CAMBRIDGE
International Examinations

Cambridge
IGCSE

SYLLABUS

Cambridge IGCSE® (9–1)*
Mathematics
0626

For examination in June and November 2017, 2018 and 2019

*This syllabus is regulated in England as a Cambridge International Level 1/Level 2 Certificate (QN: 601/5294/1).

Cambridge Secondary 2

Version 1

Changes to syllabus for 2017, 2018 and 2019

There are significant changes to this syllabus for first examination in 2017. Teachers are strongly advised to read the whole of the syllabus before planning their teaching programme.

Changes to the syllabus code

- Syllabus **0626** is the regulated syllabus for examination from 2017 onwards. 0580 will be regulated for examination in 2015 and 2016.

Changes to syllabus content

- The syllabus sections have all been updated and some topics have been expanded slightly to improve their clarity or provide better progression to Level 3 mathematics.
- Some material has been moved from the Extended curriculum to Core curriculum.
- The syllabus aims have been updated to reflect changes made to the qualification.

Changes to assessment

- The assessment objectives have been updated and the assessment structure revised.
- This qualification will be graded using a numerical grading scale 9–1.
- The qualification comprises **three** compulsory components which are assessed by examination only.
- Paper 1 and Paper 2 are worth 25% of the total marks for the qualification.
- Paper 3 and Paper 4 are worth 35% of the total marks for the qualification.
- Paper 5 and Paper 6 are worth 40% of the total marks for the qualification.
- Calculators are **not** permitted in Paper 3 (Core) and Paper 4 (Extended).

Core assessment

- Core candidates take Papers 1, 3, and 5.
- The weighting of AO2 in the assessment has increased to 45–55% of the whole qualification.
- The weighting of topics in the assessment has changed slightly. Number has increased to 40–45% and Space and Shape has decreased to 20–25%.

Extended assessment

- Extended candidates take Papers 2, 4 and 6.
- The weighting of AO2 in the assessment has increased to 55–65% of the whole qualification.
- The weighting of topics in the assessment has changed slightly. Number has increased to 20–25% and Space and Shape has decreased to 25–30%.

In addition to reading the syllabus, teachers should refer to the updated specimen papers and are encouraged to access resources. These materials are on our website **www.cie.org.uk**

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1. Introduction

1.1 Why choose Cambridge?

Cambridge International Examinations is part of the University of Cambridge. We prepare school students for life, helping them develop an informed curiosity and a lasting passion for learning. 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 set the global standard for international education. They are created by subject experts, are rooted in academic rigour, and provide a strong platform for progression. Over 10 000 schools in 160 countries work with us to prepare nearly a million learners for their future with an international education from Cambridge.

Cambridge learners

Cambridge programmes and qualifications develop not only subject knowledge but also skills. We encourage Cambridge learners to be:

- **confident** in working with information and ideas – their own and those of others
- **responsible** for themselves, responsive to and respectful of others
- **reflective** as learners, developing their ability to learn
- **innovative** and equipped for new and future challenges
- **engaged** intellectually and socially, ready to make a difference.

Recognition

Cambridge IGCSE is recognised by leading universities and employers worldwide, and is an international passport to progression and success. It provides a solid foundation for moving on to higher level studies. Learn more at **www.cie.org.uk/recognition**

Support for teachers

A wide range of materials and resources is available to support teachers and learners in Cambridge schools. Resources suit a variety of teaching methods in different international contexts. Through subject discussion forums and training, teachers can access the expert advice they need for teaching our qualifications. More details can be found in Section 2 of this syllabus and at **www.cie.org.uk/teachers**

Support for exams officers

Exams officers can trust in reliable, efficient administration of exams entries and excellent personal support from our customer services. Learn more at **www.cie.org.uk/examsofficers**

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

1.2 Why choose Cambridge IGCSE?

Cambridge IGCSEs are international in outlook, but retain a local relevance. The syllabuses provide opportunities for contextualised learning and the content has been created to suit a wide variety of schools, avoid cultural bias and develop essential lifelong skills, including creative thinking and problem-solving.

Our aim is to balance knowledge, understanding and skills in our programmes and qualifications to enable students to become effective learners and to provide a solid foundation for their continuing educational journey.

Through our professional development courses and our support materials for Cambridge IGCSEs, we provide the tools to enable teachers to prepare learners to the best of their ability and work with us in the pursuit of excellence in education.

Cambridge IGCSEs are considered to be an excellent preparation for Cambridge International AS and A Levels, the Cambridge AICE (Advanced International Certificate of Education) Group Award, Cambridge Pre-U, and other education programmes, such as the US Advanced Placement program and the International Baccalaureate Diploma programme. Learn more about Cambridge IGCSE (9–1) at **www.cie.org.uk/qualifications**

1.3 Why choose Cambridge IGCSE (9–1) Mathematics?

Cambridge IGCSE (9–1) Mathematics allows learners to:

- develop competence and fluency with mathematical concepts, methods and skills
- develop a feel for numbers, patterns and relationships
- develop an ability to consider problems, select appropriate strategies and present and interpret results
- develop the ability to reason, make inferences and communicate using mathematical concepts
- acquire a solid foundation of mathematical knowledge for further study.

Cambridge IGCSE (9–1) Mathematics is accepted by universities and employers as proof of mathematical knowledge and understanding.

Prior learning

We recommend that learners who are beginning this course should have previously studied an appropriate lower secondary mathematics programme such as the Cambridge Secondary 1 programme, the Key Stage 3 Programme of Study within the National Curriculum for England, or equivalent educational frameworks. Learn more at **www.cie.org.uk/cambridgesecondary1**

Progression

Cambridge IGCSEs (9–1) are general qualifications that enable learners to progress directly to employment or to proceed to further qualifications in another subject area or at a higher level, requiring more specific knowledge, understanding and skills.

Candidates who are awarded grades 4 to 9 in Cambridge IGCSE (9–1) Mathematics Extended curriculum are well prepared to follow courses leading to Cambridge International AS and A Level Mathematics, or the equivalent.

1.4 How can I find out more?

If you are already a Cambridge school

You can make entries for this qualification through your usual channels. If you have any questions, please contact us at **info@cie.org.uk**

If you are not yet a Cambridge school

Learn about the benefits of becoming a Cambridge school at **www.cie.org.uk/startcambridge**. Email us at **info@cie.org.uk** to find out how your organisation can register to become a Cambridge school.

2. Teacher support

2.1 Support materials

We send Cambridge syllabuses, past question papers and examiner reports to cover the last examination series to all Cambridge schools.

You can also go to our public website at **www.cie.org.uk/igcse** to download current and future syllabuses together with specimen papers or past question papers and examiner reports from one series.

For teachers at registered Cambridge schools a range of additional support materials for specific syllabuses is available from Teacher Support, our secure online support for Cambridge teachers. Go to **http://teachers.cie.org.uk** (username and password required).

2.2 Endorsed resources

We work with publishers providing a range of resources for our syllabuses including print and digital materials. Resources endorsed by Cambridge go through a detailed quality assurance process to ensure they provide a high level of support for teachers and learners.

We have resource lists which can be filtered to show all resources, or just those which are endorsed by Cambridge. The resource lists include further suggestions for resources to support teaching.

2.3 Training

We offer a range of support activities for teachers to ensure they have the relevant knowledge and skills to deliver our qualifications. See **www.cie.org.uk/events** for further information.

3. Syllabus content at a glance

Candidates may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades 5 to 9 should follow the Extended curriculum.

All candidates will study the following topics:

1. Number
2. Algebra and graphs
3. Geometry
4. Mensuration
5. Co-ordinate geometry
6. Trigonometry
7. Matrices and transformations
8. Probability
9. Statistics

Centres are reminded that the study of mathematics offers opportunities for the use of ICT, particularly spreadsheets and graph-drawing packages. For example, spreadsheets may be used in the work on percentages (C1.12 and E1.12), personal and household finance (C1.16 and E1.16), algebraic formulae (C2.1 and E2.1), statistics (C9 and E9), etc. Graph-drawing packages may be used in the work on graphs in practical situations and graphs of functions (C2 and E2), statistics (C9 and E9), etc. It is important to note that use or knowledge of ICT will **not** be assessed in the examination papers.

As well as demonstrating skill in the techniques listed in section 6, 'Syllabus content', candidates will be expected to apply them in the solution of problems and make connections between different areas of mathematics.

4. Assessment at a glance

Cambridge IGCSE (9–1) Mathematics is assessed via three components. All candidates take **three** written papers. Candidates who follow the Core curriculum take Papers 1, 3 and 5 and are eligible for grades 1 to 5. Candidates who follow the Extended curriculum take Papers 2, 4 and 6 and are eligible for grades 4 to 9 (grade 3 allowed).

Component	Weighting
Paper 1 (Core) **1 hour** Short-answer and structured questions based on the Core curriculum. Electronic calculators are required. 60 marks. Externally marked.	25%
Paper 2 (Extended) **1 hour** Short-answer and structured questions based on the Extended curriculum. Electronic calculators are required. 60 marks. Externally marked.	25%
Paper 3 (Core) **1 hour 30 minutes** Short-answer and structured questions based on the Core curriculum. Electronic calculators are **not** permitted. 84 marks. Externally marked.	35%
Paper 4 (Extended) **1 hour 30 minutes** Short-answer and structured questions based on the Extended curriculum. Electronic calculators are **not** permitted. 84 marks. Externally marked.	35%
Paper 5 (Core) **2 hours** Structured questions based on the Core curriculum. Electronic calculators are required. 96 marks. Externally marked.	40%
Paper 6 (Extended) **2 hours** Structured questions based on the Extended curriculum. Electronic calculators are required. 96 marks. Externally marked.	40%

- Candidates should have an electronic calculator for Papers 1, 2, 5 and 6. Algebraic or graphical calculators are not permitted. Three significant figures will be required in answers except where otherwise stated.
- In Papers 1, 2, 5 and 6 candidates should use the value of π from their calculators if their calculator provides this. Otherwise, they should use the value of 3.142 given on the front page of the question paper only.
- Tracing paper may be used as an additional material for all of the written papers.

Availability

This syllabus is examined in the June and November examination series.

This syllabus is available to private candidates.

Detailed timetables are available from **www.cie.org.uk/examsofficers**

Combining this with other syllabuses

Candidates can combine this syllabus in an examination series with any other Cambridge syllabus, except:

- syllabuses with the same title at the same level
- 0580 Cambridge IGCSE Mathematics
- 0607 Cambridge IGCSE International Mathematics.

Please note that Cambridge International Level 1/Level 2 (9–1) Certificate, Cambridge IGCSE and Cambridge O Level syllabuses are at the same level.

5. Syllabus aims and assessment objectives

5.1 Syllabus aims

The aims of the syllabus are the same for all candidates. The aims are set out below and describe the educational purposes of a course in mathematics for Cambridge IGCSE (9–1). They are not listed in order of priority.

The aims are to enable learners 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 which mathematics plays in their own lives and in 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 abilities 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 their further study of mathematics or for other disciplines.

5.2 Assessment objectives

AO1: Use mathematical techniques

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

- organising, processing and presenting information accurately in written, tabular, graphical and diagrammatic forms
- using and interpreting mathematical notation correctly
- performing calculations and procedures using suitable methods, including use of 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
- apply combinations of mathematical skills and techniques using connections between different areas of mathematics to solve problems
- interpreting results in the context of a given problem and evaluating the methods used and solutions obtained.

5.3 Relationship between assessment objectives and components

Core assessment

Assessment objective	Paper 1 (marks)	Paper 3 (marks)	Paper 5 (marks)	Approximate weighting of AO in overall qualification
AO1: Use mathematical techniques	33–39	42–50	34–43	45–55%
AO2: Reason, interpret and communicate mathematically when solving problems	21–27	34–42	53–62	45–55%
Total mark	60	84	96	240
Weighting of paper in overall qualification	25%	35%	40%	100%

Extended assessment

Assessment objective	Paper 2 (marks)	Paper 4 (marks)	Paper 6 (marks)	Approximate weighting of AO in overall qualification
AO1: Use mathematical techniques	27–33	34–42	24–34	35–45%
AO2: Reason, interpret and communicate mathematically when solving problems	27–33	42–50	62–72	55–65%
Total mark	60	84	96	240
Weighting of paper in overall qualification	25%	35%	40%	100%

The weightings in the assessment of the main topic areas of mathematics are shown in the table below.

Components	Number	Algebra	Space and shape	Statistics and probability
Core (Papers 1, 3 and 5)	40–45%	20–25%	20–25%	10–15%
Extended (Papers 2, 4 and 6)	20–25%	35–40%	25–30%	10–15%

5.4 Grade descriptions

We expect to provide grade descriptions in an update to this syllabus in due course.

6. Syllabus content

Candidates may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades 5 to 9 should follow the Extended curriculum.

Formulae will only be given where stated in the notes. The formulae will be given as part of the relevant question and not as a separate formulae list.

C1	Number – Core curriculum	Notes/Examples
C1.1	Identify and use natural numbers, integers (positive, negative and zero), prime numbers, square 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 — $n(A)$ 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.	Evaluate $3^2 \times \sqrt[4]{16}$
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 $1 \leqslant A < 10$.	$5^{\frac{1}{2}} = \sqrt{5}$ Evaluate $5^{-2}, 100^{\frac{1}{2}}, 7^0$ 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.
C1.8	Use the four rules for calculations with whole numbers, decimals and fractions (mixed and vulgar), including correct ordering of operations and use of brackets.	Applies to positive and negative integers.

E1	Number – Extended curriculum	Notes/Examples
E1.1	Identify and use natural numbers, integers (positive, negative and zero), prime numbers, square 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 — $n(A)$ "…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.	Evaluate $3^2 \times \sqrt[4]{16}$
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 $1 \leqslant A < 10$.	$5^{\frac{1}{2}} = \sqrt{5}$ Evaluate $5^{-2}, 100^{\frac{1}{2}}, 8^{-\frac{2}{3}}$ 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.
E1.8	Use the four rules for calculations with whole numbers, decimals and fractions (mixed and vulgar), including correct ordering of operations and use of brackets.	Applies to positive and negative integers.

C1	Number – Core curriculum – Continued	Notes/Examples
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 other 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.
C1.17	*Extended curriculum only.*	
C1.18	*Extended curriculum only.*	

E1	Number – Extended curriculum – Continued	Notes/Examples
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.	Estimate powers and roots of any given positive number.
E1.10	Give appropriate upper and lower bounds for data given to a specified accuracy. Obtain appropriate upper and lower bounds to solutions of simple problems given data to a specified accuracy.	e.g. measured lengths. e.g. the calculation of the perimeter or the area of a rectangle.
E1.11	Demonstrate an understanding of ratio and proportion. Increase and decrease a quantity by a given ratio. Calculate average speed. Use other 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.*
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. Extract data from tables and charts.	Includes discount, profit and loss.
E1.17	Use exponential growth and decay in relation to population and finance.	e.g. depreciation, growth of bacteria.
E1.18	Calculate with surds, including simplifying expressions. Rationalise the denominator.	

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. Transform simple formulae. Construct simple expressions and set up simple equations.	
C2.2	Manipulate directed numbers. Use brackets and extract common factors. Factorise where possible expressions of the form: $x^2 + bx + c$ $x^2 - b^2$	 e.g. expand $3x(2x - 4y)$, $(x + 4)(x - 7)$ e.g. factorise $9x^2 + 15xy$
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. Derive and solve simple quadratic equations by factorisation. Derive and solve simple linear inequalities.	 Simple quadratic equations of the form $x^2 + bx + c = 0$ $x^2 - b^2 = 0$ e.g. $x + 2 \leqslant 5$, $-2 \leqslant 2x \leqslant 3$ including representing and interpreting inequalities on a number line. Interpretation of results may be required.

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 transform complicated formulae and equations.	 e.g. transform formulae where the subject appears twice.
E2.2	Manipulate directed numbers. Use brackets and extract common factors. Expand products of algebraic expressions. Factorise where possible expressions of the form: $ax + bx + kay + kby$ $a^2x^2 - b^2y^2$ $a^2 + 2ab + b^2$ $ax^2 + bx + c$	 e.g. expand $3x(2x - 4y)$, $(x + 4)(x - 7)$, $(x + 4)(x - 7)(x + 2)$ e.g. factorise $9x^2 + 15xy$
E2.3	Manipulate algebraic fractions. Factorise and simplify rational expressions.	e.g. $\frac{x}{3}+\frac{x-4}{2}$, $\frac{2x}{3}-\frac{3(x-5)}{2}$, $\frac{3a}{4}\times\frac{9a}{10}$, $\frac{3a}{4}\div\frac{9a}{10}$, $\frac{1}{x-2}+\frac{2}{x-3}$ 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. Use the rules of indices.	 e.g. solve $32^x = 2$ 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 quadratic equations by factorisation, completing the square or by use of the formula. Derive and solve simultaneous equations, involving one linear and one quadratic, including the intersection of a line and a circle. 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. Find and use the *n*th term of sequences.	Recognise sequences of square, cube and triangular numbers. Recognise sequences of the powers of 2, 3, 4 and 5. Linear, simple quadratic and cubic sequences.
C2.8	*Extended curriculum only.*	
C2.9	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.
C2.10	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, quadratic, cubic and reciprocal).	Knowledge of turning points and asymptotes is not required.
C2.11	*Extended curriculum only.*	
C2.12	Interpret simple expressions as functions with inputs and outputs and find simple inverse functions.	
C2.13	*Extended curriculum only.*	
C2.14	*Extended curriculum only.*	

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. Find and use the *n*th term of sequences.	 Subscript notation may be used. 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.	Interpret graphs that represent direct and inverse proportion.
E2.9	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. Calculate distance travelled as area under a speed-time graph.	 May include estimation and interpretation of the gradient of a tangent at a point. May include calculation under a linear graph or estimations under a non-linear graph.
E2.10	Construct tables of values and draw graphs for functions of the form ax^n (and simple sums of these) and functions of the form b^x. Solve associated equations approximately, including finding and interpreting roots by graphical methods. Draw and interpret graphs representing exponential growth and decay problems. Recognise, sketch and interpret graphs of functions (linear, quadratic, cubic, reciprocal, exponential and trigonometric).	a is a rational constant, b is a positive integer, and $n = -2, -1, 0, 1, 2, 3$. Sums would not include more than three functions. Find turning points of quadratics by completing the square. Knowledge of turning points and asymptotes is required.
E2.11	Estimate gradients of curves by drawing tangents.	
E2.12	Interpret expressions as functions with inputs and outputs and find inverse functions. Use function notation, e.g. $f(x) = 3x - 5$, $f: x \longmapsto 3x - 5$, to describe simple functions. Find inverse functions $f^{-1}(x)$. Form composite functions as defined by $gf(x) = g(f(x))$.	
E2.13	Use iterations to find approximate solutions.	Subscript notation may be used.
E2.14	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 $n = 0, 1, 2, 3, 4$. e.g. $2x^3 + x - 7$.

C3	Geometry – Core curriculum	Notes/Examples
C3.1	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.	
C3.2	Measure lines and angles. Construct a triangle given the three sides using a ruler and a pair of compasses only. Construct other simple geometrical figures from given data using a ruler and a protractor as necessary. Construct angle bisectors and perpendicular bisectors using a straight edge and a pair of compasses only. Know that the perpendicular distance from a point to a line is the shortest distance to the line and construct this perpendicular line.	
C3.3	Read and make scale drawings.	
C3.4	Calculate lengths of similar figures.	
C3.5	Recognise congruent shapes.	
C3.6	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.

E3	Geometry – Extended curriculum	Notes/Examples
E3.1	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.	
E3.2	Measure lines and angles. Construct a triangle given the three sides using a ruler and a pair of compasses only. Construct other simple geometrical figures from given data using a ruler and a protractor as necessary. Construct angle bisectors and perpendicular bisectors using a straight edge and a pair of compasses only. Know that the perpendicular distance from a point to a line is the shortest distance to the line and construct this perpendicular line.	
E3.3	Read and make scale drawings.	
E3.4	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.	
E3.5	Use the basic congruence criteria for triangles (SSS, ASA, SAS, RHS).	
E3.6	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.

C3	Geometry – Core curriculum – Continued	Notes/Examples
C3.7	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 semi-circle • angle between tangent and radius of a circle.	Candidates will be expected to use the correct geometrical terminology when giving reasons for answers.
C3.8	Use the following loci and the method of intersecting loci for sets of points in two dimensions which are: • at a given distance from a given point • at a given distance from a given straight line • equidistant from two given points • equidistant from two given intersecting straight lines.	

E3	Geometry – Extended curriculum – Continued	Notes/Examples
E3.7	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 semi-circle • 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.
E3.8	Use the following loci and the method of intersecting loci for sets of points in two dimensions which are: • at a given distance from a given point • at a given distance from a given straight line • equidistant from two given points • equidistant from two given intersecting straight lines.	

C4	Mensuration – Core curriculum	Notes/Examples
C4.1	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.
C4.2	Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.	
C4.3	Carry out calculations involving the circumference and area of a circle. Solve simple 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. Where the sector angle is a factor of 360.
C4.4	Carry out calculations involving the volume of a cuboid, prism and cylinder and the surface area of a cuboid and a 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 a sphere, pyramid and cone in the question.*
C4.5	Carry out calculations involving the areas and volumes of compound shapes.	Answers may be asked for in multiples of π.

E4	Mensuration – Extended curriculum	Notes/Examples
E4.1	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.
E4.2	Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.	
E4.3	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.
E4.4	Carry out calculations involving the volume of a cuboid, prism and cylinder and the surface area of a cuboid and a 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 a sphere, pyramid and cone in the question.*
E4.5	Carry out calculations involving the areas and volumes of compound shapes.	Answers may be asked for in multiples of π.

C5	Co-ordinate geometry – Core curriculum	Notes/Examples
C5.1	Demonstrate familiarity with Cartesian co-ordinates in two dimensions.	Solve geometrical problems on co-ordinate axes.
C5.2	Find the gradient of a straight line. Calculate the gradient of a straight line from the co-ordinates of two points on it.	
C5.3	*Extended curriculum only.*	
C5.4	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 or two co-ordinates are given with one being of the form $(0, c)$.
C5.5	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 $(0, -3)$.
C5.6	*Extended curriculum only.*	
C5.7	*Extended curriculum only.*	
C5.8	*Extended curriculum only.*	

E5	Co-ordinate geometry – Extended curriculum	Notes/Examples
E5.1	Demonstrate familiarity with Cartesian co-ordinates in two dimensions.	Solve geometrical problems on co-ordinate axes.
E5.2	Find the gradient of a straight line. Calculate the gradient of a straight line from the co-ordinates of two points on it.	
E5.3	Calculate the length and the co-ordinates of the midpoint of a straight line from the co-ordinates of its end points.	
E5.4	Interpret and obtain the equation of a straight line graph.	
E5.5	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).
E5.6	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 co-ordinates (1, 3) and (–2, –9).
E5.7	Recognise and use the equation of a circle, centred at the origin.	
E5.8	Find the equation of the tangent to a circle at a given point.	Use the fact that the tangent is perpendicular to the radius.

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 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 an angle of a right-angled triangle. Solve trigonometrical problems in two dimensions involving angles of elevation and depression. Extend sine and cosine values to angles between 90° and 180°.	Angles will be quoted in degrees. Answers should be written in degrees and decimals to one decimal place.
E6.3	Know the exact values for the sine and cosine ratios of 0°, 30°, 45°, 60° and 90°. Know the exact values for the tangent ratios of 0°, 30°, 45° and 60°. Extend sine and cosine and tangent values to angles between 90° and 360°. Graph and know the properties of trigonometric functions. Solve simple trigonometric equations.	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 $= \frac{1}{2}ab\sin C$.	
E6.5	Solve simple trigonometrical problems in three dimensions including angle between a line and a plane.	

C7	Matrices 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 **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. Recognise and describe reflections, rotations, translations and enlargements.	Positive and fractional scale factors for enlargements only. Positive and fractional scale factors for enlargements only.
C7.3	*Extended curriculum only.*	
C7.4	*Extended curriculum only.*	
C7.5	*Extended curriculum only.*	

E7	Matrices 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 **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. Recognise and describe reflections, rotations, translations and enlargements.	Positive, fractional and negative scale factors for enlargements. Positive, fractional and negative scale factors for enlargements.
E7.3	Calculate the magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2 + y^2}$. Represent vectors by directed line segments. Use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors. Use position vectors.	Vectors will be printed as $\overrightarrow{AB}$ or **a** and their magnitudes denoted by modulus signs, e.g. $\lvert\overrightarrow{AB}\rvert$ or $\lvert\mathbf{a}\rvert$. 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 vectors to construct geometric arguments.
E7.4	Display information in the form of a matrix of any order. Calculate the sum and product (where appropriate) of two matrices. Calculate the product of a matrix and a scalar quantity. Use the algebra of 2 × 2 matrices including the zero and identity 2 × 2 matrices. Calculate the determinant $\lvert\mathbf{A}\rvert$ and inverse $\mathbf{A}^{-1}$ of a non-singular matrix **A**.	
E7.5	Use the following transformations of the plane: reflection (M), rotation (R), translation (T), enlargement (E), and their combinations. Identify and give precise descriptions of transformations connecting given figures. Describe transformations using co-ordinates and matrices (singular matrices are excluded).	

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.	
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	Calculate simple conditional probability from Venn diagrams, tree diagrams and tables.	

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.	
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 from Venn diagrams, tree diagrams and tables.	

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	Understand and use sampling.	Including random and systematic sampling. Know the limitations of sampling.
C9.4	Construct and interpret bar charts, pie charts, pictograms, stem and leaf diagrams, simple frequency distributions, histograms with equal intervals and scatter diagrams.	
C9.5	Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purposes for which they are used.	
C9.6	*Extended curriculum only.*	
C9.7	*Extended curriculum only.*	
C9.8	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram.	
C9.9	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	Understand and use sampling.	Including random, stratified and systematic sampling. Know the limitations of sampling.
E9.4	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'.
E9.5	Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purposes for which they are used.	
E9.6	Calculate an estimate of the mean for grouped and continuous data. Identify the modal class from a grouped frequency distribution.	
E9.7	Construct and use cumulative frequency diagrams. Estimate and interpret the median, percentiles, quartiles and inter-quartile range. Construct and interpret boxplots.	
E9.8	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram.	
E9.9	Draw, interpret and use lines of best fit by eye.	

7. Other information

Equality and inclusion

Cambridge International Examinations has taken great care in the preparation of this syllabus and assessment materials to avoid bias of any kind. To comply with the UK Equality Act (2010), Cambridge has designed this qualification with the aim of avoiding direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. Arrangements can be put in place for these candidates to enable them to access the assessments and receive recognition of their attainment. Access arrangements will not be agreed if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who are unable to access the assessment of any component may be eligible to receive an award based on the parts of the assessment they have taken.

Information on access arrangements is found in the *Cambridge Handbook* which can be downloaded from the website **www.cie.org.uk/examsofficers**

Language

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

Grading and reporting

Cambridge International Level 1/Level 2 (9–1) Certificate results are shown by one of the grades 1, 2, 3, 4, 5, 6, 7, 8 or 9 indicating the standard achieved, 9 being the highest and 1 being the lowest. 'Ungraded' indicates that the candidate's performance fell short of the standard required for grade 1. 'Ungraded' will be reported on the statement of results but not on the certificates. The letters Q (result pending), X (no results) and Y (to be issued) may also appear on the statement of results but not on the certificate.

Entry codes

Information about entry codes can be found in the *Cambridge Guide to Making Entries*.

8. Additional information for regulated syllabuses

This syllabus appears on the Register of Regulated Qualifications (**http://register.ofqual.gov.uk**) as a Cambridge International Level 1/Level 2 Certificate. In other contexts it is known as a Cambridge IGCSE.

Candidates who are awarded grades 1 to 3 will have achieved an award at Level 1 of the National Qualifications Framework. Candidates who are awarded grades 4 to 9 will have achieved an award at Level 2 of the National Qualifications Framework.

Progression

Cambridge International Level 1/Level 2 (9–1) Certificates are general qualifications that enable learners to progress directly to employment or to proceed to further qualifications in another subject area or at a higher level, requiring more specific knowledge, understanding and skills.

Candidates who are awarded grades 4 to 9 in Cambridge International Level 1/Level 2 (9–1) Certificate in Mathematics Extended curriculum are well prepared to follow courses leading to Cambridge International AS and A Level Mathematics, or the equivalent.

Overlapping qualifications

Every qualification is assigned to a discount code indicating the subject area to which it belongs. Candidates who enter for more than one qualification with the same discount code will only have one grade (the highest) counted for the purpose of the school and college performance tables.

Centres may wish to advise candidates that, if they take two qualifications with the same discount code, colleges are very likely to take the view that they have achieved only one of the two qualifications. Candidates who have any doubts about their subject combinations should seek advice, either from their centre or the institution to which they wish to progress.

For the latest information on discount codes and performance tables, please see the Department for Education website.

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