Cambridge Assessment International Education

Syllabus

Cambridge IGCSE™ (9–1)
Mathematics 0980

Use this syllabus for exams in 2023 and 2024.
Exams are available in the June and November series.

Version 1

Cambridge Pathway

Why choose Cambridge International?

Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part of the University of Cambridge.

Our Cambridge Pathway gives students a clear path for educational success from age 5 to 19. Schools can shape the curriculum around how they want students to learn – with a wide range of subjects and flexible ways to offer them. It helps students discover new abilities and a wider world, and gives them the skills they need for life, so they can achieve at school, university and work.

Our programmes and qualifications set the global standard for international education. They are created by subject experts, rooted in academic rigour and reflect the latest educational research. They provide a strong platform for learners to progress from one stage to the next, and are well supported by teaching and learning resources.

Our mission is to provide educational benefit through provision of international programmes and qualifications for school education and to be the world leader in this field. Together with schools, we develop Cambridge learners who are confident, responsible, reflective, innovative and engaged – equipped for success in the modern world.

Every year, nearly a million Cambridge students from 10 000 schools in 160 countries prepare for their future with the Cambridge Pathway.

'We think the Cambridge curriculum is superb preparation for university.'

Christoph Guttentag, Dean of Undergraduate Admissions, Duke University, USA

Quality management

Cambridge International is committed to providing exceptional quality. In line with this commitment, our quality management system for the provision of international qualifications and education programmes for students aged 5 to 19 is independently certified as meeting the internationally recognised standard, ISO 9001:2015. Learn more at **www.cambridgeinternational.org/ISO9001**

Contents

Important: Changes to this syllabus

For information about changes to this syllabus for 2023 and 2024, go to page 41.

The latest syllabus is version 1, published September 2020. There are no significant changes which affect teaching.

Any textbooks endorsed to support the syllabus for examination from 2020 are still suitable for use with this syllabus.

1 Why choose this syllabus?

Key benefits

Cambridge IGCSE is the world's most popular international qualification for 14 to 16 year olds, although it can be taken by students of other ages. It is tried, tested and trusted.

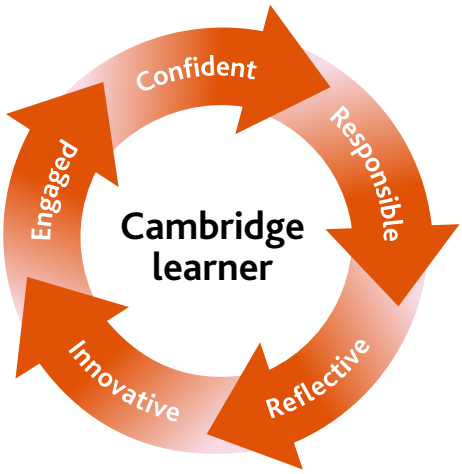
Students can choose from 70 subjects in any combination – it is taught by over 4800 schools in over 150 countries.

Our programmes balance a thorough knowledge and understanding of a subject and help to develop the skills learners need for their next steps in education or employment.

Cambridge IGCSE (9–1) Mathematics supports learners in building competency, confidence and fluency in their use of techniques and mathematical understanding. This course helps learners to develop a feel for quantity, patterns and relationships. Learners will develop their reasoning, problem-solving and analytical skills in a variety of abstract and real-life contexts.

Cambridge IGCSE (9–1) Mathematics provides a strong foundation of mathematical knowledge both for candidates studying mathematics at a higher level and those who will require mathematics to support skills in other subjects. The course is tiered to allow all candidates to achieve and progress in their mathematical studies.

Our approach in Cambridge IGCSE (9–1) Mathematics encourages learners to be:



'The strength of Cambridge IGCSE qualifications is internationally recognised and has provided an international pathway for our students to continue their studies around the world.'

Gary Tan, Head of Schools and CEO, Raffles International Group of Schools, Indonesia

International recognition and acceptance

Our expertise in curriculum, teaching and learning, and assessment is the basis for the recognition of our programmes and qualifications around the world. The combination of knowledge and skills in Cambridge IGCSE (9–1) Mathematics gives learners a solid foundation for further study. Candidates who achieve grades 9 to 4 are well prepared to follow a wide range of courses including Cambridge International AS & A Level Mathematics.

The combination of knowledge and skills in Cambridge IGCSE (9–1) Mathematics gives learners a solid foundation for further study. Candidates who perform well should be able to progress to the advanced study of mathematics. Teachers and learners should discuss anticipated achievement, taking into account learners' individual strengths in the subject.

From Cambridge IGCSE (9–1) Mathematics learners can progress to Cambridge IGCSE Additional Mathematics or straight to Cambridge International AS & A Level Mathematics, or other qualifications at that level.

Cambridge IGCSEs are accepted and valued by leading universities and employers around the world as evidence of academic achievement. Many universities require a combination of Cambridge International AS & A Levels and Cambridge IGCSEs or equivalent to meet their entry requirements.

UK NARIC, the national agency in the UK for the recognition and comparison of international qualifications and skills, has carried out an independent benchmarking study of Cambridge IGCSE and found it to be comparable to the standard of the reformed GCSE in the UK. This means students can be confident that their Cambridge IGCSE qualifications are accepted as equivalent to UK GCSEs by leading universities worldwide.

Learn more at **www.cambridgeinternational.org/recognition**

'Cambridge IGCSE is one of the most sought-after and recognised qualifications in the world. It is very popular in Egypt because it provides the perfect preparation for success at advanced level programmes.'

Managing Director of British School in Egypt BSE

Supporting teachers

We provide a wide range of resources, detailed guidance and innovative training and professional development so that you can give your students the best possible preparation for Cambridge IGCSE. To find out which resources are available for each syllabus go to our School Support Hub.

The School Support Hub is our secure online site for Cambridge teachers where you can find the resources you need to deliver our programmes. You can also keep up to date with your subject and the global Cambridge community through our online discussion forums.

Find out more at **www.cambridgeinternational.org/support**

Planning and preparation

- Next step guides
- Schemes of work
- Specimen papers
- Syllabuses
- Teacher guides

Teaching and assessment

- Endorsed resources
- Online forums
- Support for coursework and speaking tests

Support for Cambridge IGCSE

Learning and revision

- Example candidate responses
- Learner guides
- Past papers and mark schemes
- Specimen paper answers

Results

- Candidate Results Service
- Principal examiner reports for teachers
- Results Analysis

Sign up for email notifications about changes to syllabuses, including new and revised products and services at **www.cambridgeinternational.org/syllabusupdates**

Professional development

We support teachers through:

- Introductory Training – face-to-face or online
- Extension Training – face-to-face or online
- Enrichment Professional Development – face-to-face or online

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- Cambridge Professional Development Qualifications

Find out more at **www.cambridgeinternational.org/profdev**

Supporting exams officers

We provide comprehensive support and guidance for all Cambridge exams officers. Find out more at: **www.cambridgeinternational.org/eoguide**

2 Syllabus overview

Aims

The aims describe the purposes of a course based on this syllabus.

The aims are to enable students to:

- develop an understanding of mathematical principles, concepts and methods in a way which encourages confidence, provides satisfaction and enjoyment, and develops a positive attitude towards mathematics
- develop a feel for number and understand the significance of the results obtained
- apply mathematics in everyday situations and develop an understanding of the part that mathematics plays in learners' own lives and the world around them
- analyse and solve problems, present the solutions clearly, and check and interpret the results
- recognise when and how a situation may be represented mathematically, identify and interpret relevant factors, select an appropriate mathematical method to solve the problem, and evaluate the method used
- use mathematics as a means of communication with emphasis on the use of clear expression and structured argument
- develop an ability to apply mathematics in other subjects, particularly science and technology
- develop the ability to reason logically, make deductions and inferences, and draw conclusions
- appreciate patterns and relationships in mathematics and make generalisations
- appreciate the interdependence of different areas of mathematics
- acquire a foundation for further study of mathematics or for other disciplines.

Cambridge Assessment International Education is an education organisation and politically neutral. The contents of this syllabus, examination papers and associated materials do not endorse any political view. We endeavour to treat all aspects of the exam process neutrally.

Content overview

All candidates will study the following topics:

Number	Algebra	Shape and space	Probability and statistics
Number	Algebra and graphs	Geometry	Probability
	Coordinate geometry	Mensuration	Statistics
		Trigonometry	
		Vectors and transformations	

The course is tiered to enable effective differentiation for learners. The Core content is intended for learners targeting grades 1 to 5, and the Extended content is intended for learners targeting grades 4 to 9. All of the Core content is in the Extended content.

The subject content is organised by topic: number, algebra, shape and space, and probability and statistics. The content is not presented in a teaching order.

This content structure and the use of tiering allows flexibility for teachers to plan delivery appropriately for their learners.

Learners should be able to both use techniques listed in the content and apply them to solve problems.

Calculators are allowed throughout the assessment. Learners should know when and how to use their calculator, how to check their answers and how to apply rounding appropriately when solving a problem.

Learners should be able to show their working and be able to communicate mathematically, using appropriate notation and structure to communicate their reasoning within a problem.

Components	Number %	Algebra %	Shape and space %	Probability and statistics %
Core (Papers 1 and 3)	30–35	20–25	30–35	10–15
Extended (Papers 2 and 4)	15–20	35–40	30–35	10–15

Assessment overview

All candidates take two components.

Candidates who have studied the Core syllabus content, or who are expected to achieve a grade 4 or below, should be entered for Paper 1 and Paper 3. These candidates will be eligible for grades 1 to 5.

Candidates who have studied the Extended syllabus content and who are expected to achieve a grade 5 or above should be entered for Paper 2 and Paper 4. These candidates will be eligible for grades 3 to 9.

Core assessment

Core candidates take Paper 1 and Paper 3. The questions are based on the Core curriculum.

Paper 1 (Core)	
1 hour	35%
56 marks	
Short-answer questions	
Externally assessed	

Paper 3 (Core)	
2 hours	65%
104 marks	
Structured questions	
Externally assessed	

Extended assessment

Extended candidates take Paper 2 and Paper 4. The questions are based on the Extended curriculum.

Paper 2 (Extended)	
1 hour 30 minutes	35%
70 marks	
Short-answer questions	
Externally assessed	

Paper 4 (Extended)	
2 hours 30 minutes	65%
130 marks	
Structured questions	
Externally assessed	

- Candidates should have a scientific calculator for all papers.
- Three significant figures will be required in answers (or one decimal place for answers in degrees) except where otherwise stated.
- Candidates should use the value of π from their calculator or the value of 3.142.

Information on availability is in the **Before you start** section.

Assessment objectives

The assessment objectives (AOs) are:

AO1 Demonstrate knowledge and understanding of mathematical techniques

Candidates should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations including:

- organising, processing and presenting information accurately in written, tabular, graphical and diagrammatic forms
- using and interpreting mathematical notation correctly
- performing calculations and procedures by suitable methods, including using a calculator
- understanding systems of measurement in everyday use and making use of these
- estimating, approximating and working to degrees of accuracy appropriate to the context and converting between equivalent numerical forms
- using geometrical instruments to measure and to draw to an acceptable degree of accuracy
- recognising and using spatial relationships in two and three dimensions.

AO2 Reason, interpret and communicate mathematically when solving problems

Candidates should be able to analyse a problem, select a suitable strategy and apply appropriate techniques to obtain its solution, including:

- making logical deductions, making inferences and drawing conclusions from given mathematical data
- recognising patterns and structures in a variety of situations, and forming generalisations
- presenting arguments and chains of reasoning in a logical and structured way
- interpreting and communicating information accurately and changing from one form of presentation to another
- assessing the validity of an argument and critically evaluating a given way of presenting information
- solving unstructured problems by putting them into a structured form involving a series of processes
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics in problem solving
- interpreting results in the context of a given problem and evaluating the methods used and solutions obtained.

Weighting for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objectives as a percentage of the Core qualification

Assessment objective	Weighting in IGCSE %
AO1 Demonstrate knowledge and understanding of mathematical techniques	60–70
AO2 Reason, interpret and communicate mathematically when solving problems	30–40
Total	100

Assessment objectives as a percentage of the Extended qualification

Assessment objective	Weighting in IGCSE %
AO1 Demonstrate knowledge and understanding of mathematical techniques	40–50
AO2 Reason, interpret and communicate mathematically when solving problems	50–60
Total	100

Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %			
	Paper 1	Paper 2	Paper 3	Paper 4
AO1 Demonstrate knowledge and understanding of mathematical techniques	60–70	40–50	60–70	40–50
AO2 Reason, interpret and communicate mathematically when solving problems	30–40	50–60	30–40	50–60
Total	100	100	100	100

3 Subject content

This syllabus gives you the flexibility to design a course that will interest, challenge and engage your learners. Where appropriate you are responsible for selecting subject contexts, resources and examples to support your learners' study. These should be appropriate for the learners' age, cultural background and learning context as well as complying with your school policies and local legal requirements.

Candidates may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades 4 to 9 should follow the Extended curriculum.

C1 Number

	Core curriculum	Notes/Examples
C1.1	Identify and use natural numbers, integers (positive, negative and zero), prime numbers, square and cube numbers, common factors and common multiples, rational and irrational numbers (e.g. π, $\sqrt{2}$), real numbers, reciprocals.	Includes expressing numbers as a product of prime factors. Finding the lowest common multiple (LCM) and highest common factor (HCF) of two numbers.
C1.2	Understand notation of Venn diagrams. Definition of sets e.g. $A = \{x: x \text{ is a natural number}\}$ $B = \{a, b, c, \ldots\}$	Notation Number of elements in set A — $\mathrm{n}(A)$ Universal set — $\mathscr{E}$ Union of A and B — $A \cup B$ Intersection of A and B — $A \cap B$
C1.3	Calculate with squares, square roots, cubes and cube roots and other powers and roots of numbers.	Work out $3^2 \times \sqrt[4]{16}$
C1.4	Use directed numbers in practical situations.	e.g. temperature changes, flood levels.
C1.5	Use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts. Recognise equivalence and convert between these forms.	
C1.6	Order quantities by magnitude and demonstrate familiarity with the symbols $=, \neq, >, <, \geqslant, \leqslant$.	
C1.7	Understand the meaning of indices (fractional, negative and zero) and use the rules of indices. Use the standard form $A \times 10^n$ where n is a positive or negative integer, and $1 \leqslant A < 10$.	$5^{\frac{1}{2}} = \sqrt{5}$ Find the value of 5^{-2}, $100^{\frac{1}{2}}$, $8^{-\frac{2}{3}}$ Work out $2^{-3} \times 2^4$, $(2^3)^2$, $(2^{-3} \div 2^4)$ Convert numbers into and out of standard form. Calculate with values in standard form.

E1 Number

	Extended curriculum	Notes/Examples
E1.1	Identify and use natural numbers, integers (positive, negative and zero), prime numbers, square and cube numbers, common factors and common multiples, rational and irrational numbers (e.g. π, $\sqrt{2}$), real numbers, reciprocals.	Includes expressing numbers as a product of prime factors. Finding the lowest common multiple (LCM) and highest common factor (HCF) of two or more numbers.
E1.2	Use language, notation and Venn diagrams to describe sets and represent relationships between sets. Definition of sets e.g. $A = \{x: x \text{ is a natural number}\}$ $B = \{(x, y): y = mx + c\}$ $C = \{x: a \leqslant x \leqslant b\}$ $D = \{a, b, c, \ldots\}$	Notation Number of elements in set A — $\mathrm{n}(A)$ "… is an element of …" — $\in$ " …is not an element of …" — $\notin$ Complement of set A — A' The empty set — $\varnothing$ Universal set — $\mathscr{E}$ A is a subset of B — $A \subseteq B$ A is a proper subset of B — $A \subset B$ A is not a subset of B — $A \not\subseteq B$ A is not a proper subset of B — $A \not\subset B$ Union of A and B — $A \cup B$ Intersection of A and B — $A \cap B$
E1.3	Calculate with squares, square roots, cubes and cube roots and other powers and roots of numbers.	Work out $3^2 \times \sqrt[4]{16}$
E1.4	Use directed numbers in practical situations.	e.g. temperature changes, flood levels.
E1.5	Use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts. Recognise equivalence and convert between these forms.	Includes the conversion of recurring decimals to fractions, e.g. change $0.\dot{7}$ to a fraction
E1.6	Order quantities by magnitude and demonstrate familiarity with the symbols $=, \neq, >, <, \geqslant, \leqslant$.	
E1.7	Understand the meaning of indices (fractional, negative and zero) and use the rules of indices. Use the standard form $A \times 10^n$ where n is a positive or negative integer, and $1 \leqslant A < 10$.	$5^{\frac{1}{2}} = \sqrt{5}$ Find the value of 5^{-2}, $100^{\frac{1}{2}}$, $8^{-\frac{2}{3}}$ Work out $2^{-3} \times 2^4$, $(2^3)^2$, $(2^{-3} \div 2^4)$ Convert numbers into and out of standard form. Calculate with values in standard form.

C1	Number	
	Core curriculum continued	Notes/Examples
C1.8	Use the four rules for calculations with whole numbers, decimals and fractions (including mixed numbers and improper fractions), including correct ordering of operations and use of brackets.	Applies to positive and negative numbers.
C1.9	Make estimates of numbers, quantities and lengths, give approximations to specified numbers of significant figures and decimal places and round off answers to reasonable accuracy in the context of a given problem.	
C1.10	Give appropriate upper and lower bounds for data given to a specified accuracy.	e.g. measured lengths.
C1.11	Demonstrate an understanding of ratio and proportion. Calculate average speed. Use common measures of rate.	To include numerical problems involving direct and inverse proportion. Use ratio and scales in practical situations. Formulae for other rates will be given in the question e.g. pressure and density.
C1.12	Calculate a given percentage of a quantity. Express one quantity as a percentage of another. Calculate percentage increase or decrease.	
C1.13	Use a calculator efficiently. Apply appropriate checks of accuracy.	
C1.14	Calculate times in terms of the 24-hour and 12-hour clock. Read clocks, dials and timetables.	
C1.15	Calculate using money and convert from one currency to another.	
C1.16	Use given data to solve problems on personal and household finance involving earnings, simple interest and compound interest. Extract data from tables and charts.	Includes discount, profit and loss. Knowledge of compound interest formula **is** required.
C1.17	*Extended curriculum only.*	

E1	Number	
	Extended curriculum continued	Notes/Examples
E1.8	Use the four rules for calculations with whole numbers, decimals and fractions (including mixed numbers and improper fractions), including correct ordering of operations and use of brackets.	Applies to positive and negative numbers.
E1.9	Make estimates of numbers, quantities and lengths, give approximations to specified numbers of significant figures and decimal places and round off answers to reasonable accuracy in the context of a given problem.	
E1.10	Give appropriate upper and lower bounds for data given to a specified accuracy.	e.g. measured lengths.
	Obtain appropriate upper and lower bounds to solutions of simple problems given data to a specified accuracy.	e.g. the calculation of the perimeter or the area of a rectangle.
E1.11	Demonstrate an understanding of ratio and proportion.	To include numerical problems involving direct and inverse proportion.
	Increase and decrease a quantity by a given ratio.	
	Calculate average speed.	Use ratio and scales in practical situations.
	Use common measures of rate.	Formulae for other rates will be given in the question e.g. pressure and density.
E1.12	Calculate a given percentage of a quantity.	
	Express one quantity as a percentage of another.	
	Calculate percentage increase or decrease.	
	Carry out calculations involving reverse percentages.	e.g. finding the cost price given the selling price and the percentage profit.
E1.13	Use a calculator efficiently.	
	Apply appropriate checks of accuracy.	
E1.14	Calculate times in terms of the 24-hour and 12-hour clock.	
	Read clocks, dials and timetables.	
E1.15	Calculate using money and convert from one currency to another.	
E1.16	Use given data to solve problems on personal and household finance involving earnings, simple interest and compound interest.	Includes discount, profit and loss.
	Extract data from tables and charts.	Knowledge of compound interest formula is required.
E1.17	Use exponential growth and decay in relation to population and finance.	e.g. depreciation, growth of bacteria.

C2	Algebra and graphs	
	Core curriculum	Notes/Examples
C2.1	Use letters to express generalised numbers and express basic arithmetic processes algebraically. Substitute numbers for words and letters in formulae. Rearrange simple formulae. Construct simple expressions and set up simple equations.	
C2.2	Manipulate directed numbers.	
	Use brackets and extract common factors.	e.g. expand $3x(2x - 4y)$ e.g. factorise $9x^2 + 15xy$
	Expand products of algebraic expressions.	Two brackets only, e.g. expand $(x + 4)(x - 7)$
C2.3	*Extended curriculum only.*	
C2.4	Use and interpret positive, negative and zero indices.	
	Use the rules of indices.	e.g. simplify $3x^4 \times 5x$, $10x^3 \div 2x^2$, $(x^6)^2$
C2.5	Derive and solve simple linear equations in one unknown. Derive and solve simultaneous linear equations in two unknowns.	

E2 Algebra and graphs

	Extended curriculum	Notes/Examples
E2.1	Use letters to express generalised numbers and express basic arithmetic processes algebraically.	
	Substitute numbers for words and letters in complicated formulae.	
	Construct and rearrange complicated formulae and equations.	e.g. rearrange formulae where the subject appears twice.
E2.2	Manipulate directed numbers.	
	Use brackets and extract common factors.	e.g. expand $3x(2x - 4y)$ e.g. factorise $9x^2 + 15xy$
	Expand products of algebraic expressions.	e.g. expand $(x + 4)(x - 7)$ Includes products of more than two brackets, e.g. $(x + 4)(x - 7)(2x + 1)$
	Factorise where possible expressions of the form: $ax + bx + kay + kby$ $a^2x^2 - b^2y^2$ $a^2 + 2ab + b^2$ $ax^2 + bx + c$	
E2.3	Manipulate algebraic fractions.	e.g. $\frac{x}{3} + \frac{x-4}{2}$, $\frac{2x}{3} - \frac{3(x-5)}{2}$, $\frac{3a}{4} \times \frac{9a}{10}$, $\frac{3a}{4} \div \frac{9a}{10}$, $\frac{1}{x-2} + \frac{2}{x-3}$
	Factorise and simplify rational expressions.	e.g. $\frac{x^2 - 2x}{x^2 - 5x + 6}$
E2.4	Use and interpret positive, negative and zero indices.	
	Use and interpret fractional indices.	e.g. solve $32^x = 2$
	Use the rules of indices.	e.g. simplify $3x^{-4} \times \frac{2}{3}x^{\frac{1}{2}}$, $\frac{2}{5}x^{\frac{1}{2}} \div 2x^{-2}$, $\left(\frac{2x^5}{3}\right)^3$
E2.5	Derive and solve linear equations in one unknown.	
	Derive and solve simultaneous linear equations in two unknowns.	
	Derive and solve simultaneous equations, involving one linear and one quadratic.	
	Derive and solve quadratic equations by factorisation, completing the square and by use of the formula.	
	Derive and solve linear inequalities.	Including representing and interpreting inequalities on a number line. Interpretation of results may be required.

C2	Algebra and graphs	
	Core curriculum continued	Notes/Examples
C2.6	*Extended curriculum only.*	
C2.7	Continue a given number sequence. Recognise patterns in sequences including the term to term rule and relationships between different sequences.	Recognise sequences of square, cube and triangular numbers.
	Find and use the nth term of sequences.	Linear, simple quadratic and cubic sequences.
C2.8	*Extended curriculum only.*	
C2.9	*Extended curriculum only.*	
C2.10	Interpret and use graphs in practical situations including travel graphs and conversion graphs. Draw graphs from given data.	e.g. interpret the gradient of a straight line graph as a rate of change.
C2.11	Construct tables of values for functions of the form $ax + b$, $\pm x^2 + ax + b$, $\frac{a}{x}$ $(x \neq 0)$, where a and b are integer constants. Draw and interpret these graphs. Solve linear and quadratic equations approximately, including finding and interpreting roots by graphical methods.	
	Recognise, sketch and interpret graphs of functions.	Linear and quadratic only. Knowledge of turning points is **not** required.

E2	Algebra and graphs	
	Extended curriculum continued	Notes/Examples
E2.6	Represent inequalities graphically and use this representation to solve simple linear programming problems.	The conventions of using broken lines for strict inequalities and shading unwanted regions will be expected.
E2.7	Continue a given number sequence.	
	Recognise patterns in sequences including the term to term rule and relationships between different sequences.	Subscript notation may be used.
	Find and use the nth term of sequences.	Linear, quadratic, cubic and exponential sequences and simple combinations of these.
E2.8	Express direct and inverse proportion in algebraic terms and use this form of expression to find unknown quantities.	
E2.9	Use function notation, e.g. $\mathrm{f}(x) = 3x - 5$, $\mathrm{f}: x \longmapsto 3x - 5$, to describe simple functions.	
	Find inverse functions $\mathrm{f}^{-1}(x)$.	
	Form composite functions as defined by $\mathrm{gf}(x) = \mathrm{g}(\mathrm{f}(x))$.	
E2.10	Interpret and use graphs in practical situations including travel graphs and conversion graphs.	
	Draw graphs from given data.	
	Apply the idea of rate of change to simple kinematics involving distance–time and speed–time graphs, acceleration and deceleration.	May include estimation and interpretation of the gradient of a tangent at a point.
	Calculate distance travelled as area under a speed–time graph.	
E2.11	Construct tables of values and draw graphs for functions of the form ax^n (and simple sums of these) and functions of the form $ab^x + c$.	a and c are rational constants, b is a positive integer, and $n = -2, -1, 0, 1, 2, 3$.
		Sums would not include more than three functions.
	Solve associated equations approximately, including finding and interpreting roots by graphical methods.	Find turning points of quadratics by completing the square.
	Draw and interpret graphs representing exponential growth and decay problems.	
	Recognise, sketch and interpret graphs of functions.	Linear, quadratic, cubic, reciprocal and exponential.
		Knowledge of turning points and asymptotes is required.

C2	Algebra and graphs	
	Core curriculum continued	Notes/Examples
C2.12	*Extended curriculum only.*	
C2.13	*Extended curriculum only.*	

E2	Algebra and graphs	
	Extended curriculum continued	Notes/Examples
E2.12	Estimate gradients of curves by drawing tangents.	
E2.13	Understand the idea of a derived function. Use the derivatives of functions of the form ax^n, and simple sums of not more than three of these. Apply differentiation to gradients and turning points (stationary points). Discriminate between maxima and minima by any method.	a is a rational constant and n is a positive integer or 0. e.g. $2x^3 + x - 7$

C3	Coordinate geometry	
	Core curriculum	Notes/Examples
C3.1	Demonstrate familiarity with Cartesian coordinates in two dimensions.	
C3.2	Find the gradient of a straight line.	
C3.3	*Extended curriculum only.*	
C3.4	Interpret and obtain the equation of a straight line graph in the form $y = mx + c$.	Problems will involve finding the equation where the graph is given.
C3.5	Determine the equation of a straight line parallel to a given line.	e.g. find the equation of a line parallel to $y = 4x - 1$ that passes through $(0, -3)$.
C3.6	*Extended curriculum only.*	

E3	Coordinate geometry	
	Extended curriculum	Notes/Examples
E3.1	Demonstrate familiarity with Cartesian coordinates in two dimensions.	
E3.2	Find the gradient of a straight line. Calculate the gradient of a straight line from the coordinates of two points on it.	
E3.3	Calculate the length and the coordinates of the midpoint of a straight line from the coordinates of its end points.	
E3.4	Interpret and obtain the equation of a straight line graph.	
E3.5	Determine the equation of a straight line parallel to a given line.	e.g. find the equation of a line parallel to $y = 4x - 1$ that passes through $(0, -3)$.
E3.6	Find the gradient of parallel and perpendicular lines.	e.g. find the gradient of a line perpendicular to $y = 3x + 1$. e.g. find the equation of a line perpendicular to one passing through the coordinates $(1, 3)$ and $(-2, -9)$.

C4	Geometry	
	Core curriculum	Notes/Examples
C4.1	Use and interpret the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse and reflex angles, perpendicular, similarity and congruence. Use and interpret vocabulary of triangles, quadrilaterals, circles, polygons and simple solid figures including nets.	
C4.2	Measure and draw lines and angles. Construct a triangle given the three sides using a ruler and a pair of compasses only.	
C4.3	Read and make scale drawings.	
C4.4	Calculate lengths of similar figures.	
C4.5	Recognise congruent shapes.	
C4.6	Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions.	Includes properties of triangles, quadrilaterals and circles directly related to their symmetries.

E4	Geometry	
	Extended curriculum	Notes/Examples
E4.1	Use and interpret the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse and reflex angles, perpendicular, similarity and congruence. Use and interpret vocabulary of triangles, quadrilaterals, circles, polygons and simple solid figures including nets.	
E4.2	Measure and draw lines and angles. Construct a triangle given the three sides using a ruler and a pair of compasses only.	
E4.3	Read and make scale drawings.	
E4.4	Calculate lengths of similar figures. Use the relationships between areas of similar triangles, with corresponding results for similar figures and extension to volumes and surface areas of similar solids.	
E4.5	Use the basic congruence criteria for triangles (SSS, ASA, SAS, RHS).	
E4.6	Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions. Recognise symmetry properties of the prism (including cylinder) and the pyramid (including cone). Use the following symmetry properties of circles: • equal chords are equidistant from the centre • the perpendicular bisector of a chord passes through the centre • tangents from an external point are equal in length.	Includes properties of triangles, quadrilaterals and circles directly related to their symmetries.

C4	Geometry	
	Core curriculum continued	Notes/Examples
C4.7	Calculate unknown angles using the following geometrical properties: • angles at a point • angles at a point on a straight line and intersecting straight lines • angles formed within parallel lines • angle properties of triangles and quadrilaterals • angle properties of regular polygons • angle in a semicircle • angle between tangent and radius of a circle.	Candidates will be expected to use the correct geometrical terminology when giving reasons for answers.

E4	Geometry	
	Extended curriculum continued	Notes/Examples
E4.7	Calculate unknown angles using the following geometrical properties: • angles at a point • angles at a point on a straight line and intersecting straight lines • angles formed within parallel lines • angle properties of triangles and quadrilaterals • angle properties of regular polygons • angle in a semicircle • angle between tangent and radius of a circle • angle properties of irregular polygons • angle at the centre of a circle is twice the angle at the circumference • angles in the same segment are equal • angles in opposite segments are supplementary; cyclic quadrilaterals • alternate segment theorem.	Candidates will be expected to use the correct geometrical terminology when giving reasons for answers.

C5	Mensuration	
	Core curriculum	Notes/Examples
C5.1	Use current units of mass, length, area, volume and capacity in practical situations and express quantities in terms of larger or smaller units.	Convert between units including units of area and volume.
C5.2	Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.	
C5.3	Carry out calculations involving the circumference and area of a circle.	Answers may be asked for in multiples of π.
	Solve simple problems involving the arc length and sector area as fractions of the circumference and area of a circle.	Where the sector angle is a factor of 360.
C5.4	Carry out calculations involving the surface area and volume of a cuboid, prism and cylinder.	Answers may be asked for in multiples of π.
	Carry out calculations involving the surface area and volume of a sphere, pyramid and cone.	Formulae will be given for the surface area and volume of the sphere, pyramid and cone in the question.
C5.5	Carry out calculations involving the areas and volumes of compound shapes.	Answers may be asked for in multiples of π.

E5	Mensuration	
	Extended curriculum	Notes/Examples
E5.1	Use current units of mass, length, area, volume and capacity in practical situations and express quantities in terms of larger or smaller units.	Convert between units including units of area and volume.
E5.2	Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.	
E5.3	Carry out calculations involving the circumference and area of a circle. Solve problems involving the arc length and sector area as fractions of the circumference and area of a circle.	Answers may be asked for in multiples of π.
E5.4	Carry out calculations involving the surface area and volume of a cuboid, prism and cylinder. Carry out calculations involving the surface area and volume of a sphere, pyramid and cone.	Answers may be asked for in multiples of π. Formulae will be given for the surface area and volume of the sphere, pyramid and cone in the question.
E5.5	Carry out calculations involving the areas and volumes of compound shapes.	Answers may be asked for in multiples of π.

C6	Trigonometry	
	Core curriculum	Notes/Examples
C6.1	Interpret and use three-figure bearings.	Measured clockwise from the North, i.e. 000°–360°.
C6.2	Apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle.	Angles will be quoted in degrees. Answers should be written in degrees and decimals to one decimal place.
C6.3	*Extended curriculum only.*	
C6.4	*Extended curriculum only.*	
C6.5	*Extended curriculum only.*	

E6	Trigonometry	
	Extended curriculum	Notes/Examples
E6.1	Interpret and use three-figure bearings.	Measured clockwise from the North, i.e. 000°–360°.
E6.2	Apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle. Solve trigonometric problems in two dimensions involving angles of elevation and depression. Know that the perpendicular distance from a point to a line is the shortest distance to the line.	Angles will be quoted in degrees. Answers should be written in degrees and decimals to one decimal place.
E6.3	Recognise, sketch and interpret graphs of simple trigonometric functions. Graph and know the properties of trigonometric functions. Solve simple trigonometric equations for values between 0° and 360°.	e.g. $\sin x = \frac{\sqrt{3}}{2}$ for values of x between 0° and 360°.
E6.4	Solve problems using the sine and cosine rules for any triangle and the formula area of triangle = $\frac{1}{2}ab\sin C$.	Includes problems involving obtuse angles.
E6.5	Solve simple trigonometrical problems in three dimensions including angle between a line and a plane.	

C7	Vectors and transformations	
	Core curriculum	Notes/Examples
C7.1	Describe a translation by using a vector represented by e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or $\mathbf{a}$.	
	Add and subtract vectors.	
	Multiply a vector by a scalar.	
C7.2	Reflect simple plane figures in horizontal or vertical lines.	
	Rotate simple plane figures about the origin, vertices or midpoints of edges of the figures, through multiples of 90°.	
	Construct given translations and enlargements of simple plane figures.	Positive and fractional scale factors for enlargements only.
	Recognise and describe reflections, rotations, translations and enlargements.	Positive and fractional scale factors for enlargements only.
C7.3	*Extended curriculum only.*	

E7 Vectors and transformations

	Extended curriculum	Notes/Examples
E7.1	Describe a translation by using a vector represented by e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or $\mathbf{a}$.	
	Add and subtract vectors.	
	Multiply a vector by a scalar.	
E7.2	Reflect simple plane figures.	
	Rotate simple plane figures through multiples of 90°.	
	Construct given translations and enlargements of simple plane figures.	Positive, fractional and negative scale factors for enlargements.
	Recognise and describe reflections, rotations, translations and enlargements.	Positive, fractional and negative scale factors for enlargements.
E7.3	Calculate the magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2 + y^2}$.	Vectors will be printed as $\overrightarrow{AB}$ or $\mathbf{a}$ and their magnitudes denoted by modulus signs, e.g. $\lvert\overrightarrow{AB}\rvert$ or $\lvert\mathbf{a}\rvert$.
	Represent vectors by directed line segments.	In their answers to questions, candidates are expected to indicate a in some definite way, e.g. by an arrow or by underlining, thus $\overrightarrow{AB}$ or $\underline{a}$.
	Use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors.	
	Use position vectors.	

C8	Probability	
	Core curriculum	Notes/Examples
C8.1	Calculate the probability of a single event as either a fraction, decimal or percentage.	Problems could be set involving extracting information from tables or graphs.
C8.2	Understand and use the probability scale from 0 to 1.	
C8.3	Understand that the probability of an event occurring = 1 – the probability of the event not occurring.	
C8.4	Understand relative frequency as an estimate of probability. Expected frequency of occurrences.	
C8.5	Calculate the probability of simple combined events, using possibility diagrams, tree diagrams and Venn diagrams.	In possibility diagrams, outcomes will be represented by points on a grid, and in tree diagrams, outcomes will be written at the end of branches and probabilities by the side of the branches. Venn diagrams will be limited to two sets.
C8.6	*Extended curriculum only.*	

E8	Probability	
	Extended curriculum	Notes/Examples
E8.1	Calculate the probability of a single event as either a fraction, decimal or percentage.	Problems could be set involving extracting information from tables or graphs.
E8.2	Understand and use the probability scale from 0 to 1.	
E8.3	Understand that the probability of an event occurring = 1 – the probability of the event not occurring.	
E8.4	Understand relative frequency as an estimate of probability. Expected frequency of occurrences.	
E8.5	Calculate the probability of simple combined events, using possibility diagrams, tree diagrams and Venn diagrams.	In possibility diagrams, outcomes will be represented by points on a grid, and in tree diagrams, outcomes will be written at the end of branches and probabilities by the side of the branches.
E8.6	Calculate conditional probability using Venn diagrams, tree diagrams and tables.	e.g. Two dice are rolled. Given that the total showing on the two dice is 7, find the probability that one of the dice shows the number 2.

C9	Statistics	
	Core curriculum	Notes/Examples
C9.1	Collect, classify and tabulate statistical data.	
C9.2	Read, interpret and draw simple inferences from tables and statistical diagrams. Compare sets of data using tables, graphs and statistical measures. Appreciate restrictions on drawing conclusions from given data.	
C9.3	Construct and interpret bar charts, pie charts, pictograms, stem-and-leaf diagrams, simple frequency distributions, histograms with equal intervals and scatter diagrams.	
C9.4	Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purposes for which they are used.	
C9.5	*Extended curriculum only.*	
C9.6	*Extended curriculum only.*	
C9.7	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram.	
C9.8	Draw, interpret and use lines of best fit by eye.	

E9	Statistics	
	Extended curriculum	Notes/Examples
E9.1	Collect, classify and tabulate statistical data.	
E9.2	Read, interpret and draw inferences from tables and statistical diagrams. Compare sets of data using tables, graphs and statistical measures. Appreciate restrictions on drawing conclusions from given data.	
E9.3	Construct and interpret bar charts, pie charts, pictograms, stem-and-leaf diagrams, simple frequency distributions, histograms with equal and unequal intervals and scatter diagrams.	For unequal intervals on histograms, areas are proportional to frequencies and the vertical axis is labelled 'frequency density'.
E9.4	Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purposes for which they are used.	
E9.5	Calculate an estimate of the mean for grouped and continuous data. Identify the modal class from a grouped frequency distribution.	
E9.6	Construct and use cumulative frequency diagrams. Estimate and interpret the median, percentiles, quartiles and interquartile range. Construct and interpret box-and-whisker plots.	
E9.7	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram.	
E9.8	Draw, interpret and use lines of best fit by eye.	

4 Details of the assessment

Core assessment

Paper 1 – Core

1 hour, 56 marks

Candidates answer all questions.

This paper consists of short-answer questions based on the Core curriculum.

This is a compulsory component for Core candidates.

This written paper is an externally set assessment, marked by Cambridge International.

Paper 3 – Core

2 hours, 104 marks

Candidates answer all questions.

This paper consists of structured questions based on the Core curriculum.

This is a compulsory component for Core candidates.

This written paper is an externally set assessment, marked by Cambridge International.

Extended assessment

Paper 2 – Extended

1 hour 30 minutes, 70 marks

Candidates answer all questions.

This paper consists of short-answer questions based on the Extended curriculum.

This is a compulsory component for Extended candidates.

This written paper is an externally set assessment, marked by Cambridge International.

Paper 4 – Extended

2 hours 30 minutes, 130 marks

Candidates answer all questions.

This paper consists of structured questions based on the Extended curriculum.

This is a compulsory component for Extended candidates.

This written paper is an externally set assessment, marked by Cambridge International.

Command words

Command words and their meanings help candidates know what is expected from them in the exams. The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

Command word	What it means
Calculate	work out from given facts, figures or information, generally using a calculator
Construct	make an accurate drawing
Describe	state the points of a topic / give characteristics and main features
Determine	establish with certainty
Explain	set out purposes or reasons / make the relationships between things evident / provide why and/or how and support with relevant evidence
Give	produce an answer from a given source or recall / memory
Plot	mark point(s) on a graph
Show (that)	provide structured evidence that leads to a given result
Sketch	make a simple freehand drawing showing the key features
Work out	calculate from given facts, figures or information with or without the use of a calculator
Write	give an answer in a specific form
Write down	give an answer without significant working

5 What else you need to know

This section is an overview of other information you need to know about this syllabus. It will help to share the administrative information with your exams officer so they know when you will need their support. Find more information about our administrative processes at **www.cambridgeinternational.org/eoguide**

Before you start

Previous study

We recommend that learners starting this course should have studied a mathematics curriculum such as the Cambridge Lower Secondary programme or equivalent national educational framework.

Guided learning hours

We design Cambridge IGCSE syllabuses based on learners having about 130 guided learning hours for each subject during the course but this is for guidance only. The number of hours a learner needs to achieve the qualification may vary according to local practice and their previous experience of the subject.

Availability and timetables

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable.

You can view the timetable for your administrative zone at **www.cambridgeinternational.org/timetables**

You can enter candidates in the June and November exam series.

Check you are using the syllabus for the year the candidate is taking the exam.

Private candidates can enter for this syllabus.

Combining with other syllabuses

Candidates can take this syllabus alongside other Cambridge International syllabuses in a single exam series. The only exceptions are:

- Cambridge IGCSE Mathematics (0580)
- Cambridge IGCSE International Mathematics (0607)
- Cambridge O Level Mathematics (4024)

Cambridge IGCSE, Cambridge IGCSE (9–1) and Cambridge O Level syllabuses are at the same level.

Making entries

Exams officers are responsible for submitting entries to Cambridge International. We encourage them to work closely with you to make sure they enter the right number of candidates for the right combination of syllabus components. Entry option codes and instructions for submitting entries are in the *Cambridge Guide to Making Entries*. Your exams officer has a copy of this guide.

Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as administrative zones. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

Support for exams officers

We know how important exams officers are to the successful running of exams. We provide them with the support they need to make your entries on time. Your exams officer will find this support, and guidance for all other phases of the Cambridge Exams Cycle, at **www.cambridgeinternational.org/eoguide**

Retakes

Candidates can retake the whole qualification as many times as they want to.

Equality and inclusion

We have taken great care to avoid bias of any kind in the preparation of this syllabus and related assessment materials. In our effort to comply with the UK Equality Act (2010) we have taken all reasonable steps to avoid any direct and indirect discrimination.

The standard assessment arrangements may present barriers for candidates with impairments. Where a candidate is eligible, we may be able to make arrangements to enable that candidate to access assessments and receive recognition of their attainment. We do not agree access arrangements if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who cannot access the assessment of any component may be able to receive an award based on the parts of the assessment they have completed.

Information on access arrangements is in the *Cambridge Handbook* at **www.cambridgeinternational.org/eoguide**

Language

This syllabus and the related assessment materials are available in English only.

After the exam

Grading and reporting

Grades 9, 8, 7, 6, 5, 4, 3, 2 or 1 indicate the standard a candidate achieved at Cambridge IGCSE (9–1).

9 is the highest and 1 is the lowest. 'Ungraded' means that the candidate's performance did not meet the standard required for grade 1. 'Ungraded' is reported on the statement of results but not on the certificate.

In specific circumstances your candidates may see one of the following letters on their statement of results:

- Q (PENDING)
- X (NO RESULT).

These letters do not appear on the certificate.

On the statement of results and certificates, Cambridge IGCSE is shown as INTERNATIONAL GENERAL CERTIFICATE OF SECONDARY EDUCATION (IGCSE).

How students and teachers can use the grades

Assessment at Cambridge IGCSE has two purposes:

- to measure learning and achievement

  The assessment:
  - confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.
- to show likely future success

  The outcomes:
  - help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
  - help students choose the most suitable course or career.

Grade descriptions

Grade descriptions are provided to give an indication of the standards of achievement candidates awarded particular grades are likely to show. Weakness in one aspect of the examination may be balanced by a better performance in some other aspect.

Grade descriptions for Cambridge IGCSE (9–1) Mathematics will be published after the first assessment of the syllabus in 2020. Find more information at **www.cambridgeinternational.org/0980**

Changes to this syllabus for 2023 and 2024

The syllabus has been updated. This is version 1, published September 2020.

There are no significant changes which affect teaching.

You must read the whole syllabus before planning your teaching programme.

Any textbooks endorsed to support the syllabus for examination from 2020 are still suitable for use with this syllabus.

‘While studying Cambridge IGCSE and Cambridge International A Levels, students broaden their horizons through a global perspective and develop a lasting passion for learning.’

Zhai Xiaoning, Deputy Principal, The High School Affiliated to Renmin University of China

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