
		• From pie charts:
		  – find the total frequency
		  – find the size of each section
		• Find the median, mode, range and **interquartile range, as well as the greatest and least values from stem and leaf diagrams**
		• **From cumulative frequency graphs:**
		  – **estimate frequency greater/less than a given value**
		  – **find the median and quartile values and interquartile range**
		• **From histograms:**
		  – **complete a grouped frequency table**
		  – **define the frequency density**
		(NB: No pictograms or bar charts at Higher Tier)

Ref	Content descriptor	Concepts and skills
SP j	Look at data to find patterns and exceptions	• Present findings from databases, tables and charts • Look at data to find patterns and exceptions • **Explain an isolated point on a scatter graph**
SP k	Recognise correlation and draw and/or use lines of best fit by eye, understanding what these represent	• Draw lines of best fit by eye, understanding what these represent • Distinguish between positive, negative and zero correlation using lines of best fit • Understand that correlation does not imply causality • Use a line of best fit, **or otherwise,** to predict values of a variable given values of the other variable • **Appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply 'no relationship' but merely 'no linear relationship'**
SP l	Compare distributions and make inferences	• **Compare distributions and make inferences, using the shapes of distributions and measures of average and spread, including median and quartiles** • Compare the mean and range of two distributions, **or median and interquartile range**, as appropriate • Understand that the frequency represented by corresponding sectors in two pie charts is dependent upon the total populations represented by each of the pie charts • Use dual or comparative bar charts to compare distributions • Recognise the advantages and disadvantages between measures of average • **Compare the measures of spread between a pair of box plots/cumulative frequency graphs**
SP u	Use calculators efficiently and effectively, including statistical functions	• Calculate the mean of a small data set, using the appropriate key on a scientific calculator • $\sum x$ **and** $\sum fx$ **or the calculation of the line of best fit**

2   Probability

What students need to learn:

Ref	Content descriptor	Concepts and skills
SP m	Understand and use the vocabulary of probability and 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 in words or fractions, decimals and percentages
SP n	Understand and use estimates or measures of probability from theoretical models (including equally likely outcomes), or from relative frequency	• Understand and use estimates or measures of probability, including relative frequency • Use theoretical models to include outcomes using dice, spinners, coins • Find 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
SP o	List all outcomes for single events, and for two successive events, in a systematic way and derive relative probabilities	• List all outcomes for single events, and for two successive events, systematically • Use and draw sample space diagrams
SP p	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1	• Add simple probabilities • Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1 • 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
SP q	**Know when to add or multiply two probabilities: when A and B are mutually exclusive, then the probability of A or B occurring is $\mathrm{P}(A) + \mathrm{P}(B)$, whereas when A and B are independent events, the probability of A and B occurring is $\mathrm{P}(A) \times \mathrm{P}(B)$**	• **Use conditional probabilities** • **Understand selection with or without replacement**

Ref	Content descriptor	Concepts and skills
SP r	**Use tree diagrams to represent outcomes of compound events, recognising when events are independent**	• **Draw a probability tree diagram based on given information (no more than 3 branches per event)** • **Use a tree diagram to calculate conditional probability**
SP s	Compare experimental data and theoretical probabilities	• Compare experimental data and theoretical probabilities
SP t	Understand that if they repeat an experiment, they may – and usually will – get different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics	• Compare relative frequencies from samples of different sizes

3   Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, negative numbers, integers, fractions and decimals • Multiply and divide by any number between 0 and 1 • Multiply and divide fractions
N h	Understand equivalent fractions, simplifying a fraction by cancelling all common factors	• Find equivalent fractions • Write a fraction in its simplest form • Compare fractions
N j	Use decimal notation and recognise that each terminating decimal is a fraction	• Convert between fractions and decimals
N l	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Convert between fractions, decimals and percentages
N m	Use percentage, **repeated proportional change**	• Use percentages to solve problems – **Compound interest** – **Depreciation**
N o	Interpret fractions, decimals and percentages as operators	• Find a fraction of a quantity • Find a percentage of a quantity • Use decimals to find quantities • Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used
N p	Use ratio notation, including reduction to its simplest form and its various links to fraction notation	• Use ratios • Write ratios in their simplest form
N q	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 • Solve word problems

Ref	Content descriptor	Concepts and skills
N t	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem in a context
N u	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 a given number of significant figures • Round to a given number of decimal places • Estimate answers to calculations, including use of rounding
N v	Use calculators effectively and efficiently	• Enter a range of calculations, including those involving time and money • Know how to enter complex calculations • Understand and interpret the calculator display • Understand that premature rounding can cause problems when undertaking calculations with more than one step • Use calculator functions including $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, x^y, $x^{1/y}$ and brackets

4   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
A b	Distinguish in meaning between the words 'equation', 'formula', **'identity'** and 'expression'	• Write an expression • Select an expression/**identity**/equation/ formula from a list
A l	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding gradients	• Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane • Find the gradient of a straight line from a graph • **Analyse problems and use gradients to see how one variable changes in relation to another**
A m	**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**	• **Interpret and analyse a straight line graph**
A p	**Recognise graphs of simple functions, including cubic, reciprocal and exponential curves**	• **Recognise a range of mathematical functions for lines of best fit and curves of best fit**

A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Interpret straight line graphs for real-life situations
		  – ready reckoner graphs
		  – conversion graphs
		  – fuel bills
		  – fixed charge (standing charge) and cost per unit

5 Geometry and Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM a	Recall and use properties of angles at a point	• Recall and use properties of angles at a point
GM o	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements	• Interpret scales on a range of measuring instruments – seconds, minutes, hours, days, weeks, months and years • Use correct notation for time, 12- and 24-hour clock • Work out time intervals • Recognise the inaccuracy of measurements • Know that measurements using real numbers depend on the choice of unit • Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction
GM p	Convert measurements from one unit to another	• Convert metric units to metric units
GM q	Make sensible estimates of a range of measures	• Make sensible estimates of a range of measures in everyday settings • Choose appropriate units for estimating or carrying out estimates
GM t	Measure and draw lines and angles	• Measure and draw lines to the nearest mm • Measure and draw angles, to the nearest degree

Specification

Unit 2: Number, Algebra, Geometry 1

Higher

Overview

Content overview

This unit contains:

1. Number

- The four operations
- Factors and multiples
- Cubes, roots and squares
- Index Laws
- **Standard form**
- **Surds**
- Fractions, decimals and percentages
- Inverse operations
- Accuracy
- Recurring decimals
- Finding percentages
- Ratio

2. Algebra

- Expressions
- Factorising
- Formulae
- **Rational expressions**
- Sequences
- Coordinates in 2-D **and 3-D**
- Straight line graphs
- **Gradients of lines**
- Real life graphs

3. Geometry

- Angles and triangles
- Quadrilaterals
- Symmetry
- Polygons
- Parts of a circle
- Perimeter and area
- **Circle theorems**
- 3-D shapes
- Volume

4. Measures

- Scales and measures
- Compound measures

Assessment overview

- 30% of the qualification
- One written paper
- 1 hour 15 minutes
- 60 marks
- Answer all questions
- Non-Calculator
- Grades A*-D available (E allowed)
- Available March, June and November
- 20-30% of the paper assesses the functional elements of Mathematics

References

Each topic in this unit contains a specification reference (for example, **SP a** for Statement a, Statistics and Probability), 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 for that content descriptor.

1   Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, negative numbers, integers, fractions and decimals • Multiply and divide by any number between 0 and 1
N b	Order rational numbers	• Order integers, decimals and fractions • Understand and use positive numbers and negative integers, both as positions and translations on a number line
N c	Use the concepts and vocabulary of factor (divisor), multiple, common factor, 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 numbers • Find the Highest Common Factor (HCF) and the Lowest Common Multiple (LCM) of two numbers
N d	Use the terms square, positive and negative square root, cube and cube root	• Recall integer squares from 2×2 to 15×15 and the corresponding square roots • Recall the cubes of 2, 3, 4, 5 and 10
N e	Use index notation for squares, cubes and powers of 10	• Use index notation for squares and cubes • Use index notation for integer powers of 10 • Find the value of calculations which include indices

Ref	Content descriptor	Concepts and skills
N f	Use index laws for multiplication and division of integer, **fractional and negative** powers	• Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer, **fractional and negative** powers, and powers of a power • **Recall that $n^0 = 1$ and $n^{-1} = \dfrac{1}{n}$ 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**
N g	**Interpret, order and calculate with numbers written in standard index form**	• **Use standard form, expressed in conventional notation** • **Be able to write very large and very small numbers presented in a context in standard form**
N h	Understand equivalent fractions, simplifying a fraction by cancelling all common factors	• Find equivalent fractions • Write a fraction in its simplest form • Convert between mixed numbers and improper fractions
N i	Add and subtract fractions	• Add and subtract fractions
N j	Use decimal notation and recognise that each terminating decimal is a fraction	• Recall the fraction-to-decimal conversion of familiar simple fractions • Convert between fractions and decimals
N k	Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals	• Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals • Convert between recurring decimals and fractions
N l	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions	• Convert between fractions, decimals and percentages
N o	Interpret fractions, decimals and percentages as operators	• Find a fraction of a quantity • Find percentages of quantities • Use decimals to find quantities • Use a multiplier to increase or decrease
N p	Use ratio notation, including reduction to its simplest form and its various links to fraction notation	• Use ratios • Write ratios in their simplest form

Ref	Content descriptor	Concepts and skills
N q	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 • Solve word problems
N r	**Use surds and π in exact calculations**	• **Use surds and π in exact calculations, without a calculator** • **Give an answer to a question involving the area of a circle as 25π** • **Give an answer to use of Pythagoras' theorem as $\sqrt{13}$** • **Write $(3 - \sqrt{3})^2$ in the form $a + b\sqrt{3}$** • **Rationalise a denominator**
N t	Divide a quantity in a given ratio	• Divide a quantity in a given ratio • Solve a ratio problem in a context
N u	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 a given number of significant figures • Round to a given number of decimal places • Estimate answers to calculations, including using rounding

2   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A a	Distinguish the different roles played by letter symbols in algebra, using the correct notation	• Use notation and symbols correctly
A b	Distinguish in meaning between the words 'equation', 'formula', **'identity'** and 'expression'	• Write an expression • Select an expression/**identity**/equation/ formula from a list
A c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors, **multiplying two linear expressions, factorise quadratic expressions**	• Manipulate algebraic expressions by collecting like terms • Multiply a single term over a bracket • Use instances of index laws, including use of **fractional, zero and negative** powers, and powers raised to a power • Factorise algebraic expressions by taking out common factors • Write expressions to solve problems • **Expand the product of two linear expressions** • **Factorise quadratic expressions** • **Factorise quadratic expressions using the difference of two squares** • **Simplify rational expressions by cancelling, adding, subtracting, and multiplying**
A f	Derive a formula, substitute numbers into a formula	• Derive a formula • Use formulae from mathematics and other subjects • Substitute numbers into a formula • Substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$
A i	Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	• Recognise sequences of odd and even numbers • Generate simple sequences of numbers, squared integers and sequences derived from diagrams • Describe the term-to-term definition of a sequence in words • Find a specific term in a sequence using the position-to-term and term-to-term rules • Identify which terms cannot be in a sequence

Ref	Content descriptor	Concepts and skills
A j	Use linear expressions to describe the nth term of an arithmetic sequence	• Find the nth term of an arithmetic sequence • Use the nth term of an arithmetic sequence
A k	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information	• 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 (NB: Points may be in the first quadrant or all four quadrants) • Find the coordinates of points identified by geometrical information in 2-D **and in 3-D** • Find the coordinates of the midpoint of a line segment
A l	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding gradients	• Draw, label and scale axes • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane • Plot and draw graphs of functions • 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
A m	**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**	• **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**

Ref	Content descriptor	Concepts and skills
A n	**Understand the gradients of parallel lines**	• **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 $-\dfrac{1}{m}$** • **Interpret and analyse a straight line graph and generate equations of lines parallel and perpendicular to the given line**
A r	Construct linear functions from real-life problems and plot their corresponding graphs	• Draw straight line graphs for real-life situations – ready reckoner graphs – conversion graphs – fuel bills – fixed charge (standing charge) and cost per unit • Draw distance-time graphs
A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Interpret straight line graphs for real-life situations – Ready reckoner graphs – Conversion graphs – Fuel bills – Fixed charge (standing charge) and cost per unit • Interpret distance-time graphs

3   Geometry

What students need to learn:

Ref	Content descriptor	Concepts and skills

GM a	Recall and use properties of angles at a point, on a straight line (including right angles), perpendicular lines, and opposite angles at a vertex	• Recall and use properties of angles
		  – angles at a point
		  – angles at a point on a straight line, including right angles
		  – perpendicular lines
		  – vertically opposite angles

GM b	Understand and use the angle properties of intersecting lines and triangles	• Distinguish between scalene, isosceles, equilateral, and right-angled triangles • Understand and use the angle properties of triangles • Use the angle sum of a triangle is 180º • Understand and use the angle properties of intersecting lines • 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 360º • Understand the proof that the angle sum of a triangle is 180º • Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices • **Recall and use these basic properties of angles in more complex problems**

Ref	Content descriptor	Concepts and skills
GM c	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 angle sum 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 sum of the interior angle and the 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
		• Understand tessellations of regular and irregular polygons
		• Tessellate combinations of polygons
		• Explain why some shapes tessellate and why other shapes do not
GM d	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, including symmetry properties
		• List the properties of each, or identify (name) a given shape
		• Classify quadrilaterals by their geometric properties
GM e	Recognise reflection and rotation symmetry of 2-D shapes	• Recognise reflection symmetry of 2-D shapes
		• Identify and draw lines of symmetry on a shape
		• Recognise rotation symmetry of 2-D shapes
		• Identify the order of rotational symmetry of a 2-D shape
		• Draw or complete diagrams with a given number of lines of symmetry
		• State the line of symmetry as a simple algebraic equation
		• Draw or complete diagrams with a given order of rotational symmetry

Ref	Content descriptor	Concepts and skills
GM i	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 terms of a circle • Draw a circle given the radius or diameter
GM j	**Understand and construct geometrical proofs using circle theorems**	• **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**
GM k	Use 2-D representations of 3-D shapes	• Use 2-D representations of 3-D shapes • Use isometric grids • Draw nets and show how they fold to make a 3-D solid • Understand and draw front and side elevations and plans of shapes made from simple solids • Given the front and side elevations and the plan of a solid, draw a sketch of the 3-D solid

Ref	Content descriptor	Concepts and skills
GM x	Calculate perimeters and areas of shapes made from triangles and rectangles, **and other shapes**	• Measure shapes to find perimeter or area • Find the perimeter of rectangles and triangles • Calculate perimeter and area of compound shapes made from triangles, rectangles **and other shapes** • Recall and use the formulae for the area of a triangle and a rectangle • Calculate areas of compound shapes • Find the area of a trapezium • Find the area of a parallelogram • Find the surface area of simple shapes (prisms) using the formulae for triangles and rectangles, **and other shapes**
GM aa	Calculate volumes of right prisms and shapes made from cubes and cuboids	• Calculate volumes of right prisms, including triangular prisms, and shapes made from cubes and cuboids • Recall and use the formula for the volume of a cuboid

4   Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM o	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements	• Know that measurements using real numbers depend upon the choice of unit • Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction
GM p	Convert measurements from one unit to another	• Convert between units of measure in the same system (NB: Conversion between imperial units will be given. Metric equivalents should be known) • Know rough metric equivalents of pounds, feet, miles, pints and gallons:

	Metric	**Imperial**
	1 kg	2.2 pounds
	1 *l*	$1\frac{3}{4}$ pints
	4.5 *l*	1 gallon
	8 km	5 miles
	30 cm	1 foot

Ref	Content descriptor	Concepts and skills
		• Convert between imperial and metric measures • Convert between speed measures, using metric units • Convert between metric units of volume and units of capacity measures, eg 1 cm^3 = 1 m*l*
GM q	Make sensible estimates of a range of measures	• Make sensible estimates of a range of measures in everyday settings • Choose appropriate units for estimating or carrying out estimates
GM s	Understand and use compound measures	• Understand and use compound measures, including speed
GM t	Measure and draw lines and angles	• Measure and draw lines to the nearest mm • Measure and draw angles, to the nearest degree

Specification

Edexcel GCSE
in Mathematics B

Unit 3: Number, Algebra, Geometry 2

Higher

Overview

Content overview

This unit contains:

1. Number

- **Calculations with standard form**
- **Proof with** recurring decimals
- Using percentage and **repeated percentage change**
- **Compound interest**
- Reciprocals
- **Upper and lower bounds**
- Using calculators

2. Algebra

- Equations
- **Quadratic equations**
- Changing the subject of the formula
- Inequalities
- Trial and improvement
- **Simultaneous equations**
- **Graphs of functions**
- **Graphs of loci**
- Quadratic graphs
- **Direct and indirect proportion**
- **Transformation of functions**

3. Geometry

- Congruence
- Pythagoras' Theorem
- **Trigonometry**
- **Circle theorems**
- Transformations
- Constructions
- Loci
- $\dfrac{1}{2}\,ab\sin C$
- Mensuration
- **Vectors**

4. Measures

- Bearings
- Scale drawings

Assessment overview

- 40% of the qualification
- One written paper
- 1 hour 45 minutes
- 80 marks
- Answer all questions
- Calculator allowed
- Grades A*-D available (E allowed)
- Available March, June and November
- 20-30% of the papers assess the functional elements of Mathematics

References

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

Content at Higher Tier only is indicated in **Bold type**.

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

 Specification Edexcel GCSE
in Mathematics B

1   Number

What students need to learn:

Ref	Content descriptor	Concepts and skills
N a	Add, subtract, multiply and divide any number	• Add, subtract, multiply and divide whole numbers, integers, negative numbers, fractions and decimals, and numbers in index form • Solve a problem involving division by a decimal (up to 2 decimal places)
N g	**Interpret, order and calculate with numbers written in standard index form**	• **Convert between ordinary and standard form representations** • **Interpret a calculator display using standard form** • **Calculate with standard form**
N k	Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals	• Convert between recurring decimals and fractions • **Understand a recurring decimal to fraction proof**
N m	Use percentage, **repeated proportional change**	• Use percentages in real-life situations – VAT – Simple Interest – Income tax calculations – **Compound interest** – **Depreciation** – Find prices after a percentage increase or decrease – **Percentage profit and loss** • **Calculate an original amount when given the transformed amount after a percentage change** • **Calculate repeated proportional change**

Ref	Content descriptor	Concepts and skills
N n	**Direct and indirect proportion**	• **Calculate an unknown quantity from quantities that vary in direct or inverse proportion**
N o	Interpret fractions, decimals and percentages as operators	• Express a given number as a fraction of another number
		• Express a given number as a percentage of another number
		• Understand the multiplicative nature of percentages as operators
		• **Represent repeated proportional change using a multiplier raised to a power**
		• **Use compound interest**
		• Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used
N q	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 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
		• **Use reverse percentage calculations**

Ref	Content descriptor	Concepts and skills
N s	**Calculate upper and lower bounds**	• **Calculate the upper and lower bounds of calculations, particularly when working with measurements**
		• **Find the upper and lower bounds of calculations involving perimeter, areas and volumes of 2-D and 3-D shapes**
		• **Find the upper and lower bounds in real life situations using measurements given to appropriate degrees of accuracy**
		• **Give the final answer to an appropriate degree of accuracy following an analysis of the upper and lower bounds of a calculation**
N v	Use calculators effectively and efficiently, **including trigonometrical functions**	• Use an extended range of calculator functions including $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, x^y, $x^{1/y}$, brackets and **trigonometrical functions**
		• **Calculate the upper and lower bounds of calculations, particularly when working with measurements**
		• **Use standard form display and know how to enter numbers in standard form**
		• **Calculate using standard form**
		• **Use calculators for reverse percentage calculations by doing an appropriate division**
		• **Use calculators to explore exponential growth and decay, using a multiplier and the power key**

2   Algebra

What students need to learn:

Ref	Content descriptor	Concepts and skills
A c	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors, **multiplying two linear expressions, factorise quadratic expressions including the difference of two squares and simplify rational expressions**	• Use algebraic manipulation to solve problems
A d	Set up and solve simple equations **including simultaneous equations in two unknowns**	• 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 contain 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 • **Find the exact solutions of two simultaneous equations in two unknowns** • **Be able to use elimination or substitution to solve simultaneous equations** • **Interpret a pair of simultaneous equations as a pair of straight lines and their solution as the point of intersection on a graph** • **Set up and solve a pair of simultaneous equations in two variables**
A e	**Solve quadratic equations**	• **Solve simple quadratic equations by using the quadratic formula** • **Solve simple quadratic equations by factorisation and completing the square**
A f	Substitute numbers into a formula and change the subject of a formula	• Substitute numbers into a formula • Change the subject of a formula **including cases where the subject occurs on both sides of the formula, or where a power of the subject appears**

Ref	Content descriptor	Concepts and skills
A g	Solve linear inequalities in one or **two** variables, and represent the solution set on a number line **or coordinate grid**	• Solve simple linear inequalities in one variable, and represent the solution set on a number line • Use the correct notation to show inclusive and exclusive inequalities • **Show the solution set of several inequalities in two variables on a graph**
A h	Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them	• Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them
A k	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information	• Calculate the length of a line segment
A l	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding gradients	• **Find the gradient of lines given by equations of the form** $y = mx + c$ • **Analyse problems and use gradients to see how one variable changes in relation to another**
A o	**Find the intersection points of the graphs of a linear and quadratic function, knowing that these are the approximate solutions of the corresponding simultaneous equations representing the linear and quadratic functions**	• **Solve exactly, by elimination of an unknown, 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**

Ref	Content descriptor	Concepts and skills
A p	**Draw, sketch, recognise graphs of simple cubic functions, the reciprocal function $y = \dfrac{1}{x}$ with $x \neq 0$, the function $y = k^x$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$ and $y = \cos x$**	• **Plot graphs of simple cubic functions, the reciprocal function $y = \dfrac{1}{x}$ with $x \neq 0$, the exponential function $y = k^x$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$ and $y = \cos x$, within the range -360º to +360º** • **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 are of the correct shape**
A q	**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** • **Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendicular lines**
A r	Construct linear, **quadratic and other** functions from real-life problems and plot their corresponding graphs	• **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** • **Find the intersection points of the graphs of a linear and a quadratic function, knowing that these are the approximate solutions of the corresponding simultaneous equations representing the linear and quadratic functions**
A s	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations	• Plot a linear graph • Interpret information presented in a range of linear and non-linear graphs

Ref	Content descriptor	Concepts and skills
A t	Generate points and plot graphs of simple quadratic functions, and use these to find approximate solutions	• 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**
A u	**Direct and inverse proportion**	• **Set up and use equations to solve word and other problems involving direct proportion or inverse proportion and relate algebraic solutions to graphical representation of the equations**
A v	**Transformation of functions**	• **Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ for linear, quadratic, sine and cosine functions $f(x)$** • **Select and apply the transformations of reflection, rotation, enlargement and translation of functions expressed algebraically** • **Interpret and analyse transformations of functions and write the functions algebraically**

3 Geometry
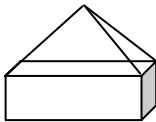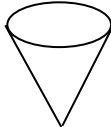
What students need to learn:

Ref	Content descriptor	Concepts and skills
GM f	Understand congruence and similarity	• Recognise that all corresponding angles in similar figures are equal in size when the lengths of sides are not
		• **Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and a pair of compasses constructions**
		• **Understand similarity of triangles and of other plane figures, and use this to make geometric inferences**
		• **Formal geometric proof of similarity of two given triangles**
GM g	Use Pythagoras' theorem in 2-D **and 3-D**	• Understand, recall and use Pythagoras' theorem in 2-D, **then in 3-D problems**
		• **Understand the language of planes, and recognise the diagonals of a cuboid**
		• **Calculate the length of a diagonal of a cuboid**
GM h	**Use the trigonometric ratios and the sine and cosine rules 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**
		• **Find the angle between a line and a plane (but not the angle between two planes or between two skew lines)**
		• **Find angles of elevation and angles of depression**
		• **Use the sine and cosine rules to solve 2-D and 3-D problems**

Ref	Content descriptor	Concepts and skills
GM j	**Understand and construct geometrical proofs using circle 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**
GM l	Describe and transform 2-D shapes using single or combined rotations, reflections, translations, or enlargements by a positive **fractional or negative** 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 • Understand that translations are specified by a distance and direction (using a vector) • Translate a given shape by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Ref	Content descriptor	Concepts and skills
GM l	(*Continued*)	• 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 (0, 0) as the centre of enlargement
		• Enlargement with centre other than (0, 0)
		• Find the centre of enlargement
		• Describe and transform 2-D shapes using combined rotations, reflections, translations, or enlargements
		• Distinguish properties that are preserved under particular transformations
		• Recognise that enlargements preserve angle but not length
		• Use congruence to show that translation, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations
		• Understand that distances and angles are preserved under rotations, reflections and translations so that any shape is congruent to its image
		• Describe a transformation

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Ref	Content descriptor	Concepts and skills
GM v	Use straight edge and a pair of compasses to do constructions	• Use straight edge and a pair of compasses to do standard constructions • Construct a triangle • Construct an equilateral triangle • Understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not • Construct the perpendicular bisector of a given line • Construct the perpendicular from a point to a line • Construct the perpendicular from a point on a line • Construct the bisector of a given angle • Construct angles of 60°, 90°, 30°, 45° • Draw parallel lines • Draw circles and arcs to a given radius • Construct a regular hexagon inside a circle • Construct diagrams of everyday 2-D situations involving rectangles, triangles, perpendicular and parallel lines • Draw and construct diagrams from given information

GM w	Construct loci	• Construct
		
		  – a region bounded by a circle and an intersecting line
		
		  – a given distance from a point and a given distance from a line
		
		  – equal distances from two points or two line segments
		
		  – regions which may be defined by 'nearer to' or 'greater than'
		
		• Find and describe regions satisfying a combination of loci
		
		(NB: All loci restricted to two dimensions only)

GM y	**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**

Ref	Content descriptor	Concepts and skills
GM z	Find circumferences and areas of 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 semicircles and quarter circles • **Calculate the lengths of arcs and the areas of sectors of circles** • **Answers in terms of π may be required** • Find the surface area of a cylinder
GM aa	Calculate volumes of right prisms and shapes made from cubes and cuboids	• Find the volume of a cylinder • Use volume to solve problems
GM bb	**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 areas and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders** *Examples:* • **Solve problems including examples of solids in everyday use** • **Find the area of a segment of a circle given the radius and length of the chord**
GM cc	**Use vectors to solve problems**	• **Understand and use vector notation** • **Calculate, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector** • **Calculate the resultant of two vectors** • **Solve geometrical problems in 2-D using vector methods** • **Apply vector methods for simple geometrical proofs**

4 Measures

What students need to learn:

Ref	Content descriptor	Concepts and skills
GM m	Use and interpret maps and scale drawings	• Use and interpret maps and scale drawings • Read and construct scale drawings • Draw lines and shapes to scale • Estimate lengths using a scale diagram
GM n	Understand **and use** the effect of enlargement for perimeter, area and volume of shapes and solids	• 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**
GM p	Convert measurements from one unit to another	• Convert between metric area measures • Convert between metric volume measures • Convert between metric units of volume and units of capacity measures, eg 1m/ = 1 cm³
GM r	Understand and use bearings	• Use three-figure bearings to specify direction • Mark on a diagram, the position of a point B given its bearing and distance from point A • Measure or draw a bearing between two points on a map or scaled plan • Given the bearing of a point A from a point B, work out the bearing of point B from point A
GM s	Understand and use compound measures	• Understand and use compound measures, including **density**
GM u	Draw triangles and other 2-D shapes using ruler and protractor	• Make accurate drawing of triangles and other 2-D shapes using a ruler and a protractor • Make an accurate scale drawing from a diagram • Use accurate drawing to solve bearings problems

Specification

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B Assessment

Assessment summary

Units 1, 2, and 3 are all externally assessed.

| Unit 1: | Statistics and Probability | Unit code 1F: 5MB1F |
| | | Unit code 1H: 5MB1H |

- Externally assessed
- One written paper
- Includes elements of number, algebra, geometry and measures common with Unit 2
- 1 hour 15 minutes Foundation Tier
- 1 hour 15 minutes Higher Tier
- 60 marks
- Calculator allowed
- Tiered papers
  - Foundation Tier grades C-G available
  - Higher Tier grades A*-D available (E allowed)
  - 30-40% of Foundation Tier paper assesses the functional elements of Mathematics
  - 20-30% of Higher Tier paper assesses the functional elements of Mathematics

| Unit 2: | Number, Algebra, Geometry 1 | Unit code 2F: 5MB2F |
| | | Unit code 2H: 5MB2H |

- Externally assessed
- One written paper
- 1 hour 15 minutes Foundation Tier
- 1 hour 15 minutes Higher Tier
- 60 marks
- Non-calculator
- Tiered papers
  - Foundation Tier grades C-G available
  - Higher Tier grades A*-D available (E allowed)
  - 30-40% of Foundation Tier paper assesses the functional elements of Mathematics
  - 20-30% of Higher Tier paper assesses the functional elements of Mathematics

| Unit 3: | Number, Algebra, Geometry 2 | Unit code 3F: 5MB3F |
| | | Unit code 3H: 5MB3H |

- Externally assessed
- One written paper
- 1 hour 30 minutes Foundation Tier
- 1 hour 45 minutes Higher Tier
- 80 marks
- Calculator allowed
- Tiered papers
  - o Foundation Tier grades C-G available
  - o Higher Tier grades A*-D available (E allowed)
  - o 30-40% of Foundation Tier paper assesses the functional elements of Mathematics
  - o 20-30% of Higher Tier paper assesses the functional elements of Mathematics

Assessment Objectives and weightings

	% in GCSE
AO1: Recall and use their knowledge of the prescribed content	45-55%
AO2: Select and apply mathematical methods in a range of contexts	25-35%
AO3: Interpret and analyse problems and generate strategies to solve them	15-25%
TOTAL	100%

Relationship of Assessment Objectives to units

Unit	Assessment Objective			
	AO1	**AO2**	**AO3**	**Total for AO1, AO2 and AO3**
Unit 1: Statistics and Probability	13.5-16.5%	7.5-10.5%	4.5-7.5%	30%
Unit 2: Number, Algebra, Geometry 1	13.5-16.5%	7.5-10.5%	4.5-7.5%	30%
Unit 3: Number, Algebra, Geometry 2	18-22%	10-14%	6-10%	40%
Total for GCSE	**45-55%**	**25-35%**	**15-25%**	**100%**

Entering your students for assessment

Student entry

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).

There is a requirement that at least 40% of the assessment must be taken in the examination series in which certification is requested. The final qualification grade will include assessment results which satisfy this terminal requirement.

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.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, and Entry Level aims to enhance access to the qualifications for students with disabilities and other difficulties (as defined by the Disability Discrimination Act 1995 and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence.

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

- the JCQ policy Access Arrangements and Special Considerations, Regulations and Guidance Relating to students who are Eligible for Adjustments in Examinations

- the forms to submit for requests for access arrangements and special considerations

- dates for submission of the forms.

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

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Disability Discrimination Act (DDA)

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

Assessing your students

The first assessment opportunity for Unit 1 and Unit 2 of this qualification will take place in the November 2010 series and in each following March, June and November series for the lifetime of the specification.

The first assessment opportunity for Unit 3 of this qualification will take place in the June 2012 series and in each following November, March and June series for the lifetime of the specification.

At least 40% of the assessment must be taken in the examination series in which the qualification is awarded.

Assessment opportunities

Unit	November 2010	March 2011	June 2011	November 2011	March 2012	June 2012
Unit 1	✓	✓	✓	✓	✓	✓
Unit 2	✓	✓	✓	✓	✓	✓
Unit 3	✗	✗	✗	✗	✗	✓

Please note, first certification of this qualification is in **June 2012** and thereafter.

Under the terminal assessment rules for GCSE, candidates **must** take at least 40% of the final assessment **at the time of certification**.

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 office of the Qualifications and Examinations Regulator (Ofqual). The GCSE qualification will be graded and certificated on an eight-grade scale from A* to G. Higher Tier units are awarded at grades A*-D, with E allowed. Foundation Tier units are awarded at grades C-G. Individual unit results will be reported.

The results for a student who fails to reach the minimum standard for a grade to be awarded will be recorded as U (Unclassified) and will not be certificated.

The first certification opportunity for the Edexcel GCSE in Mathematics B will be June 2012.

Unit results

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

Units 1 and 2

Unit grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 120	108	96	84	72	60	48	36	24

The maximum uniform mark available for students entered for the Foundation Tier unit is 83.

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0-24.

Unit 3

Unit grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 160	144	128	112	96	80	64	48	32

The maximum uniform mark available for students entered for the Foundation Tier unit is 111.

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0-31.

Qualification results

The minimum uniform marks required for each grade:

GCSE in Mathematics B   **cash-in code: 2MB01**

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 on their total uniform mark score.

Resitting of units

Students can resit a unit once (regardless of tier) before claiming certification for the qualification.

At least 40% of the assessment must be taken in the examination series in which certification is requested and the results from these assessments must be used. Therefore, any previous, banked results for the unit(s) that are being used to satisfy the terminal requirement cannot be used even if they are better than the results achieved in the terminal series.

Results of units held in Edexcel's unit bank have a shelf-life limited only by the shelf-life of this specification, and subject to the terminal requirement, these unit results may be re-used after certification.

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:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear

- select and use a form and style of writing appropriate to purpose and to complex subject matter

- organise relevant 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, non structured, task-based questions, prove etc

- students are challenged by the content, skills and knowledge defined in each unit of the specification.

Functional elements

GCSE in Mathematics will assess functional elements of mathematics, as required by the Key Stage 4 Programme of Study for Mathematics.

This will be 20-30% on Higher Tier papers, and 30-40% on Foundation Tier papers.

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 Mathematics B 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 eg numerical, graphical and algebraic representations of linear functions; percentages, fractions and decimals. Their numerical skills are sound and they use a calculator accurately. They apply ideas of proportionality to numerical problems and use geometric properties of angles, lines and shapes.

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

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

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

Grade 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

FREE Teacher Support Materials

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, including: past papers, sample papers, mock papers and mark schemes.

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

Edexcel published resources

We have a comprehensive suite of resources to support our Mathematics specifications, written by senior examiners and practising teachers. They include:

- **Student Books**: differentiated and accessible text books to help all students make progress. We've combined ResultsPlus exam performance data with valuable examiner insight to give students lots of tips and guidance on how to achieve exam success.

- **ActiveTeach**: digital resources enriched with BBC Active video clips to engage all students.

- **Teacher Guides**: offering you complete support with teaching the specification. These contain easy-to-use lesson plans to save you valuable planning time.

If you would like to receive an evaluation pack for Edexcel GCSE Mathematics published resources (Specification A or B), please visit www.maths10.co.uk and click on the 'Resources' tab.

Training

A programme of professional development and training courses covering various aspects of the specification and examination will be arranged by Edexcel each year on a regional basis. We can also customise courses to your specific training needs, and deliver them at your centre or Local Authority.

Full details can be obtained 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.

From the maths team of Edexcel **email bulletins** are a fantastic way to be kept informed of all the developments that are taking place in mathematics. If you would like to be added to this email distribution list, please email **mathsemporium@edexcel.com**

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 are available for GCSE Mathematics 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.

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

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
Leeds	0115 224 2253
Manchester	0161 855 7560

Endorsed resources

Edexcel also endorses some additional materials written to support this qualification. Any resources bearing the Edexcel logo have been through a quality assurance process to ensure complete and accurate support for the specification. For up-to-date information about endorsed resources, please visit www.edexcel.com/endorsed

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

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D   Appendices

Specification

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Appendix 1   Key skills

Signposting

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.

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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
Spiritual	All units	This qualification enables centres to provide courses in Mathematics that 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:
Moral	All units	
Ethical	All units	
Social	All units	
Legislative	All units	
Economic	All units	• use and abuse of statistics in the media
Cultural	All units	• financial and business mathematics
Sustainable	All units	• how mathematics is used to communicate climate change
Health and safety	All units	• cultural and historical roots of mathematics
European initiatives	All units	• use of mathematics in cultural symbols and patterns.

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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.	2210
National Qualifications Framework (NQF) codes	Each qualification title is allocated a QCA National Qualifications Framework (NQF) code. The QCA National Qualifications Framework (NQF) code is known as a Qualification Accreditation Number (QAN). This is the code that features in the DfES Funding Schedule, Sections 96 and 97, and is to be used for all qualification funding purposes. The QCA QAN is the number that will appear on the student's final certification documentation.	The QAN for the qualification in this publication is: GCSE – 500/7886/0
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 – 5MB1F Unit 1H – 5MB1H Unit 2F – 5MB2F Unit 2H – 5MB2H Unit 3F – 5MB3F Unit 3H – 5MB3H
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 – 2MB01
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 the Edexcel website.

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Appendix 4   Formulae sheets

Foundation Tier

Area of trapezium = $\frac{1}{2}(a + b)h$
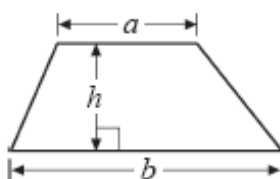
Volume of prism = area of cross section × length
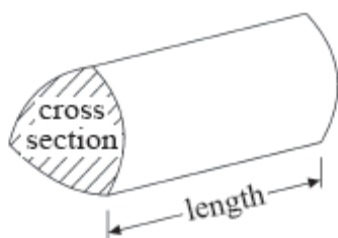
Volume of a prism = area of cross section × length
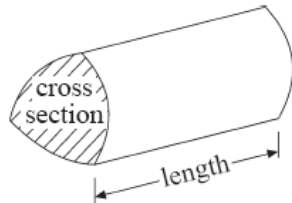
Volume of sphere $=\frac{4}{3}\pi r^3$

Surface area of sphere $=4\pi r^2$
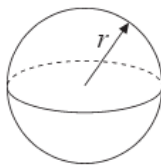
Volume of cone $=\frac{1}{3}\pi r^2 h$

Curved surface area of cone $=\pi r l$
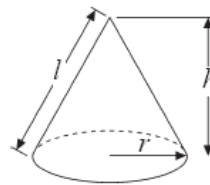
Area of trapezium $=\frac{1}{2}(a+b)h$
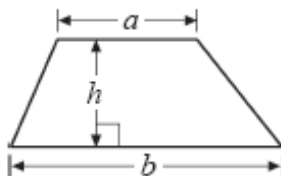
In any triangle ABC
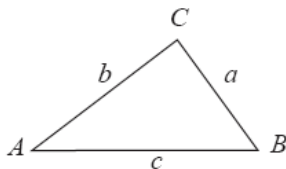
The Quadratic Equation

The solutions of $ax^2+bx+c=0$

where $a\neq 0$, are given by

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

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

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

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

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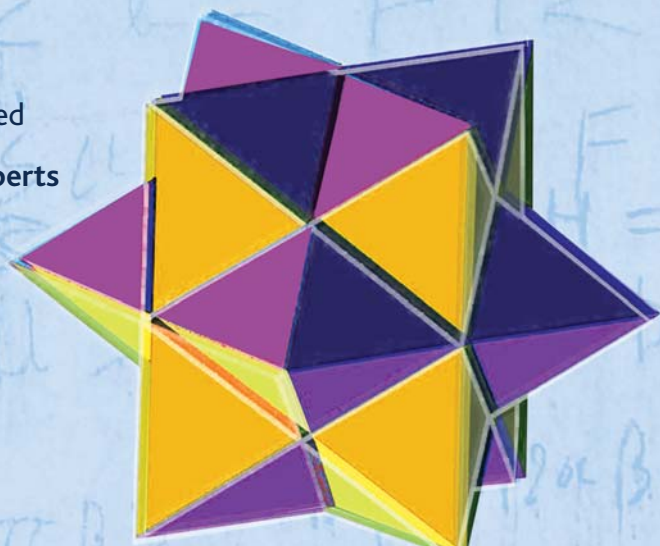
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