Cambridge Assessment International Education

Syllabus

Cambridge IGCSE®

International Mathematics 0607

For examination in June and November 2020, 2021 and 2022.

Version 1

Cambridge Pathway

Why choose Cambridge?

Cambridge Assessment International Education 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 international qualifications are recognised by the world's best universities and employers, giving students a wide range of options in their education and career. As a not-for-profit organisation, we devote our resources to delivering high-quality educational programmes that can unlock learners' potential.

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 an international education from Cambridge International.

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

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

Quality management

Our systems for managing the provision of international qualifications and education programmes for students aged 5 to 19 are certified as meeting the internationally recognised standard for quality management, ISO 9001:2008. Learn more at **www.cambridgeinternational.org/ISO9001**

Contents

Changes to this syllabus

For information about changes to this syllabus for 2020, 2021 and 2022, go to page 43.

The latest syllabus is version 1, published September 2017.

Any textbooks endorsed to support the syllabus for examination from 2017 are still suitable for use with this syllabus.

1 Why choose this syllabus?

Key benefits

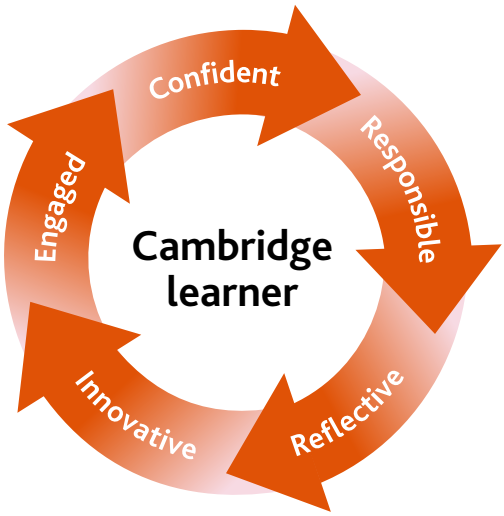
Cambridge IGCSE® syllabuses are created especially for international students. For over 25 years, we have worked with schools and teachers worldwide to develop syllabuses that are suitable for different countries, different types of schools and for learners with a wide range of abilities.

Cambridge IGCSE International 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 International 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 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.

Our approach 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

Recognition and progression

The combination of conceptual understanding with application of techniques and approaches in Cambridge IGCSE International Mathematics, such as investigation and modelling, 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 International 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 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 UK GCSE. 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.'

Mrs Omnia Kassabgy, Managing Director of British School in Egypt BSE

Supporting teachers

We provide a wide range of practical resources, detailed guidance, and innovative training and professional development so that you can give your learners the best possible preparation for Cambridge IGCSE.

Support for Cambridge IGCSE

Teaching resources

- School Support Hub **www.cambridgeinternational.org/support**
- Syllabus
- Scheme of work
- Learner guide
- Discussion forum
- Resource list
- Endorsed textbooks and digital resources

Exam preparation resources

- Question papers
- Mark schemes
- Example candidate responses to understand what examiners are looking for at key grades
- Examiner reports to improve future teaching

Training

- Face-to-face workshops around the world
- Online self-study training
- Online tutor-led training
- Cambridge Professional Development Qualifications

Community

You can find useful information, as well as share your ideas and experiences with other teachers, on our social media channels and community forums.

Find out more at **www.cambridgeinternational.org/social-media**

2 Syllabus overview

Aims

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

The aims are to enable students to:

- develop mathematical skills and apply them to other subjects and to the real world
- develop methods of problem-solving
- interpret mathematical results and understand their significance
- develop patience and persistence in solving problems
- develop a positive attitude towards mathematics which encourages enjoyment, fosters confidence and promotes enquiry and further learning
- appreciate the elegance of mathematics
- appreciate the difference between mathematical proof and pattern spotting
- appreciate the interdependence of different branches of mathematics and the links with other disciplines
- appreciate the international aspect of mathematics, its cultural and historical significance and its role in the real world
- read mathematics and communicate the subject in a variety of ways
- acquire a foundation of mathematical skills appropriate to further study and continued learning in mathematics.

Support for Cambridge IGCSE International Mathematics

Our School Support Hub **www.cambridgeinternational.org/support** provides Cambridge schools with a secure site for downloading specimen and past question papers, mark schemes, grade thresholds and other curriculum resources specific to this syllabus. The School Support Hub community offers teachers the opportunity to connect with each other and to ask questions related to the syllabus.

Content overview

Candidates may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades A* to C should follow the Extended curriculum.

All candidates will study the following topics:

1 Number
2 Algebra
3 Functions
4 Coordinate geometry
5 Geometry
6 Vectors and transformations
7 Mensuration
8 Trigonometry
9 Sets
10 Probability
11 Statistics

Graphic display calculator requirements

Candidates should be able to do the following using a graphic display calculator:

- sketch a graph
- produce a table of values for a function
- find zeros and local maxima or minima of a function
- find the intersection point of two graphs
- find mean, median, quartiles
- find the linear regression equation.

Other existing in-built applications should not be used and will gain no credit.

Calculators with symbolic algebraic logic are not permitted.

Any other applications and programs from external sources are not permitted.

Problem-solving requirements

Candidates should be able to:

- select the mathematics and information to model a situation
- select the appropriate tools, including ICT, to use in a situation
- apply appropriate methods and techniques to analyse a situation
- interpret and communicate the results of the analysis.

Assessment overview

All candidates take **three** papers.

Candidates who have studied the Core syllabus content should be entered for Paper 1, Paper 3 and Paper 5. These candidates are eligible for grades C to G.

Candidates who have studied the Extended syllabus content should be entered for Paper 2, Paper 4 and Paper 6. These candidates are eligible for grades A* to E.

Candidates should have a graphic display calculator for Papers 3, 4, 5 and 6.

Core candidates take:

Paper 1 (Core) 45 minutes
40 marks

Short-answer questions based on the Core curriculum

Calculators are **not** permitted

Assessing grades C–G

Externally assessed

This paper will be weighted at 25% of the final total mark

and:

Paper 3 (Core) 1 hour 45 minutes
96 marks

Structured questions based on the Core curriculum

Graphic display calculators are required

Assessing grades C–G

Externally assessed

This paper will be weighted at 60% of the final total mark

and:

Paper 5 Investigation (Core)
1 hour 10 minutes
36 marks

One investigative task based on the Core curriculum

Graphic display calculators are required

Assessing grades C–G

Externally assessed

This paper will be weighted at 15% of the final total mark

Total: 172 marks

Extended candidates take:

Paper 2 (Extended) 45 minutes
40 marks

Short-answer questions based on the Extended curriculum

Calculators are **not** permitted

Assessing grades A*–E

Externally assessed

This paper will be weighted at 20% of the final total mark

and:

Paper 4 (Extended) 2 hours 15 minutes
120 marks

Structured questions based on the Extended curriculum

Graphic display calculators are required

Assessing grades A*–E

Externally assessed

This paper will be weighted at 60% of the final total mark

and:

Paper 6 Investigation and modelling (Extended) 1 hour 40 minutes
60 marks

One investigative task and one modelling task based on the Extended curriculum

Graphic display calculators are required

Assessing grades A*–E

Externally assessed

This paper will be weighted at 20% of the final total mark

Total: 220 marks

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, interpreting and presenting information accurately in written, tabular, graphical and diagrammatic forms
- using and interpreting mathematical notation, terminology, diagrams and graphs correctly
- performing calculations and procedures by suitable methods, including using a calculator
- understanding and using measurement systems in everyday use
- estimating, approximating and working to degrees of accuracy appropriate to the context and converting between equivalent numerical forms
- recognising patterns and structures
- using mathematical instruments to draw and measure to an acceptable degree of accuracy
- using technology, including a graphic display calculator.

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:

- drawing logical conclusions from information and demonstrating the significance of mathematical or statistical results
- recognising patterns and structures in a variety of situations and forming generalisations
- communicating methods and results in a clear and logical form, using appropriate terminology, symbols, tables, diagrams and graphs
- solving unstructured problems by putting them into a structured form involving a series of processes
- applying combinations of mathematical skills and techniques to solve a problem
- solving a problem by investigation, analysis, the use of deductive skills and the application of an appropriate strategy
- using spatial awareness in solving problems
- using the concepts of mathematical modelling to describe a real-life situation and draw conclusions
- using statistical techniques to explore relationships in the real world
- using a graphic display calculator to interpret properties of functions and to solve problems
- using appropriate strategies in dealing with an investigative and a modelling task
- testing conjectures and determining their validity
- testing a mathematical model for validity and fitness for purpose.

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 qualification

Assessment objective	Weighting in IGCSE Core %	Weighting in IGCSE Extended %
AO1 Demonstrate knowledge and understanding of mathematical techniques	70	45
AO2 Reason, interpret and communicate mathematically when solving problems	30	55

Assessment objectives as a percentage of each component: Core curriculum

Assessment objective	Weighting in components %		
	Paper 1	Paper 3	Paper 5
AO1 Demonstrate knowledge and understanding of mathematical techniques	80	80	30
AO2 Reason, interpret and communicate mathematically when solving problems	20	20	70

Assessment objectives as a percentage of each component: Extended curriculum

Assessment objective	Weighting in components %		
	Paper 2	Paper 4	Paper 6
AO1 Demonstrate knowledge and understanding of mathematical techniques	60	45	35
AO2 Reason, interpret and communicate mathematically when solving problems	40	55	65

3 Subject content

Candidates may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades A* to E should follow the Extended curriculum.

C1 Number

	Core curriculum	Notes/Examples
C1.1	Vocabulary and notation for different sets of numbers: natural numbers $\mathbb{N}$, primes, squares, cubes, integers $\mathbb{Z}$, rational numbers $\mathbb{Q}$, irrational numbers, real numbers $\mathbb{R}$, triangle numbers	$\mathbb{N} = \{0, 1, 2, \ldots\}$
C1.2	Use of the four operations and brackets	
C1.3	Highest common factor (HCF), lowest common multiple (LCM)	
C1.4	Calculation of powers and roots	
C1.5	Ratio and proportion	Including use of e.g. map scales Syllabus link: C5.5
C1.6	*Extended curriculum only*	
C1.7	Equivalences between decimals, fractions and percentages	
C1.8	Percentages including applications such as interest and profit	Knowledge of reverse percentages is **not** required Includes both simple and compound interest
C1.9	Meaning of exponents (powers, indices) in $\mathbb{Z}$ Standard Form, $a \times 10^n$ where $1 \leqslant a < 10$ and $n \in \mathbb{Z}$ Rules for exponents	
C1.10	*Extended curriculum only*	
C1.11	Estimating, rounding, decimal places and significant figures	
C1.12	Calculations involving time: seconds (s), minutes (min), hours (h), days, months, years including the relation between consecutive units	1 year = 365 days
C1.13	Problems involving speed, distance and time	

E1 Number

	Extended curriculum	Notes/Examples
E1.1	Vocabulary and notation for different sets of numbers: natural numbers $\mathbb{N}$, primes, squares, cubes, integers $\mathbb{Z}$, rational numbers $\mathbb{Q}$, irrational numbers, real numbers $\mathbb{R}$, triangle numbers	$\mathbb{N} = \{0, 1, 2, \ldots\}$
E1.2	Use of the four operations and brackets	
E1.3	Highest common factor (HCF), lowest common multiple (LCM)	
E1.4	Calculation of powers and roots	
E1.5	Ratio and proportion	Including use of e.g. map scales Syllabus link: E5.5
E1.6	Absolute value $\lvert x \rvert$	
E1.7	Equivalences between decimals, fractions and percentages	
E1.8	Percentages including applications such as interest and profit	Includes both simple and compound interest Includes percentiles Syllabus links: E3.2, E11.7, E3.10
E1.9	Meaning of exponents (powers, indices) in $\mathbb{Q}$ Standard Form, $a \times 10^n$ where $1 \leqslant a < 10$ and $n \in \mathbb{Z}$ Rules for exponents	
E1.10	Surds (radicals), simplification of square root expressions Rationalisation of the denominator	e.g. $\frac{1}{\sqrt{3}-1}$
E1.11	Estimating, rounding, decimal places and significant figures	
E1.12	Calculations involving time: seconds (s), minutes (min), hours (h), days, months, years including the relation between consecutive units	1 year = 365 days
E1.13	Problems involving speed, distance and time	

C2 Algebra

	Core curriculum	Notes/Examples
C2.1	Writing, showing and interpretation of inequalities, including those on the real number line	Syllabus link: C9.2
C2.2	Solution of simple linear inequalities	
C2.3	Solution of linear equations	
C2.4	Simple indices – multiplying and dividing	e.g. $8x^5 \div 2x^3$
C2.5	Derivation, rearrangement and evaluation of simple formulae	
C2.6	Solution of simultaneous linear equations in two variables	
C2.7	Expansion of brackets	Including e.g. $(x - 5)(2x + 1)$
C2.8	Factorisation: common factor only	e.g. $6x^2 + 9x = 3x(2x + 3)$
C2.9	Algebraic fractions:	
	simplification	e.g. $\frac{2x^2}{6x}$
	addition or subtraction of fractions with integer denominators	e.g. $\frac{2x}{3} - \frac{y}{5}$
	multiplication or division of two simple fractions	e.g. $\frac{p}{q} \div \frac{2t}{3q}$
C2.10	*Extended curriculum only*	
C2.11	Use of a graphic display calculator to solve equations, including those which may be unfamiliar	e.g. $2x = x^2$ Syllabus link: C3.6

E2 Algebra

	Extended curriculum	Notes/Examples
E2.1	Writing, showing and interpretation of inequalities, including those on the real number line	Syllabus link: E9.2
E2.2	Solution of linear and quadratic inequalities Solution of inequalities using a graphic display calculator	e.g. $2x^2 + 5x - 3 < 0$
E2.3	Solution of linear equations including those with fractional expressions	
E2.4	Indices	
E2.5	Derivation, rearrangement and evaluation of formulae	
E2.6	Solution of simultaneous linear equations in two variables	
E2.7	Expansion of brackets, including the square of a binomial	
E2.8	Factorisation:	
	common factor	e.g. $6x^2 + 9x = 3x(2x + 3)$
	difference of squares	e.g. $9x^2 - 16y^2 = (3x - 4y)(3x + 4y)$
	trinomial	e.g. $6x^2 + 11x - 10 = (3x - 2)(2x + 5)$
	four term	e.g. $xy - 3x + 2y - 6 = (x + 2)(y - 3)$
E2.9	Algebraic fractions:	
	simplification, including use of factorisation addition or subtraction of fractions with linear denominators or single term multiplication or division and simplification of two fractions	$\frac{1}{x} + \frac{1}{x^2}$ or $\frac{2}{x} - \frac{1}{xy^2}$
E2.10	Solution of quadratic equations:	
	by factorisation	
	using a graphic display calculator	Syllabus link: E3.6
	using the quadratic formula	Formula given
E2.11	Use of a graphic display calculator to solve equations, including those which may be unfamiliar	e.g. $2x - 1 = \frac{1}{x^3}$ Syllabus link: C3.6

C2 Algebra

	Core curriculum continued	Notes/Examples
C2.12	Continuation of a sequence of numbers or patterns Determination of the nth term Use of a difference method to find the formula for a linear sequence or a simple quadratic sequence	
C2.13	*Extended curriculum only*	

E2 Algebra

	Extended curriculum continued	Notes/Examples
E2.12	Continuation of a sequence of numbers or patterns Determination of the nth term Use of a difference method to find the formula for a linear sequence, a quadratic sequence or a cubic sequence Identification of a simple geometric sequence and determination of its formula	
E2.13	Direct variation (proportion) $y \propto x$, $y \propto x^2$, $y \propto x^3$, $y \propto \sqrt{x}$ Inverse variation $y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$, $y \propto \frac{1}{\sqrt{x}}$ Best variation model for given data	Syllabus link: modelling

C3 Functions

	Core curriculum	Notes/Examples
C3.1	Notation	
	Domain and range	Domain is $\mathbb{R}$ unless stated otherwise
	Mapping diagrams	
C3.2	*Extended curriculum only*	
C3.3	*Extended curriculum only*	
C3.4	*Extended curriculum only*	
C3.5	Understanding of the concept of asymptotes and graphical identification of simple examples parallel to the axes	
C3.6	Use of a graphic display calculator to:	
	sketch the graph of a function	Including unfamiliar functions not mentioned explicitly in this syllabus
	produce a table of values	Vertex of quadratic
	find zeros, local maxima or minima	Syllabus link: C2.11
	find the intersection of the graphs of functions	
C3.7	*Extended curriculum only*	
C3.8	Description and identification, using the language of transformations, of the changes to the graph of $y = \mathrm{f}(x)$ when $y = \mathrm{f}(x) + k$, $y = \mathrm{f}(x + k)$	k an integer Syllabus link: C6.4
C3.9	*Extended curriculum only*	
C3.10	*Extended curriculum only*	

E3 Functions

	Extended curriculum	Notes/Examples
E3.1	Notation Domain and range Mapping diagrams	Domain is $\mathbb{R}$ unless stated otherwise
E3.2	Recognition of the following function types from the shape of their graphs:	Syllabus link: modelling Some of a, b, c or d may be 0
	linear $f(x) = ax + b$	Syllabus link: E4.6
	quadratic $f(x) = ax^2 + bx + c$	Syllabus link: E4.8
	cubic $f(x) = ax^3 + bx^2 + cx + d$	
	reciprocal $f(x) = \frac{a}{x}$	
	exponential $f(x) = a^x$ with $0 < a < 1$ or $a > 1$	Compound interest Syllabus link: E1.8
	absolute value $f(x) = \lvert ax + b \rvert$	
	trigonometric $f(x) = a\sin(bx)$; $a\cos(bx)$; $\tan x$	Including period and amplitude Syllabus link: E8.8
E3.3	Determination of at most two of a, b, c or d in simple cases of 3.2	Syllabus link: modelling
E3.4	Finding the quadratic function given	
	vertex and another point,	$y = a(x - h)^2 + k$ has a vertex of (h, k)
	x-intercepts and a point,	
	vertex or x-intercepts with $a = 1$	
E3.5	Understanding of the concept of asymptotes and graphical identification of simple examples parallel to the axes	e.g. $f(x) = \tan x$ asymptotes at 90°, 270°, etc. Excludes algebraic derivation of asymptotes Excludes oblique asymptotes
E3.6	Use of a graphic display calculator to:	
	sketch the graph of a function	Including unfamiliar functions not mentioned explicitly in this syllabus
	produce a table of values	
	find zeros, local maxima or minima	Syllabus link: E2.11
	find the intersection of the graphs of functions	Vertex of quadratic Syllabus link: E2.10
E3.7	Simplify expressions such as $f(g(x))$ where $g(x)$ is a linear expression	
E3.8	Description and identification, using the language of transformations, of the changes to the graph of	Syllabus link: E6.4
	$y = f(x)$ when $y = f(x) + k$, $y = k\,f(x)$, $y = f(x + k)$	k an integer
E3.9	Inverse function f^{-1}	Syllabus link: E6.5
E3.10	Logarithmic function as the inverse of the exponential function	Syllabus link: E1.8
	$y = a^x$ equivalent to $x = \log_a y$	$\log x$ is $\log_{10} x$ unless stated otherwise
	Rules for logarithms corresponding to rules for exponents	
	Solution to $a^x = b$ as $x = \frac{\log b}{\log a}$	

C4 Coordinate geometry

	Core curriculum	Notes/Examples
C4.1	Plotting of points and reading from a graph in the Cartesian plane	Syllabus link: C11.1
C4.2	Distance between two points	Syllabus link: C5.6
C4.3	Mid-point of a line segment	
C4.4	Gradient of a line segment	
C4.5	Gradient of parallel lines	
C4.6	Equation of a straight line as $y = mx + c$ or $x = k$	
C4.7	*Extended curriculum only*	
C4.8	Symmetry of diagrams or graphs in the Cartesian plane	Syllabus link: C5.2

E4 Coordinate geometry

	Extended curriculum	Notes/Examples
E4.1	Plotting of points and reading from a graph in the Cartesian plane	Syllabus link: E11.1
E4.2	Distance between two points	Syllabus links: E5.6 and E6.3
E4.3	Mid-point of a line segment	
E4.4	Gradient of a line segment	
E4.5	Gradient of parallel and perpendicular lines	
E4.6	Equation of a straight line as $y = mx + c$ and $ax + by = d$ (a, b and d integer)	Syllabus link: E3.2
E4.7	Linear inequalities in the Cartesian plane	Shade unwanted regions
E4.8	Symmetry of diagrams or graphs in the Cartesian plane	Syllabus links: E3.2 and E5.2

C5 Geometry

	Core curriculum	Notes/Examples
C5.1	Use and interpret the geometrical terms: acute, obtuse, right angle, reflex, parallel, perpendicular, congruent, similar	
	Use and interpret vocabulary of triangles, quadrilaterals, polygons and simple solid figures	e.g. pyramids including tetrahedrons
C5.2	Line and rotational symmetry	Syllabus link: C4.8
C5.3	Angle measurement in degrees	
C5.4	Angles round a point Angles on a straight line and intersecting straight lines Vertically opposite angles Alternate and corresponding angles on parallel lines Angle sum of a triangle, quadrilateral and polygons Interior and exterior angles of a polygon Angles of regular polygons	
C5.5	Similarity Calculation of lengths of similar figures	Syllabus link: C1.5
C5.6	Pythagoras' Theorem in two dimensions Including: chord length distance of a chord from the centre of a circle distances on a grid	Syllabus link: C4.2
C5.7	Use and interpret vocabulary of circles Properties of circles: • tangent perpendicular to radius at the point of contact • tangents from a point • angle in a semicircle	Includes sector and segment

E5 Geometry

	Extended curriculum	Notes/Examples
E5.1	Use and interpret the geometrical terms: acute, obtuse, right angle, reflex, parallel, perpendicular, congruent, similar Use and interpret vocabulary of triangles, quadrilaterals, polygons and simple solid figures	 e.g. pyramids including tetrahedrons
E5.2	Line and rotational symmetry	Syllabus link: E4.8
E5.3	Angle measurement in degrees	
E5.4	Angles round a point Angles on a straight line and intersecting straight lines Vertically opposite angles Alternate and corresponding angles on parallel lines Angle sum of a triangle, quadrilateral and polygons Interior and exterior angles of a polygon Angles of regular polygons	
E5.5	Similarity Calculation of lengths of similar figures Use of area and volume scale factors	Syllabus link: E1.5
E5.6	Pythagoras' Theorem and its converse in two and three dimensions Including: chord length distance of a chord from the centre of a circle distances on a grid	Syllabus links: E6.3 and E4.2
E5.7	Use and interpret vocabulary of circles Properties of circles: • tangent perpendicular to radius at the point of contact • tangents from a point • angle in a semicircle • angles at the centre and at the circumference on the same arc • cyclic quadrilateral • alternate segment	Includes sector and segment

C6 Vectors and transformations

	Core curriculum	Notes/Examples
C6.1	Notation: component form $\begin{pmatrix} x \\ y \end{pmatrix}$	
C6.2	*Extended curriculum only*	
C6.3	*Extended curriculum only*	
C6.4	Transformations on the Cartesian plane: • translation • reflection • rotation • enlargement (reduction) Description of a transformation	Syllabus link: C3.8
C6.5	*Extended curriculum only*	
C6.6	*Extended curriculum only*	

E6 Vectors and transformations

	Extended curriculum	Notes/Examples
E6.1	Notation: component form $\begin{pmatrix} x \\ y \end{pmatrix}$	
E6.2	Addition and subtraction of vectors Negative of a vector Multiplication of a vector by a scalar	
E6.3	Find the magnitude of $\begin{pmatrix} x \\ y \end{pmatrix}$	Syllabus links: E4.2 and E5.6
E6.4	Transformations on the Cartesian plane: • translation • reflection • rotation • enlargement (reduction) • stretch Description of a transformation	Syllabus link: E3.8
E6.5	Inverse of a transformation	Syllabus link: E3.9
E6.6	Combined transformations	

C7 Mensuration

	Core curriculum	Notes/Examples
C7.1	Units: mm, cm, m, km mm^2, cm^2, m^2, ha, km^2 mm^3, cm^3, m^3 ml, cl, l, g, kg, t	Convert between units
C7.2	Perimeter and area of rectangle, triangle and compound shapes derived from these	Formula given for area of triangle Syllabus link: C5.1
C7.3	Circumference and area of a circle Arc length and area of sector	Formulae given for circumference and area of a circle
C7.4	Surface area and volume of prism and pyramid (in particular, cuboid, cylinder and cone) Surface area and volume of sphere and hemisphere	Formulae given for curved surface areas of cylinder, cone and sphere; volume of pyramid, cone, cylinder, prism and sphere
C7.5	Areas and volumes of compound shapes	Simple cases only

E7 Mensuration

	Extended curriculum	Notes/Examples
E7.1	Units: mm, cm, m, km mm^2, cm^2, m^2, ha, km^2 mm^3, cm^3, m^3 ml, cl, l, g, kg, t	Convert between units
E7.2	Perimeter and area of rectangle, triangle and compound shapes derived from these	Syllabus link: E5.1
E7.3	Circumference and area of a circle Arc length and area of sector	
E7.4	Surface area and volume of prism and pyramid (in particular, cuboid, cylinder and cone) Surface area and volume of sphere and hemisphere	Formulae given for curved surface areas of cylinder, cone and sphere; volume of pyramid, cone, cylinder, and sphere
E7.5	Areas and volumes of compound shapes	

C8 Trigonometry

	Core curriculum	Notes/Examples
C8.1	Right-angled triangle trigonometry	
C8.2	*Extended curriculum only*	
C8.3	*Extended curriculum only*	
C8.4	*Extended curriculum only*	
C8.5	*Extended curriculum only*	
C8.6	*Extended curriculum only*	
C8.7	Applications: three-figure bearings and North, East, South, West problems in two dimensions	
C8.8	*Extended curriculum only*	

E8 Trigonometry

	Extended curriculum	Notes/Examples
E8.1	Right-angled triangle trigonometry	
E8.2	Exact values for the trigonometric ratios of 0°, 30°, 45°, 60°, 90°	
E8.3	Extension to the four quadrants, i.e. 0°–360°	
E8.4	Sine rule	Formula given, ASA SSA (ambiguous case)
E8.5	Cosine rule	Formula given, SAS, SSS
E8.6	Area of triangle	Formula given
E8.7	Applications: three-figure bearings and North, East, South, West problems in two and three dimensions	
E8.8	Properties of the graphs of $y = \sin x$, $y = \cos x$, $y = \tan x$	x in degrees Syllabus links: E3.2 and E3.8

C9 Sets

	Core curriculum	Notes/Examples
C9.1	Notation and meaning for: • number of elements in A, $(n(A))$ • is an element of $(\in)$ • is not an element of $(\notin)$ • complement of A, (A') • empty set $(\varnothing$ or $\{\ \})$ • universal set (U) • is a subset of $(\subseteq)$ • is a proper subset of $(\subset)$	
C9.2	Sets in descriptive form $\{ x \mid \quad \}$ or as a list	Syllabus link: C2.1
C9.3	Venn diagrams with at most two sets	Syllabus link: C10.6
C9.4	Intersection and union of sets	

E9 Sets

	Extended curriculum	Notes/Examples
E9.1	Notation and meaning for: • number of elements in A, $(n(A))$ • is an element of $(\in)$ • is not an element of $(\notin)$ • complement of A, (A') • empty set $(\varnothing$ or $\{\ \})$ • universal set (U) • is a subset of $(\subseteq)$ • is a proper subset of $(\subset)$	
E9.2	Sets in descriptive form $\{ x \mid \quad \}$ or as a list	Syllabus link: E2.1
E9.3	Venn diagrams with at most three sets	Syllabus link: E10.6
E9.4	Intersection and union of sets	

C10 Probability

	Core curriculum	Notes/Examples
C10.1	Probability P(*A*) as a fraction, decimal or percentage Significance of its value	
C10.2	Relative frequency as an estimate of probability	
C10.3	Expected frequency of occurrences	
C10.4	Combining events	simple cases only
C10.5	Tree diagrams including successive selection with or without replacement	simple cases only
C10.6	Probabilities from Venn diagrams and tables	Syllabus link: C9.3

E10 Probability

	Extended curriculum	Notes/Examples
E10.1	Probability P(A) as a fraction, decimal or percentage Significance of its value	
E10.2	Relative frequency as an estimate of probability	
E10.3	Expected frequency of occurrences	
E10.4	Combining events:	
	the addition rule $P(A \text{ or } B) = P(A) + P(B)$	Mutually exclusive
	the multiplication rule $P(A \text{ and } B) = P(A) \times P(B)$	Independent
E10.5	Tree diagrams including successive selection with or without replacement	
E10.6	Probabilities from Venn diagrams and tables	Syllabus link: E9.3

C11 Statistics

	Core curriculum	Notes/Examples
C11.1	Reading and interpretation of graphs or tables of data	Syllabus link: C4.1
C11.2	Discrete and continuous data	
C11.3	(Compound) bar chart, line graph, pie chart, pictograms, stem-and-leaf diagram, scatter diagram	
C11.4	Mean, mode, median, quartiles and range from lists of discrete data	
	Mean, mode, median and range from grouped discrete data	
C11.5	Mean from continuous data	
C11.6	Cumulative frequency table and curve	
	Median, quartiles and interquartile range	Read from curve
C11.7	Use of a graphic display calculator to calculate mean, median and quartiles for discrete data and mean for grouped data	
C11.8	Understanding and description of correlation (positive, negative or zero) with reference to a scatter diagram	The coefficient of correlation is not required
	Straight line of best fit (by eye) through the mean on a scatter diagram	

E11 Statistics

	Extended curriculum	Notes/Examples
E11.1	Reading and interpretation of graphs or tables of data	Syllabus link: E4.1
E11.2	Discrete and continuous data	
E11.3	(Compound) bar chart, line graph, pie chart, pictograms, stem-and-leaf diagram, scatter diagram	
E11.4	Mean, mode, median, quartiles and range from lists of discrete data Mean, mode, median and range from grouped discrete data	
E11.5	Mean from continuous data	
E11.6	Cumulative frequency table and curve Median, quartiles, percentiles and interquartile range	 Read from curve
E11.7	Use of a graphic display calculator to calculate mean, median, and quartiles for discrete data and mean for grouped data	Syllabus link: E1.8
E11.8	Understanding and description of correlation (positive, negative or zero) with reference to a scatter diagram Straight line of best fit (by eye) through the mean on a scatter diagram Use a graphic display calculator to find equation of linear regression	The coefficient of correlation is not required

4 Details of the assessment

All candidates take **three** papers.

Candidates who have studied the Core syllabus content should be entered for Paper 1, Paper 3 and Paper 5. These candidates are eligible for grades C to G.

Candidates who have studied the Extended syllabus content should be entered for Paper 2, Paper 4 and Paper 6. These candidates are eligible for grades A* to E.

Core assessment

Paper 1 (Core)

45 minutes, 40 marks

Candidates answer **all** questions.

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

Calculators are **not** permitted.

The paper is designed to assess knowledge and use of mathematical skills and methods.

Any part of the syllabus content may be tested in this paper but questions will focus on concepts which can be assessed without access to a calculator.

This is a compulsory component for Core candidates.

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

Paper 3 (Core)

1 hour 45 minutes, 96 marks

Candidates answer **all** questions.

This paper consists of 11–15 structured questions based on the Core curriculum.

Graphic display calculators are required.

Some of the questions will assess the use of the graphic display calculator functions described on page 6.

This is a compulsory component for Core candidates.

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

Paper 5 Investigation (Core)

1 hour 10 minutes, 36 marks

Candidates answer **all** questions.

This paper consists of an investigative task based on the Core curriculum.

Graphic display calculators are required.

Candidates are assessed on their ability to investigate and solve a more open-ended problem.

Clear communication and full reasoning are especially important and mark schemes reflect this.

This is a compulsory component for Core candidates.

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

Extended assessment

Paper 2 (Extended)

45 minutes, 40 marks

Candidates answer **all** questions.

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

Calculators are **not** permitted.

The paper is designed to assess knowledge and use of mathematical skills and methods.

Any part of the syllabus content may be tested in this paper but questions will focus on concepts which can be assessed without access to a calculator.

This is a compulsory component for Extended candidates.

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

Paper 4 (Extended)

2 hours 15 minutes, 120 marks

Candidates answer **all** questions.

This paper consists of 11–15 structured questions based on the Extended curriculum.

Graphic display calculators are required.

Some of the questions will assess the use of the graphic display calculator functions described on page 6.

This is a compulsory component for Extended candidates.

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

Paper 6 Investigation and modelling (Extended)

1 hour 40 minutes, 60 marks

Candidates answer **all** questions.

This paper consists of one investigation task and one modelling task based on the Extended curriculum.

Graphic display calculators are required.

Candidates are assessed on their ability to investigate, model, and solve more open-ended problems.

Clear communication and full reasoning are especially important and mark schemes reflect this.

This is a compulsory component for Extended candidates.

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

List of formulae

List of formulae provided on Core Papers 1 and 3

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle, radius r.	$A = \pi r^2$
Circumference, C, of circle, radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Curved surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$

List of formulae provided on Extended Papers 2 and 4

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

Curved surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

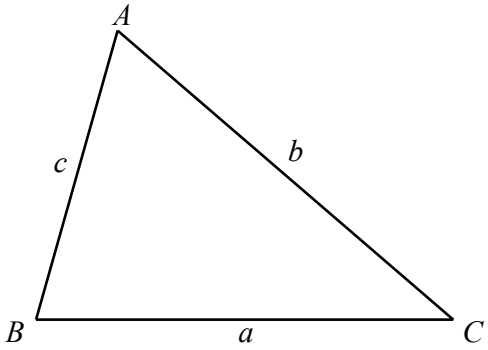
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $\quad V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



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

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

$$\text{Area} = \frac{1}{2}bc\sin A$$

Command words

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
Compare	identify/comment on similarities and/or differences
Describe	state the points of a topic/give characteristics and main features
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
Investigate	use available information to search systematically for a possible solution
Plot	mark point(s) on a graph
Revise	change to reflect further given information
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/examsofficers**

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 such as the Key Stage 3 programme of study within the National Curriculum for England.

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

You can enter candidates in the June and November exam series. You can view the timetable for your administrative zone at **www.cambridgeinternational.org/timetables**

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable. This syllabus is **not** available in all administrative zones. To find out about the availability visit the syllabus page at **www.cambridgeinternational.org/igcse**

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 Mathematics (9–1) (0980)
- Cambridge IGCSE Mathematics (US) (0444)
- Cambridge O Level Mathematics D (4024)
- syllabuses with the same title at the same level.

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

Group awards: Cambridge ICE

Cambridge ICE (International Certificate of Education) is a group award for Cambridge IGCSE. It allows schools to offer a broad and balanced curriculum by recognising the achievements of learners who pass examinations in a range of different subjects.

Learn more about Cambridge ICE at **www.cambridgeinternational.org/cambridgeice**

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/examsofficers**

Retakes

Candidates can retake the whole qualification as many times as they want to. This is a linear qualification so candidates cannot re-sit individual components.

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 compliance with the UK Equality Act (2010) we have designed this qualification to avoid any direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. We can put arrangements in place for these candidates to enable them to access the 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/examsofficers

Language

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

After the exam

Grading and reporting

Grades A*, A, B, C, D, E, F or G indicate the standard a candidate achieved at Cambridge IGCSE.

A* is the highest and G is the lowest. 'Ungraded' means that the candidate's performance did not meet the standard required for grade G. '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 (result pending)
- X (no result)
- Y (to be issued)

These letters do not appear on the certificate.

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 International Mathematics will be published after the first assessment of the IGCSE in 2020. Find more information at **www.cambridgeinternational.org/igcse**

Changes to this syllabus for 2020, 2021 and 2022

The syllabus has been reviewed and revised for first examination in 2020.

Changes to syllabus content	• There have been minor amendments to the names and order of the subject content. They now appear as follows: 1 Number 2 Algebra 3 Functions 4 Coordinate geometry 5 Geometry 6 Vectors and transformations 7 Mensuration 8 Trigonometry 9 Sets 10 Probability 11 Statistics • The wording of a note in the Notes/Examples column in section E3.5 *Functions* has been changed from *Includes oblique asymptotes* to *Excludes oblique asymptotes*. • The term *alternate segment* has been added to section 5, *Geometry*. • The term *pictograms* has been added to section 11, *Statistics*. • The subtopic of *Histograms* has been removed from section 11, *Statistics*. • Other minor changes have been made to the subject content, mainly in the use of vocabulary, rewording of some statements for clarity and minor editorial changes. • A list of command words now appears in the syllabus.
Changes to assessment (including changes to specimen papers)	• The assessment objectives have been revised, renamed and grouped into two broad objectives. • The relationship between the assessment objectives and components as well as the relationship between the assessment objectives as a percentage of the whole qualification are now shown in the syllabus. • The number of marks for Paper 5 has been adjusted from 24 to 36. The number of marks for Paper 6 has been adjusted from 40 to 60. In both Paper 5 and Paper 6, the number of communication marks has been increased. • The duration of Paper 5 and Paper 6 has been extended by 10 minutes, to 1 hour 10 minutes and 1 hour 40 minutes respectively. • Paper 5 and Paper 6 now have titles, Paper 5 Investigation (Core) and Paper 6 Investigation and modelling (Extended). • Marks for each question and part question are now shown in Paper 5 and Paper 6 and more detailed marking guidance is provided in the mark schemes.

In addition to reading the syllabus, teachers should refer to the updated specimen assessment materials.

You are strongly advised to read the whole syllabus before planning your teaching programme.

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

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

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

Cambridge Assessment International Education
1 Hills Road, Cambridge, CB1 2EU, United Kingdom
Tel: +44 (0)1223 553554 Fax: +44 (0)1223 553558
Email: info@cambridgeinternational.org www.cambridgeinternational.org