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London Examinations IGCSE

Mathematics (4400)

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Teacher's Guide

London Examinations IGCSE

Mathematics (4400)

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Introduction

This Teacher's Guide is intended to help teachers who are preparing students for London Examinations' IGCSE in Mathematics (4400).

It gives detailed information about tiers of entry and the structure and style of the final examination papers.

The content of both Foundation Tier and Higher Tier is analysed in detail, adding to the information in the Specification. This analysis assumes that the course will be taught over two years.

The subject-specific information includes advice on calculators and formula sheets.

Finally, there are some suggested resources and contact details for Edexcel International's Customer Relations Unit.

Tiers of entry

Students are entered for either Foundation Tier or Higher Tier.

The **Foundation Tier** papers are designed for students who are unlikely to achieve a high grade but whose achievement can still be recognised with a grade at the appropriate level. No matter how well students may do on the Foundation Tier paper, the highest grade they can be awarded is grade C. Students who fail to achieve grade G will be awarded 'Ungraded'.

The **Higher Tier** papers are designed for students who are likely to achieve at least grade C. Knowledge of all the Foundation Tier content is assumed for Higher Tier candidates but material related to grades below the range of the Higher Tier will not be the focus of assessment. Some questions are common to both tiers but the remaining questions mainly test topics which are for Higher Tier students only, and so are obviously more demanding.

The highest grade which can be awarded on Higher Tier is A*, a grade reserved for only the highest achievers at the top of grade A. Questions in the Higher Tier are targeted at grades A* to D, but there is a 'safety net' for those who narrowly fail to achieve grade D. A grade E can be awarded to students who are within a few marks of grade D. Students who fail to achieve the safety net grade E will be awarded 'Ungraded'.

The Foundation and Higher Tier papers take place at the same time and so students cannot be entered for both examinations. This puts a responsibility on the teacher to ensure that a student is entered for the appropriate tier. Students who consistently achieve grade C standard work in practice tests would normally be entered for the Higher Tier, where they have the opportunity to achieve the higher grades.

Because of the overlap at grades C and D between the two tiers, there are some questions common to both tiers. In Mathematics, the overlap between the tiers will account for about 40% of the marks.

Structure of specification

Summary of scheme of assessment

Paper/ component	Mode of assessment	Weighting	Length
1	Examination Paper 1F, targeted at Grades C - G (Foundation Tier)	50%	2 hours
2	Examination Paper 2F, targeted at Grades C - G (Foundation Tier)	50%	2 hours
3	Examination Paper 3H, targeted at grades A* - D (Higher Tier)	50%	2 hours
4	Examination Paper 4H, targeted at grades A* - D (Higher Tier)	50%	2 hours

Students will be required to take two papers.

Foundation Tier students will take papers 1F and 2F. The Foundation Tier papers are targeted at grades C to G.

Higher Tier students will take Papers 3H and 4H. The Higher Tier papers are targeted at grades A* to D.

Assessment requirements

Relationship of assessment objectives to external assessment

Assessment objective		Weighting
A01	Number and algebra	55%
A02	Shape, space and measures	25%
A03	Handling data	20%

The percentages above are not intended to provide a precise statement of the number of marks allocated to particular Assessment Objectives.

External assessment

- Each paper will address all of the Assessment Objectives.
- Papers will have approximately equal marks available for each of the targeted grades to be awarded.
- Each examination paper will carry a total of 100 marks.
- There will be two parallel examination papers for each tier.
- Each examination paper will assess the full range of targeted grades at each tier.
- Questions on the Higher Tier examination papers will assume knowledge from the Foundation Tier subject content.
- Diagrams will not necessarily be drawn to scale, and measurements should not be taken from diagrams unless instructions to this effect are given.
- Each candidate may be required to use mathematical instruments, e.g. pair of compasses, ruler, protractor.
- Tracing paper may be used.
- Formulae sheets will be provided for both tiers.
- There will be common questions – around 40% – across examination papers, to aid standardisation and comparability of award between tiers.
- On the Foundation papers, there will be slightly more Number than Algebra and, on the Higher papers, there will be considerably more Algebra than Number.

Course planning

To assist with course planning, the following scheme of work lists the main teaching points which have to be covered to meet the requirements of the specification.

For each Tier, the scheme is divided into four assessment objectives: Number; Algebra; Shape, space and measures; and Handling data.

These four Assessment Objectives are sub-divided into teaching modules; some of these are independent while others must be preceded by earlier modules. While it is unlikely that topics would be taught in this order, it is hoped that this is the most helpful format, as it relates directly to the specification.

A knowledge of the Foundation Tier content is assumed for the Higher Tier papers.

This scheme should be used flexibly and is intended to suggest strategies to teachers rather than constrain them. Indeed, it is probable that many teachers will find it inappropriate to cover all the topics in some modules consecutively.

Specific issues such as the sequence in which topics are covered, the time allocated to each one and the extent to which a calculator is used for arithmetic, must ultimately depend on the needs and abilities of the students.

Foundation Tier

Number: Module 1 – Integers

Target grades: E/F/G

Content	Area of Specification Content
Understanding place value in whole numbers	1.1
Reading, writing and ordering whole numbers	1.1
Addition, subtraction, multiplication and division of whole numbers	1.1
Problems involving the four rules with whole numbers	1.1
Calculations involving time	1.10
Order of operations (excluding powers)	1.1
Using a calculator efficiently	1.11
Interpreting a calculator display	1.11
Directed numbers in context	1.1
Understanding integers both as positions and as translations on a number line	1.1
Using the four rules with directed numbers	1.1

Prior knowledge

The ability to order numbers

Appreciation of place value to at least thousands

Experience of the four rules on whole numbers

Notes

Present all working clearly, emphasising that all working is to be shown.

Number: Module 2 – Decimals

Target Grades: E/F/G

Content	Area of Specification Content
Understanding place value in decimal numbers	1.3
Ordering decimals	1.3
Applying the four rules with decimals	1.10
Writing decimal numbers to the nearest whole number and to 1 or 2 decimal places	1.8
Writing decimal numbers to 1, 2 or 3 significant figures	1.8
Converting simple fractions to decimals including recurring decimals	1.2
Converting terminating decimals to fractions	1.3

Prior knowledge

Number Module 1

Four rules of number

The basic ideas of the concepts of a fraction and a decimal

Notes

Present all working clearly with decimal points in line, emphasising that all working is to be shown.

Number: Module 3 – Special numbers and powers

Target grades: C/D/E

Content	Area of Specification Content
Even and odd numbers	1.1
Factors and multiples, including common factors and common multiples	1.1
Prime numbers and prime factors	1.1
Square and cube numbers	1.4
Squares and square roots	1.4
Cubes and cube roots	1.4
Using a calculator effectively to evaluate powers and roots	1.11
Powers of numbers – using index notation	1.4
Order of operations including powers (BIDMAS)*	1.1
Expressing a number as the product of powers of its prime factors	1.4
Using laws of indices for multiplication and division of positive integer powers	1.4
Simplifying expressions using the laws of indices	1.4

Prior knowledge

Basic number bonds and multiplication/division facts

Ability to recognise basic number patterns

*__BIDMAS__ = __B__rackets, __I__ndices, __D__ivision, __M__ultiplication, __A__ddition, __S__ubtraction.

Number: Module 4 – Fractions

Target grades: C/D/E

Content	Area of Specification Content
Using diagrams to find equivalent fractions	1.2
Simplifying (cancelling) fractions	1.2
Simplest form (lowest terms)	1.2
Conversion between improper fractions and mixed numbers (vulgar fractions)	1.2
Conversion between fractions and decimals	1.2
Ordering fractions using common denominators or by conversion to decimals	1.2
Adding and subtracting fractions using common denominators	1.2
Multiplying and dividing fractions, by an integer, by a unit fraction and by a general fraction	1.2
Using fractions in problems	1.2
Calculating a fraction of a quantity	1.2
Expressing one quantity as a fraction of another.	1.2

Prior knowledge

Number Modules 1, 2 and 3

A basic understanding of fractions as ‘parts of a whole’

Notes

An understanding of equivalent fractions is fundamental to this module. Constant revision of this topic is needed. Every stage in working should be shown.

Number: Module 5 – Percentages

Target grades: C/D/E

Content	Area of Specification Content
Understanding that percentage means ‘number of parts per hundred’	1.6
Converting between percentages, fractions and decimals	1.6
Calculating percentages of quantities	1.6
Increasing or decreasing quantities by a given percentage	1.6
Expressing one quantity as a percentage of another	1.6
Finding 100% when another percentage is given	1.6
Calculating percentage increases or decreases (percentage profit or loss)	1.6
Understanding the multiplicative nature of percentages as operators	1.6
Efficient use of a calculator to solve problems involving percentages for example, simple interest	1.6

Prior knowledge

Number Modules 1, 2 and 4

A basic understanding of the concept of a percentage

An understanding of the ideas behind interest

Notes

All working should be shown.

Number: Module 6 – Ratio and proportion

Target grades: C/D/E

Content:	Area of Specification Content
Basic ideas of ratio	1.7
Simplifying ratios including simplest form	1.7
Expressing a ratio in the form 1 : *n*	1.7
Relating ratio to fractions	1.7
If one of the two quantities in a given ratio is known, find the other, including the use of the unitary method	1.7
Dividing a quantity in a given ratio into 2 or 3 parts	1.7
Problems involving ratio, including scale diagrams and maps	1.7
Using direct proportion including recipes	1.7
Using direct proportion including currency conversion	1.10

Prior knowledge

Number Modules 1, 2 and 4

Basic number skills and ability to recognise common factors

Calculator skills

Number: Module 7 – Approximation

Target grades: C/D/E/F/G

Content	Area of Specification Content
Rounding numbers to the nearest ten, hundred and thousand and use for estimating	1.8
Rounding number to 1 significant figure and use for estimating	1.8
Rounding numbers to 2 or 3 significant figures	1.8
Rounding numbers to 1, 2 or 3 decimal places	1.8
Carrying out rounding appropriate to a context	1.8
Expressing a calculator display to an appropriate degree of accuracy	1.8
Finding upper and lower bounds, i.e. maximum and minimum values for rounded values	1.8

Prior knowledge

Number Module 1 and 2.

Notes

Students should be encouraged to include more accurate answers in their working before rounding to ensure marks for correct calculations even if there is a rounding error.

Students should be aware that correct rounding will give a number of the same order of magnitude as the original.

Rounding to a level of accuracy should be continually reinforced with students.

Number: Module 8 – Set language and notation

Target grades: C/D

Content	Area of Specification Content
Meaning of 'set'	1.5
Defining sets of numbers by describing, e.g. {first four odd numbers}, $\{x : x$ is a factor of 12$\}$ or by listing, e.g. {1, 3, 5, 7}	1.5
Understanding the meaning of the universal set $\mathscr{E}$	1.5
Understanding the meaning of the null or empty set ϕ or { }	1.5
Membership of a set including the notation $\in$ and $\notin$	1.5
Intersection and union of sets including the notation $\cap$ and $\cup$	1.5

Prior knowledge

Number module 3

(Centres should be aware that the note '*Inequality notation may be used*' has been deleted from Issue 2 of this publication.)

Algebra: Module 1 – Algebraic manipulation

Target grades: C/D/E/F

Content	Area of Specification Content
Using letters to represent numbers	2.1
Collecting like terms	2.2
Simplifying products	2.1
Multiplying a single term over a bracket	2.2
Factorising by taking out a single common factor	2.2
Finding and simplifying the product of two simple linear expressions, i.e. of the form $(x + a)(x + b)$, where *a* and *b* are integers	2.2

Prior knowledge

Some idea that letters can be used instead of numbers.

Notes

Emphasise use of correct symbolic notation, e.g. $3a$ rather than $3 \times a$ or $a3$.

Algebra: Module 2 – Expressions and formulae

Target grades: C/D/E/F/G

Content	Area of Specification Content
Substituting positive and negative integers, then fractions and decimals, into expressions, word formulae and algebraic formulae	2.3
Using formulae from mathematics and other subjects expressed initially in words or diagrammatic form and converting letters and symbols	2.3
Deriving formulae	2.3

Prior knowledge

Number modules 1, 2, 3 and 4.

Algebra: Module 3 – Linear equations and simultaneous linear equations

Target grades: C/D/E/F

Content	Area of Specification Content
Inverse operations	2.4
Understanding and use of 'balancing' methods	2.4
Solving simple linear equations	2.4
Solving linear equations with two or more operations	2.4
with the unknown on both sides	2.4
with brackets	2.4
with negative or fractional coefficients	2.4
with combinations of these	2.4
Setting up and solving simple linear equations to solve problems, including finding the value of a letter which is not the subject of a formula	2.4
Solving simple simultaneous linear equations either by adding or subtracting them or by substitution, i.e. it will not be necessary to multiply either equation	2.6

Prior knowledge

Algebra modules 1 and 2

The idea that some operations are 'opposite' to each other

Notes

Students need to realise that not all linear equations can easily be solved by either observation or trial and improvement; a formal method is often needed.

Students should leave their answers in fractional form where appropriate.

Algebra: Module 4 – Coordinates and graphs

Target grade: D/E/F

Content	Area of Specification Content
Drawing and interpreting linear conversion graphs	3.3
Plotting or stating the coordinates of points in all four quadrants	3.3
Determining the coordinates of points identified by geometrical information	3.3
Determining the coordinates of the midpoint of a line segment, given the coordinates of the two end points	3.3
Drawing and interpreting linear graphs representing real-life situations, including speed/time and distance/time graphs	3.3
Drawing and interpreting non-linear graphs representing real-life situations	3.3

Prior knowledge

Experience of plotting points.

Directed numbers.

Algebra: Module 5 – Linear graphs

Target grades: C/D/E

Content	Area of Specification Content
Recognising that equations of the form $x = a$ and $y = b$ correspond to straight line graphs parallel to the *y*-axis and to the *x*-axis respectively	3.3
Completing tables of values and drawing graphs with equations of the form $y = mx + c$, where the values of *m* and *c* are given and *m* may be an integer or a fraction	3.3
Recognising that graphs with equations of the form $y = mx + c$ are straight lines	3.3
Having an informal understanding of the concept of gradient as the steepness of a line and recognising the link with *m* in $y = mx + c$	3.3
Drawing straight line graphs with equations in which *y* is given implicitly in terms of *x*, e.g. $x + y = 7$	3.3

Prior knowledge

Algebra modules 1, 2, 3 and 4

Notes

Axes should be labelled on graphs and a ruler should be used to draw linear graphs.

The science department could provide experiment results which give linear graphs.

Algebra: Module 6 – Integer sequences

Target grades: E/F/G

Content	Area of Specification Content
Continuing diagrammatic sequences	3.1
Continuing number sequences	3.1
Describing the terms of a sequence in words	3.1
Finding rules to describe sequences	3.1
Using term-to-term and position-to-term definitions to generate the terms of a sequence	3.1

Prior knowledge

Algebra Modules 1 and 2

Some experience of sequences of numbers which follow a rule

The ability to follow a series of instructions

Algebra: Module 7 – Inequalities

Target grade: C

Content	Area of Specification Content
Understanding and using the symbols >, <, $\geq$ and $\leq$	2.8
Understanding and using the convention for open and closed intervals on a number line	2.8
Solving simple linear inequalities in one variable, including 'double-ended' inequalities	2.8
Representing on a number line the solution set of simple linear inequalities	2.8
Finding the integer solutions of simple linear inequalities	2.8

Using regions to represent simple linear inequalities in one variable	2.8
Using regions to represent the solution set to several linear inequalities in one or two variables	2.8

Prior knowledge

Algebra Modules 3 and 5

Algebra: Module 8 – Indices

Target grades: C/D

Content	Area of Specification Content
Using index notation for positive integer powers	2.1
Substituting positive and negative numbers into expressions and formulae with quadratic and/or cubic terms	2.1
Completing tables of values and drawing graphs of quadratic functions	3.3
Using laws of indices with positive integer powers to simplify expressions	2.1
Substituting positive and negative numbers into expressions and formulae with quadratic and/or cubic terms	2.3

Prior knowledge

Algebra Modules 2 and 4

Shape, space and measures: Module 1 – Measures

Target grades: C/D/E/F/G

Content	Area of Specification Content
Choosing and using appropriate metric units of measure	4.4
Making sensible estimate of lengths, capacities and weights	4.4
Interpreting scales and dials on a range of measuring instruments	4.4
Telling the time from digital and analogue clocks	4.4
Converting between times and calculating time intervals in 12-hour and 24-hour clocks, e.g. timetables	4.4
Understanding and using the relationship between average speed, distance and time	4.4

Prior knowledge

Number Module 2.

Basic concepts of units, e.g. heights in metres, weights in kilograms.

Notes

Measurement is essentially a practical activity. Use a range of everyday objects to make the lesson more relevant.

Shape, space and measures: Module 2 – 2D shapes

Target grades: F/G

Content	Area of Specification Content
Estimating the size of an angle in degrees	4.1
Recognising and naming acute, obtuse, reflex and right angles	4.1
Recognising and giving the names of different types of triangle (right-angled, isosceles and equilateral)	4.1
Recognising and giving the names of different types of quadrilateral (parallelogram, rectangle, square, rhombus, trapezium, kite)	4.2
Recognising and giving the names of different types of polygon (pentagon, hexagon, octagon)	4.2
Recognising regular polygons	4.2
Understanding congruence as meaning the same shape and size	4.2
Understanding that two or more polygons with the same shape and size are said to be congruent to each other	4.2

Shape, space and measures: Module 3 – Symmetry

Target grades: F/G

Content	Area of Specification Content
Recognising line symmetry and rotational symmetry	4.3
Identifying and drawing lines of symmetry for a 2-D shape	4.3
Stating the order of rotational symmetry of a 2-D shape	4.3
Recognising all the symmetries of a 2-D shape	4.3

Shape, space and measures: Module 4 – Construction

Target grades: C/D/E/F/G

Content	Area of Specification Content
Measuring and drawing lines to the nearest millimetre	4.5
Measuring and drawing angles to the nearest degree	4.4
Constructing triangles and other 2-D shapes using ruler, protractor and compasses	4.5
Using three-figure bearings to specify direction	4.4
Using scale drawings to solve problems	4.5
Using straight edge and compasses to construct	
(i) the perpendicular bisector of a line segment	
(ii) the bisector of an angle	4.5

Prior knowledge

An understanding of angle as a measure of turn; experience of drawing and measuring using a ruler

Notes

Encourage students to use sharp pencils to improve the neatness and accuracy of drawings.

A tolerance of $2°$ is reasonable for angles.

A sturdy pair of compasses is essential.

Students are often confused

(a) about the direction from which a bearing is measured

(b) when measuring angles larger than 90° on a diagram.

Shape, space and measures: Module 5 – Geometry

Target grades: C/D/E/F/G

Content	Area of Specification Content
Calculating angles on a straight line and at a point	4.1
Recognising vertically opposite angles	4.1
Recognising parallel and perpendicular lines	4.1
Using parallel lines, alternate angles and corresponding angles	4.1
Using the angle sum of a triangle to calculate angles in triangles	4.1
Using angle properties of isosceles, equilateral and right-angled triangles	4.1
Understanding that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices	4.1
Using the angle sum of a quadrilateral to calculate angles in quadrilaterals	4.2
Understanding and using the properties of the parallelogram, rectangle, square, rhombus, trapezium and kite	4.2
Calculating and using the sums of the interior angles of polygons	4.2
Calculating and using the sum of the exterior angles of a polygon	4.2
Calculating the interior and exterior angles of regular polygons	4.2
Giving informal reasons, where required, when arriving at numerical solutions to geometrical problems	4.7

Prior knowledge

SSM Modules 1 and 2

Understanding of the concept of parallel lines

Shape, space and measures: Module 6 – Transformations

Target grades: C/D/E/F/G

Content	Area of Specification Content
Understanding that rotations are specified by a centre and an angle	5.2
Rotating a shape about a point, measuring the angle of rotation in right angles, degrees or simple fractions of a turn	5.2
Understanding that an anti-clockwise rotation is a *positive* angle rotation and a clockwise rotation is a negative angle of rotation	5.2
Understanding that reflections are specified by a mirror line, e.g. $x = 1$, $y = x$ on a coordinate grid	5.2
Reflecting shapes in a mirror line	5.2
Constructing a mirror line, given a shape and its reflection	5.2
Understanding that translations are specified by a distance and direction	5.2
Translating a shape, given the distance and direction of the translation	5.2
Recognising that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations is congruent to the original shape.	5.2
Understanding that enlargements are specified by a centre and a scale factor	5.2
Constructing enlargements of shapes with positive scale factors	5.2
Identifying the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments	5.2
Recognising that enlargements preserve angle but not length	5.2
Describing transformations in full	5.2

Prior knowledge

SSM Module 2.

The ability to recognise that a shape has symmetries.

Notes

Marks are often lost in the examination through failure to give a complete description of a transformation. For example, the centre of rotation is often omitted and it is not unusual to see the name of the transformation itself left out.

Shape, space and measures: Module 7 – Circles

Target grades: C/D/E/F/G

Content	Area of Specification Content
Understanding the terms centre, radius, chord, diameter, circumference, tangent, arc, sector and segment of a circle	4.6
Knowing and using these circle properties	
Two tangents from a point to a circle are equal in length	4.6
Tangents are perpendicular to the radius at the point of contact	4.6
The line from the centre of a circle which is perpendicular to a chord bisects the chord (and the converse is true)	4.6

Shape, space and measures: Module 8 – Area and perimeter

Target grades: D/E/F/G

Content	Area of Specification Content
Finding the perimeter of rectangles and triangles and shapes made from them	4.9
Finding area by counting squares	4.9
Finding the areas of rectangles, triangles, parallelograms and trapezia, using relevant formulae	4.9
Finding circumferences and areas of circles using relevant formulae	4.9
Finding the areas of compound shapes made from rectangles and triangles	4.9
Converting between units of length and of area within the metric system, e.g. m^2 and cm^2	4.9

Prior knowledge

SSM Module 2

Some concept of area as the amount of surface covered

Notes

Ensure that students can distinguish between perimeter and area.

Shape, space and measures: Module 9 – 3-D Shapes and volume

Target grades: C/D/E/F/G

Content	Area of Specification Content
Recognising and giving the names of solids (cube, cuboid, prism, pyramid, cylinder, cone)	4.9
Understanding the terms face, edge and vertex in the context of a 3-D solid	4.9
Finding volumes by counting cubes	4.9
Finding the volumes of right prisms, including cuboids and cylinders, using appropriate formulae	4.9
Finding the surface areas of solids with rectangular and triangular faces	4.9
Converting between units of volume within the metric system, e.g. cm^3 and litres	4.9

Prior knowledge

SSM Module 8

Some concept of the volume of a solid as the amount of space it occupies

Notes

Many students have little real understanding of perimeter, area and volume. Practical experience is essential to clarify these concepts.

Shape, space and measures: Module 10 – Pythagoras' theorem

Target grade: C

Content	Area of Specification Content
Identifying the hypotenuse of a right-angled triangle	4.8
Understanding and using Pythagoras' Theorem in two dimensions to find the length of the hypotenuse or that of one of the shorter sides of a right-angled triangle	4.8
Using Pythagoras' Theorem to solve problems	4.8

Prior knowledge

SSM Modules 2, 5 and 8

Knowledge of different types of triangle; ability to use a calculator to find squares and square roots

Notes

Students will avoid answers which are not sensible if they remember that the hypotenuse is the longest side.

Some students find questions on this topic much more difficult if the orientation of the triangle is unusual.

Shape, space and measures: Module 11 – Trigonometry

Target grade: C

Content	Area of Specification Content
Identifying the various sides of a right-angled triangle as the hypotenuse, opposite and adjacent	4.8
Understanding and using sine, cosine and tangent of acute angles to find lengths and angles in a right-angled triangle	4.8
Using trigonometry to solve problems, including bearings	4.8
Using Pythagoras' theorem and trigonometry to solve problems	4.8

Prior knowledge

SSM Modules 2, 5 and 10

Knowledge of basic concept of ratio (number module 6); ability to use a calculator to convert fractions to decimals (number module 4)

Notes

Students should ensure that their calculators are in 'degree mode' before tackling trigonometry questions.

Shape, space and measures: Module 12 – Similar shapes

Target grade: C

Content	Area of Specification Content
Understanding that if two shapes are similar their corresponding angles are equal and all their corresponding lengths are in the same ratio	4.10
Using similarity to find lengths of sides	4.10

Handling data: Module 1 – Graphical representation of data

Target grades: E/F/G

Content	Area of Specification Content
Grouping data in tally tables and frequency tables including grouped data	6.1
Obtaining data from a list, a table (including two-way) or a database	6.1
Drawing and using bar charts	6.1
Drawing and using pictograms	6.1
Calculating the angles to draw a pie chart	6.1
Drawing pie charts	6.1
Using pie charts to calculate	
the fraction, percentage or decimal of the total represented by each sector	6.1
the number of items represented by each sector	6.1

Prior knowledge

SSM Module 5.

Measuring and drawing angles (SSM Module 4).

Fractions of simple quantities (Number Module 4)

Notes

Students should label axes of pictograms and bar charts and label sectors of pie charts.

Accurate drawing skills, particularly for pie charts, should be reinforced.

Handling data: Module 2 – Statistical measures

Target grades: C/D/E/F/G

Content	Area of Specification Content
Understanding the concept of average as a value which is representative of a set of data	6.2
Finding the mean, median, mode and range for a discrete data set either from a list or from a frequency table	6.2
Selecting the most appropriate average	6.2
Finding the modal class for grouped data	6.2
Calculating an estimate for the mean for grouped data, using halfway values	6.2

Notes

Students often understand the techniques for finding mean, median and mode but confuse the three names.

It should be emphasised that the range is a single value.

Students sometimes identify the modal class by the frequency instead of the class description.

Handling data: Module 3 – Probability 1

Target grades: E/F/G

Content	Area of Specification Content
Using the language of probability, initially informally, e.g. 'likely' and then technical terms such as 'outcomes', 'equal likelihood', 'events' and 'random'	6.3
Using a probability scale from 0 to 1	6.3
Understanding that an impossible event has a probability of 0 and one which is certain has a probability of 1	6.3
Writing probabilities as numbers (fractions, decimals or percentages only)	6.3
Estimating probabilities from previously collected data	6.3
The probability of an event happening or not happening	6.3
Understanding and using estimates or measures of probability from theoretical models	6.3

Prior knowledge

Some concept of ‘chance’ and the likelihood of an event and recognition that some events are more likely than others

Notes

Where possible, introduce practical work to support the theoretical work.

Students can be unsure of the relationship P(not *n*) = 1 – P(*n*)

Handling data: Module 4 – Probability 2

Target grades: C/D/E/F

Content	Area of Specification Content
Understanding sample spaces and using them to find the probability that an event will occur	6.3
Listing systematically all the outcomes for single events, or for two successive events, and using lists to find the probability that an event will occur	6.3
Using the sum of probabilities of all possible outcomes equalling 1	6.3
Understanding the meanings of ‘equally likely’ and ‘mutually exclusive’	6.3
Using the addition rule for probability for mutually exclusive events	6.3
Understanding and using expected frequency to calculate an estimate for the number of times an event will occur	6.3

Prior knowledge

Handling data Module 3

Notes

Some students may need reminding that only fractions, decimals and percentages may be used for probability. Answers like ‘2 in 3’, ‘2 out of 3’ and ‘2 : 3’ would be penalised in the examination.

Higher Tier

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

Number: Module 1 – Decimals

Target grades: A/B/C/D

Content	Area of Specification Content
Applying the four rules with decimals	1.10
Using a calculator efficiently	1.11
Interpreting a calculator display	1.11
Writing decimal numbers to the nearest whole number and to 1 or 2 decimal places	1.8
Writing decimal numbers to 1, 2 or 3 significant figures	1.8
Converting simple fractions to decimals including recurring decimals	1.2
Converting terminating decimals to fractions	1.3
Converting recurring decimals to fractions	1.3

Number: Module 2 – Powers and roots

Target grades: A*/A/B/C

Content	Area of Specification Content
Squares and square roots	1.4
Cubes and cube roots	1.4
Using a calculator effectively to evaluate powers and roots	1.1
Powers of numbers – using index notation	1.4
Order of operations including powers (BIDMAS*)	1.1
Expressing a number as the product of powers of its prime factors	1.4
Using prime factors to evaluate Highest Common Factors (HCF) and Lowest Common Multiples (LCM)	1.4
Understanding and using powers which are zero, negative or fractions	1.4
Recognising the relationship between fractional powers and roots	1.4
Using laws of indices to simplify and evaluate numerical expressions involving integer, fractional and negative powers	1.4
Understanding the meaning of surds	1.4
Manipulating surds, including rationalising the denominator	1.4

*__BIDMAS__ = __B__rackets, __I__ndices, __D__ivision, __M__ultiplication, __A__ddition, __S__ubtraction.

Number: Module 3 – Fractions

Target grades: B/C/D

Content	Area of Specification Content
Conversion between fractions and decimals	1.2
Ordering fractions using common denominators or by conversion to decimals	1.2
Adding and subtracting fractions using common denominators	1.2
Multiplying and dividing fractions, by an integer, by a unit fraction and by a general fraction	1.2
Using fractions in problems	1.2
Calculating a fraction of a quantity	1.2
Expressing one quantity as a fraction of another	1.2

Number: Module 4 – Percentages

Target grades: B/C/D

Content	Area of Specification Content
Understanding that percentage means 'number of parts per hundred'	1.6
Converting between percentages, fractions and decimals	1.6
Calculating percentages of quantities	1.6
Increasing or decreasing quantities by a given percentage	1.6
Expressing one quantity as a percentage of another	1.6
Finding 100% when another percentage is given	1.6
Calculating percentage increases or decreases (percentage profit or loss)	1.6
Understanding the multiplicative nature of percentages as operators	1.6
Efficient use of a calculator to solve problems involving percentages, for example, simple interest	1.6
Solving reverse percentage problems by doing an appropriate division	1.6

Prior knowledge

Number Modules 1 and 3

Notes

All working should be shown.

Number: Module 5 – Ratio and proportion

Target grades: C/D

Content	Area of Specification Content
Basic ideas of ratio	1.7
Simplifying ratios including simplest form	1.7
Expressing a ratio in the form 1 : *n*	1.7
Relating ratio to fractions	1.7
If one of the two quantities in a given ratio is known, find the other, including the use of the unitary method	1.7
Dividing a quantity in a given ratio into 2 or 3 parts	1.7
Problems involving ratio, including scale diagrams and maps	1.7
Using direct proportion including recipes	1.7
Using direct proportion including currency conversion	1.10

Prior knowledge

Number Modules 1 and 3

Calculator skills

Number: Module 6 – Standard form

Target grades: B

Content	Area of Specification Content
Expressing numbers in standard form	1.9
Writing numbers expressed in standard form as ordinary numbers	1.9
Calculating with numbers in standard form	1.9
Solving problems involving standard form	1.9

Notes

Although students should, where appropriate, use their calculators for questions involving standard form, their answers should be expressed in conventional standard form e.g. 2.3×10^5, not as a calculator display such as 2.3^{05}.

Number: Module 7 – Degree of accuracy

Target grades: A*/A/B/C/D

Content	Area of Specification Content
Rounding number to 1 significant figure and use for estimating	1.8
Rounding numbers to 2 or 3 significant figures	1.8
Rounding numbers to 1, 2 or 3 decimal places	1.8
Carrying out rounding appropriate to a context	1.8
Expressing a calculator display to an appropriate degree of accuracy	1.8
Finding upper and lower bounds, i.e. maximum and minimum values for rounded values	1.8
Solving problems using upper and lower bounds where values are given to a degree of accuracy	1.8
Selecting and justifying appropriate degrees of accuracy	1.8

Notes

Students should be encouraged to include more accurate answers in their working before rounding to ensure marks for correct calculations even if there is a rounding error.

Students should be aware that correct rounding will give a number of the same magnitude as the original.

Rounding to a level of accuracy should be continually reinforced with students.

Number: Module 8 – Set language and notation

Target grades: A/B/C/D

Content	Area of Specification Content
Meaning of 'set'	1.5
Defining sets of numbers by describing, e.g. {first four odd numbers}, $\{x : x$ is a factor of 12$\}$ or by listing, e.g. {1, 3, 5, 7}	1.5
Understanding the meaning of the universal set $\mathscr{E}$	1.5
Understanding the meaning of the null or empty set ϕ or { }	1.5
Membership of a set including the notation $\in$ and $\notin$	1.5
Intersection and union of sets including the notation $\cap$ and $\cup$	1.5
Understanding sets defined in algebraic terms	1.5
Understanding and using subsets, including $\subset$ notation	1.5
Understanding and using the complement of a set (A')	1.5
Using Venn diagrams to represent sets and the number of elements in sets	1.5
Using the notation n(A) for the number of elements in the set A	1.5
Using sets in practical situations	1.5

Notes

Inequality notation may be used, e.g. $\{x : 2 \leq x < 5\}$

Algebra: Module 1 – Algebraic manipulation

Target grades: A*/A/B/C/D

Content	Area of Specification Content
Multiplying a single term over a bracket	2.2
Factorising by taking out a single common factor	2.2
Finding and simplifying the product of two linear expressions, e.g. $(2x+3)(3x-1)$, $(3x-2y)(5x+3y)$	2.2
Factorising quadratic expressions, including the difference of two squares	2.2
Adding, subtracting, multiplying and dividing algebraic fractions, including simplifying algebraic fractions by cancelling common factors	2.2
Numerator and/or the denominator may be numeric, linear or quadratic	2.2

Notes

Emphasise use of correct symbolic notation, e.g. $3a$ rather than $3 \times a$ or $a3$.

Students should be aware that there may be a need to remove the HCF (numerical) of a trinomial before factorising a quadratic expression to make the factorisation more obvious.

Algebra: Module 2 – Expressions and formulae

Target grades: A*/A/B/C/D

Content	Area of Specification Content
Substituting positive and negative integers, then fractions and decimals, into expressions, word formulae and algebraic formulae	2.3
Using formulae from mathematics and other subjects expressed initially in words or diagrammatic form and converting letters and symbols	2.3
Deriving formulae	2.3
Manipulating formulae to change the subject, including cases where the subject occurs twice or where a power of the subject appears	2.3

Algebra: Module 3 – Linear equations and simultaneous linear equations

Target grades: B/C/D

Content	Area of Specification Content
Inverse operations	2.4
Understanding and use of 'balancing' methods	2.4
Solving simple linear equations	2.4
Solving linear equations with two or more operations	2.4
with the unknown on both sides	2.4
with brackets	2.4
with negative or fractional coefficients	2.4
with combinations of these	2.4
Setting up and solving simple linear equations to solve problems, including finding the value of a letter which is not the subject of a formula	2.4
Solving simple simultaneous linear equations, including cases where one or both of the equations must be multiplied	2.6
Interpreting the equations as lines and their common solution as the point of intersection	2.6

Prior knowledge

Algebra modules 1 and 2

The idea that some operations are 'opposite' to each other

Notes

Students need to realise that not all linear equations can easily be solved by either observation or trial and improvement; a formal method is often needed.

Students should leave their answers in fractional form where appropriate.

Algebra: Module 4 – Coordinates and graphs

Target grade: D

Content	Area of Specification Content
Determining the coordinates of points identified by geometrical information	3.3
Determining the coordinates of the midpoint of a line segment, given the coordinates of the two end points	3.3
Drawing and interpreting linear graphs representing real-life situations, including speed/time and distance/time graphs	3.3
Drawing and interpreting non-linear graphs representing real-life situations	3.3

Algebra: Module 5 – Linear graphs

Target grades: A/B/C/D

Content	Area of Specification Content
Recognising that equations of the form $x = a$ and $y = b$ correspond to straight line graphs parallel to the *y*-axis and to the *x*-axis respectively	3.3
Completing tables of values and drawing graphs with equations of the form $y = mx + c$, where the values of *m* and *c* are given and *m* may be an integer or a fraction	3.3
Drawing straight-line graphs with equations in which *y* is given implicitly in terms of *x*, e.g. $x + y = 7$	3.3
Calculating the gradient of a straight line given the coordinates of two points on it	3.3
Recognising that graphs with equations of the form $y = mx + c$ are straight line graphs with gradient *m* and intercept (0, *c*) on the *y*-axis	3.3
Finding the equation of a straight line parallel to a given line	3.3

Prior knowledge

Algebra modules 1, 2, 3 and 4

Notes

The science department could provide experiment results which give linear graphs.

Axes should be labelled on graphs and a ruler should be used to draw linear graphs.

Algebra: Module 6 – Integer sequences

Target grades: C/D

Content	Area of Specification Content
Using term-to-term and position-to-term definitions to generate the terms of a sequence	3.1
Finding and using linear expressions to describe the *n*th term of an arithmetic sequence	3.1

Algebra: Module 7 – Quadratic equations

Target grade: A*/A/B/C

Content	Area of Specification Content
Solving quadratic equations by factorisation	2.7
Solving quadratic equations by using the quadratic formula	2.7
Setting up and solving quadratic equations from data given in a context	2.7
Solving 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	2.7
Solving 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 the other is of the form $x^2 + y^2 = r^2$	2.7

Prior knowledge

Algebra modules 1 and 3

Notes

Students should be reminded that factorisation of quadratics should be tried before the formula is used.

Algebra: Module 8 – Inequalities

Target grades: A/B/C

Content	Area of Specification Content
Understanding and using the symbols >, <, $\geq$ and $\leq$	2.8
Understanding and using the convention for open and closed intervals on a number line	2.8
Solving simple linear inequalities in one variable, including 'double-ended' inequalities	2.8
Representing on a number line the solution set of simple linear inequalities	2.8
Finding the integer solutions of simple linear inequalities	2.8
Using regions to represent simple linear inequalities in one variable	2.8
Using regions to represent the solution set to several linear inequalities in one or two variables	2.8
Solving quadratic inequalities in one unknown and representing the solution set on a number line	2.8

Prior knowledge

Algebra Modules 3, 5 and 7

Algebra: Module 9 – Indices

Target grades: A/B/C/D

Content	Area of Specification Content
Using index notation for positive integer powers	2.1
Substituting positive and negative numbers into expressions and formulae with quadratic and/or cubic terms	2.1
Completing tables of values and drawing graphs of quadratic functions	3.3
Using index notation with positive, negative and fractional powers to simplify expressions	2.1

Prior knowledge

Algebra Modules 2 and 4

Algebra: Module 10 – Proportion

Target grade: A

Content	Area of Specification Content
Setting up and using equations to solve problems involving direct or inverse proportion	2.5
Relating algebraic solutions to graphical representation of the equations	2.5

Prior knowledge

Algebra Modules 1, 2 and 3

Algebra: Module 11 – Function notation

Target grades: A/B

Content	Area of Specification Content
Understanding the concept that a function is a mapping between elements of two sets	3.2
Using function notation of the form $f(x) = ...$ and $f : x \ldots \mapsto$	3.2
Understanding the terms domain and range	3.2
Understanding which parts of the domain may need to be excluded	3.2
Understanding and using composite function fg and inverse function f^{-1}	3.2

Prior knowledge

Algebra Modules 1, 2 and 3

Algebra: Module 12 – Harder graphs

Target grades: A*/A/B

Content	Area of Specification Content
Plotting and drawing graphs with equation $y = Ax^3 + Bx^2 + Cx + D$ in which (i) the constants are integers and some could be zero (ii) the letters *x* and *y* can be replaced with any other two letters	3.3
Plotting and drawing graphs with equation $y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x^2}$ in which (i) the constants are integers and at least three of them are zero (ii) the letters *x* and *y* can be replaced with any other two letters	3.3
Finding the gradients of non-linear graphs by drawing a tangent	3.3
Finding the intersection points of two graphs, one linear (y_1) and one non-linear (y_2) and recognising that the solutions correspond to $y_2 - y_1 = 0$	3.3

Prior knowledge

Algebra Modules 1, 2, 3, 5 and 9

Notes

Students should be aware that rulers should **not** be used to join plotted points on non-linear graphs

When plotting points or reading off values from a graph, the scales on the axes should be checked carefully.

Algebra: Module 13 – Calculus

Target grades: A*/A/B

Content	Area of Specification Content
Understanding the concept of a variable rate of change	3.4
Differentiating integer powers of *x*	3.4
Determining gradients, rates of change, maxima and minima by differentiation and relating these to graphs	3.4
Applying calculus to linear kinematics and to other simple practical problems	3.4

Prior knowledge

Algebra Modules 1, 2, 5, 9 and 12

Notes

In applying calculus to linear kinematics, the reverse process of differentiation will not be expected.

Shape, space and measures: Module 1 – Average speed

Target grades: C/D

Content	Area of Specification Content
Understanding and using the relationship between average speed, distance and time	4.4

Shape, space and measures: Module 2 – Construction

Target grades: C/D

Content	Area of Specification Content
Constructing triangles and other 2-D shapes using ruler, protractor and compasses	4.5
Using three-figure bearings to specify direction	4.4
Using scale drawings to solve problems	4.5
Using straight edge and compasses to construct	
the perpendicular bisector of a line segment	4.5
the bisector of an angle	4.5

Notes

Encourage students to use sharp pencils to improve the neatness and accuracy of drawings.

A tolerance of $2°$ is reasonable for angles.

A sturdy pair of compasses is essential.

Students are often confused

(a) about the direction from which a bearing is measured

(b) when measuring angles larger than 90° on a diagram.

Shape, space and measures: Module 3 – Geometry

Target grades: C/D

Content	Area of Specification Content
Using parallel lines, alternate angles and corresponding angles	4.1
Using the angle sum of a triangle to calculate angles in triangles	4.1
Using angle properties of isosceles, equilateral and right-angled triangles	4.1
Understanding that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices	4.1
Using the angle sum of a quadrilateral to calculate angles in quadrilaterals	4.2
Understanding and using the properties of the parallelogram, rectangle, square, rhombus, trapezium and kite	4.2
Calculating and using the sums of the interior angles of polygons	4.2
Calculating and using the sum of the exterior angles of a polygon	4.2
Calculating the interior and exterior angles of regular polygons	4.2
Providing reasons, using standard geometrical statements to support numerical values for angles obtained in any geometrical context involving lines and polygons	4.7

Notes

In tackling questions, students should be made aware that given diagrams will not be drawn to scale and that they should not assume geometrical facts that are not given in the question.

Shape, space and measures: Module 4 – Transformations

Target grades: A/B/C/D

Content	Area of Specification Content
Understanding that rotations are specified by a centre and an angle	5.2
Rotating a shape about a point, measuring the angle of rotation in right angles, degrees or simple fractions of a turn	5.2
Understanding that an anti-clockwise rotation is a *positive* angle rotation and a clockwise rotation is a negative angle of rotation	5.2
Understanding that reflections are specified by a mirror line, e.g. $x = 1$, $y = x$ on a coordinate grid	5.2
Reflecting shapes in a mirror line	5.2
Constructing a mirror line, given a shape and its reflection	5.2
Understanding that translations are specified by vectors	5.2
Translating a shape, given the vector	5.2
Recognising that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations is congruent to the original shape	5.2
Understanding that enlargements are specified by a centre and a scale factor	5.2
Constructing enlargements of shapes with positive and fractional scale factors	5.2
Identifying the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments	5.2
Recognising that enlargements preserve angle but not length	5.2
Describing transformations in full	5.2
Describing a single transformation which is equivalent to a combination of transformations	5.2

Notes

Marks are often lost in the examination through failure to give a complete description of a transformation. For example, the centre of rotation is often omitted and it is not unusual to see the name of the transformation itself left out.

Shape, space and measures: Module 5 – Circle properties

Target grades: A*/A/B/C/D

Content	Area of Specification Content
Knowing and using these circle properties	
two tangents from a point to a circle are equal in length	4.6
tangents are perpendicular to the radius at the point of contact	4.6
bisects the chord (and the converse is true)	4.6
Recognising the term *cyclic quadrilateral*	4.6
Understanding and using angle properties of the circle including	
an angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the remaining part of the circumference	4.6
an angle subtended at the circumference by a diameter is a right angle	4.6
angles in the same segment are equal	4.6
the sum of the opposite angles of a cyclic quadrilateral is 180°	4.6
the alternate segment theorem	4.6
Understanding and using the internal and external intersecting chord properties	4.6
Providing reasons, using standard geometrical statements, to support numerical values for angles obtained in any geometrical context involving circles	4.7

Notes

In tackling questions, students should be made aware that given diagrams will not be drawn to scale and that they should not assume geometrical facts that are not given in the question.

Shape, space and measures: Module 6 – Area and perimeter

Target grades: A/B/C/D

Content	Area of Specification Content
Finding the areas of rectangles, triangles, parallelograms and trapezia, using relevant formulae	4.9
Finding circumferences and areas of circles using relevant formulae	4.9
Finding the areas of compound shapes made from rectangles and triangles	4.9
Finding perimeters and areas of sectors of circles	4.9
Converting between units of length and of area within the metric system e.g. m^2 and cm^2	4.9

Shape, space and measures: Module 7 – 3D Shapes and volume

Target grades: A/B/C/D

Content	Area of Specification Content
Understanding the terms face, edge and vertex in the context of a 3-D solid	4.9
Finding the volumes of right prisms, including cuboids and cylinders, using appropriate formulae	4.9
Finding the surface areas of solids with rectangular and triangular faces	4.9
Finding the surface area and/or volume of a sphere and of a right circular cone using relevant formulae	4.9
Converting between units of volume within the metric system, e.g. cm^3 and litres, m^3 and cm^3	4.9

Prior knowledge

SSM Module 6

Shape, space and measures: Module 8 – Pythagoras' theorem

Target grade: C

Content	Area of Specification Content
Understanding and using Pythagoras' theorem in 2 dimensions to find the length of the hypotenuse or of one of the shorter sides of a right-angled triangle	4.8
Using Pythagoras' theorem to solve problems	4.8

Notes

Students will avoid answers which are not sensible if they remember that

(i) the hypotenuse is the longest side

(II) the hypotenuse is less than the sum of the lengths of the other two sides

Some students find questions on this topic much more difficult if the orientation of the triangle is unusual.

Shape, space and measures: Module 9 – Trigonometry

Target grade: C

Content	Area of Specification Content
Identifying the various sides of a right angled triangle as the hypotenuse, opposite and adjacent	4.8
Understanding and using sine, cosine and tangent of acute angles to find lengths and angles in a right-angled triangle	4.8
Using trigonometry to solve problems, including bearings	4.8
Using Pythagoras' theorem and trigonometry to solve problems	4.8

Notes

Students should ensure that their calculators are in 'degree mode' before tackling trigonometry questions.

Shape, space and measures: Module 10 – Similar shapes

Target grade: A*/A/B/C

Content	Area of Specification Content
Understanding that, if two shapes are similar, their corresponding angles are equal and all their corresponding lengths are in the same ratio	4.10
Using similarity to find lengths of sides	4.10
Understanding that areas of similar figures are in the ratio of the square of corresponding sides	4.10
Understanding that the volumes of similar figures are in the ratio of the cube of corresponding sides	4.10
Using areas and volumes of similar figures in solving problems	4.10

Notes

Some students have difficulty in identifying correct ratios (lengths, areas, volumes) particularly when an area or a volume ratio of similar figures is given.

Shape, space and measures: Module 11 – Advanced trigonometry

Target grade: A*/A/B/C

Content	Area of Specification Content
Understanding and using sine, cosine and tangent of obtuse angles	4.8
Understanding and using angles of elevation and depression	4.8
Using Pythagoras' Theorem in 3 dimensions	4.8
Understanding and using $\frac{1}{2}ab\sin C$ for the area of a triangle	4.8
Understanding and using the sine rule and the cosine rule for any triangle	4.8
Applying trigonometrical methods to solve problems in 3 dimensions including finding the angle between a line and a plane but not the angle between two planes	4.8

Prior knowledge

SSM Modules 8 and 9

Notes

The concept that angles of elevation and depression are measured from the horizontal should be reinforced with students.

Arithmetical methods in handling the cosine rule, particularly with obtuse angles, should be reinforced with students.

Shape, space and measures: Module 12 – Vectors

Target grade: A*/A/B

Content	Area of Specification Content
Understanding that a vector has both magnitude and direction	5.1
Understanding and using vector notation	5.1
Multiplying vectors by scalar quantities	5.1
Adding and subtracting vectors	5.1
Calculating the modulus (magnitude) of a vector	5.1
Finding the resultant of two or more vectors	5.1
Applying vector methods for simple geometrical proofs in 2-D	5.1

Handling data: Module 1 – Graphical representation of data

Target grades: A/B

Content	Area of Specification Content
Constructing cumulative frequency diagrams from tabulated data	6.1
Constructing and interpreting histograms for unequal class intervals	6.1

Notes

Students need to be aware that the upper bound of the class interval is used to plot points in a cumulative frequency diagram.

Handling data: Module 2 – Statistical measures

Target grades: B/C/D

Content	Area of Specification Content
Understanding the concept of average as a value which is representative of a set of data	6.2
Finding the mean, median, mode and range for a discrete data set from a frequency table	6.2
Selecting the most appropriate average	6.2
Finding the modal class for grouped data	6.2
Calculating an estimate for the mean for grouped data, using halfway values	6.2
Estimating the median from a cumulative frequency diagram	6.2
Understanding the concept of a measure of spread	6.2
Estimating the quartiles and the interquartile range from given data or from a cumulative frequency diagram	6.2

Notes

Students need to be aware that the median and quartiles are read off as values from the non-cumulative frequency axis.

Handling data: Module 3 – Probability

Target grades: A*/A/B/C/D

Content	Area of Specification Content
Understanding sample spaces and using them to find the probability of an event	6.3
Listing systematically all the outcomes for single events or for two successive events and using lists to find the probability of an event	6.3
Using the sum of probabilities of all possible outcomes equalling 1	6.3
Understanding the meanings of ‘equally likely’ and ‘mutually exclusive’	6.3
Using the addition rule for probability for mutually exclusive events	6.3
Understanding and using expected frequency to calculate an estimate for the number of times an event will occur	6.3
Determining the probability that two or more independent events will both occur	6.3
Knowing when to add or multiply probabilities	6.3
Using simple conditional probability when combining events	6.3
Drawing tree diagrams to show the outcomes of two or more successive events and related probabilities	6.3
Using tree diagrams to solve probability problems	6.3

Notes

Some students may need reminding that only fractions, decimals and percentages may be used for probability. Answers like ‘2 in 3’, ‘2 out of 3’ and ‘2 : 3’ would be penalised in the examination.

Subject-specific information

Formulae Sheets

Formulae sheets will be provided for each tier and will be on page 2 of the question/answer booklet. The formulae sheets appear as appendices in the Specification document.

Calculators

Candidates will be expected to have access to a suitable electronic calculator for all examination papers.

- the electronic calculator to be used by candidates attempting Foundation Tier examination papers (1F and 2F) should have these functions as a minimum
- $+,\ -,\ \times,\ \div,\ x^2,\ \sqrt{x},$ memory, brackets, $x^y,\ \ x^{\frac{1}{y}}$ sine, cosine, tangent and their inverses.
- the electronic calculator to be used by candidates attempting Higher Tier examination papers (3H and 4H) should have these functions as a minimum

  $+,\ -,\ \times,\ \div,\ x^2,\ \sqrt{x},$ memory, brackets, $x^y,\ \ x^{\frac{1}{y}},\ \ \bar{x},\ \sum x,\ \sum fx,$

  standard form, sine, cosine, tangent and their inverses
- calculators with any of the following facilities are prohibited in any examination: databanks; retrieval of text or formulae; QWERTY keyboards; built-in symbolic algebraic manipulations; symbolic differentiation or integration
- calculators which are not permitted in any paper include Texas TI-89, TI-92, Casio cfx9970G, Hewlett Packard HP 48G, Casio C-300. (**NB:** There are almost certainly others that are not permitted. Check with London Examinations if unsure.)

Resources

Particularly recommended

Longman Mathematics for IGCSE, Book 1, – I Potts, W Waite, V Hony and D Turner (Longman 2004) ISBN: 1405 80211 1

Longman Mathematics for IGCSE, Book 2 – I Potts, W Waite, V Hony and D Turner (Longman 2005) ISBN: 1405 80212 X

The following texts will also prove useful in the delivery of this Specification

Edexcel GCSE Mathematics, Keith Pledger et al., ISBN: 0435532715 (Heinemann), 2001.

Collins' Study and Revision Guide: GCSE Mathematics, Paul Metcalf, ISBN: 000323505X (Collins), 1998.

GCSE Higher Mathematics 1, B. V. Hony et al., ISBN: 0582 43466 1 (Longman), 2002. Accompanying Answer Book: ISBN: 0582 43465 3

GCSE Higher Mathematics 2, B. V. Hony et al., ISBN: 0582 50357 4 (Longman), 2002. Accompanying Answer Book: ISBN 0582 50356 6

A Complete GCSE Mathematics: General Course, A. Greer, ISBN: 0748715991 (Nelson Thornes), 1993.

IGCSE Mathematics: Core Mathematics for IGCSE, David Rayner, ISBN: 0199147868 (OUP), 2000.

IGCSE Mathematics, Ric Pimental and Terry Wall, ISBN: 0719574587 (John Murray), 1997.

Further teacher guidance material on set language and notation, function notation and calculus is available as an additional resource on the Edexcel International website: www.edexcel-international.org by following the links to IGCSE and then to Mathematics.

Support and training

A programme of INSET courses covering various aspects of the specifications and assessment will be arranged by London Examinations on a regular basis. Full details may be obtained from

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Edexcel International
190 High Holborn
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Tel: +44 (0) 190 884 7750

E-mail: international@edexcel.org.uk

Edexcel publications

Support materials and further copies of this specification can be obtained from

Edexcel Publications
Adamsway
Mansfield
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