

Cambridge IGCSE Syllabus

Extended level (Paper 2 and 4)

(The original document with Core and Extended levels is available on www.papacambridge.com)

Mathematics 0580

For 2020, 2021 and 2022 examinations

The subject content is organised by topic:

Numbers 15 – 20%

Algebra 35 – 40%

Shape and space 30 – 35%

Probability and statistics 10 – 15%

Paper 2 (Extended) 35%	Paper 4 (Extended) 65%
1 hour 30 minutes 70 marks Short-answer questions	2 hour 30 minutes 130 marks Structured questions

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

1. Number

		Notes / Examples	Videos Verwysing
E1.1	Identify and use:		
	Natural numbers		
	Integers (positive, negative and zero)		
	Prime numbers		Eenheid 1 Les 4
	Square and cube numbers		Eenheid 1 Les 6
	Common factors		Eenheid 1 Les 3
	Finding the highest common factor (HCF) of two or more numbers		Eenheid 1 Les 3
	Expressing numbers as a product of prime factors		
	Common multiples		Eenheid 1 Les 2
	Finding the lowest common multiple (LCM) of two or more numbers		Eenheid 1 Les 2
	Rational numbers		Eenheid 9 Les 8 Eenheid 9 Les 10
	Irrational numbers	$\pi, \sqrt{2}$	Eenheid 9 Les 8 Eenheid 9 Les 9 Eenheid 9 Les 10
	Real numbers		
	Reciprocals		Eenheid 5 Les 4

E1.2	Use language, notation, and Venn diagrams to describe sets and represent relationships between sets.	<p>Notation</p> <p>Number of elements in set A $n(A)$</p> <p>"... is an element of ..." \in</p> <p>"... is not an element of ..." \notin</p> <p>Complement of set A A'</p> <p>The empty set \emptyset</p> <p>Universal set \mathcal{E}</p> <p>A is a subset of B $A \subseteq B$</p> <p>A is a proper subset of B $A \subset B$</p> <p>A is not a subset of B $A \not\subseteq B$</p> <p>A is not a proper subset of B $A \not\subset B$</p> <p>Union of A and B $A \cup B$</p> <p>Intersection of A and B $A \cap B$</p>	<p>Eenheid 9 Les 11</p> <p>Eenheid 9 Les 12</p> <p>Eenheid 9 Les 13</p> <p>Eenheid 9 Les 14</p>
	Definition of sets	$A = \{x: x \text{ is a natural number}\}$ $B = \{(x, y): y = mx = c\}$ $C = \{x: a \leq x \leq b\}$ $D = \{a, b, c, \dots\}$	Eenheid 9 Les 15
E1.3	Calculate with squares, square roots, cubes and cube roots and other powers and roots of numbers.	Work out $3^2 \times \sqrt[4]{16}$	<p>Eenheid 1 Les 6</p> <p>Eenheid 1 Les 7</p> <p>Eenheid 1 Les 8</p>
E1.4	Use directed numbers in practical situations	e.g. temperature changes, flood levels	Eenheid 1 Les 11
E1.5	Use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts.		Eenheid 5 Les 1
	Recognise equivalence and convert between these forms	Includes the conversion of recurring decimals to fractions, e.g., change $0.\dot{7}$ to a fraction.	Eenheid 5 Les 1
E1.6	Order quantities by magnitude and demonstrate familiarity with the symbols.	$= \neq > < \geq \leq$	Eenheid 1 Les 1

E1.7	Understand the meaning of indices (fractional, negative and zero) and use the rules of indices.	$5^{\frac{1}{2}} = \sqrt{5}$ Find the value of 5^{-2} , $100^{\frac{1}{2}}$, $8^{\frac{-2}{3}}$ Work out $2^{-3} \times 2^4$, $(2^3)^2$, $(2^{-3} \div 2^{-4})$	
	Use the standard form $A \times 10^n$ where n is a positive or negative integer, and $1 \leq A < 10$	Convert numbers into and out of standard form. Calculate with values in standard form.	Eenheid 5 Les 10 Eenheid 5 Les 11 Eenheid 5 Les 12 Eenheid 5 Les 13
E1.8	Use the four rules for calculations with <ul style="list-style-type: none"> • whole numbers, • decimals, and • fractions (including mixed numbers and improper fractions), • including correct ordering of operations and • use of brackets. 	Applies to positive and negative numbers.	Eenheid 1 Les 2 Eenheid 1 Les 3 Eenheid 1 Les 4 Eenheid 1 Les 5 Eenheid 1 Les 9 (BODMAS)
E1.9	Make estimates of <ul style="list-style-type: none"> • 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.		Eenheid 1 Les 12 Eenheid 1 Les 12
E1.10	Give appropriate upper and lower bounds for data given to a specified accuracy.	e.g. measured lengths	
	Obtain appropriate upper and lower bounds to solutions of simple problems given data to a specified accuracy.	e.g. the calculation of the perimeter or the area of a rectangle.	

E1.11	Demonstrate an understanding of ration and proportion.	To include numerical problems involving direct and inverse proportion.	
	Increase and decrease a quantity by a given ratio.		
	Calculate average speed.	Use ratio and scales in practical situations.	
	Use common measures of rate.	Formulae for other rates will be given in the question e.g. pressure and density.	
E1.12	Calculate a given percentage of a quantity.		Eenheid 5 Les 6
	Express one quantity as a percentage of another.		Eenheid 5 Les 6
	Calculate percentage increase or decrease.		Eenheid 5 Les 7 Eenheid 5 Les 8
	Carry out calculations involving reverse percentages.	e.g. finding the cost price given the selling price and the percentage profit.	Eenheid 5 Les 9
E1.13	Use a calculator efficiently.		Eenheid 1 Les 10 Eenheid 5 Les 14
	Apply appropriate checks of accuracy.		Eenheid 5 Les 15
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		

	<ul style="list-style-type: none"> personal and household finance involving earnings, simple interest and compound interest. 	Includes discount, profit, and loss. Knowledge of compound interest formula is required.	
	Exact data from tables and charts.		
E1.17	Use exponential growth and decay in relation to population and finance.	e.g. depreciation, growth of bacteria.	

2. Algebra and graphs

E2.1	Use letters to express generalised numbers and express basic arithmetic processes algebraically.		Eenheid 2 Les 1
	Substitute numbers for words and letters in complicated formulae.		Eenheid 2 Les 2
	Construct and rearrange complicated formulae and equations.	e.g. rearrange formulae where the subject appears twice.	Eenheid 2 Les 3 Eenheid 2 Les 4 Eenheid 6 Les 5 Eenheid 6 Les 6
E2.2	Manipulate directed numbers.		
	Use brackets and extract common factors.	e.g. expand $3x(2x - 4y)$ e.g. factorise $9x^2 + 15xy$	Eenheid 2 Les 5 Eenheid 6 Les 1 Eenheid 6 Les 7
	Expand products of algebraic expressions.	e.g. expand $(x + 4)(x - 7)$ Includes products of more than two brackets, e.g. $(x + 4)(x - 7)(2x + 1)$	Eenheid 6 Les 1

	<p>Factorise where possible expressions of the form:</p> <ul style="list-style-type: none"> • $ax + bx + kay + kby$ • $a^2x^2 - b^2y^2$ • $a^2 + 2ab + b^2$ • $ax^2 + bx + c$ 		<p>Eenheid 6 Les 7 Eenheid 6 Les 8 Eenheid 6 Les 9</p>
E2.3	Manipulate algebraic fractions	<p>e.g. $\frac{x}{3} + \frac{x-4}{2}$</p> <p>$\frac{2x}{3} - \frac{3(x-5)}{2}$</p> <p>$\frac{3a}{4} \times \frac{9a}{10}$</p> <p>$\frac{3a}{4} \div \frac{9a}{10}$</p> <p>$\frac{1}{x-2} + \frac{2}{x-3}$</p>	
	Factorise and simplify rational expressions.	<p>e.g. $\frac{x^2-2x}{x^2-5x+6}$</p>	
E2.4	Use and interpret positive, negative and zero indices.		
	Use and interpret fractional indices.	e.g. solve $32^x = 2$	<p>Eenheid 2 Les 12 Eenheid 6 Les 4</p>

	Use the rules of indices.	e.g. simplify $3x^{-4} \times \frac{2}{3}x^{\frac{1}{2}}$ $\frac{2}{5}x^{\frac{1}{2}} \div 2x^{-2}$ $(\frac{2x^5}{3})^3$	Eenheid 2 Les 6 Eenheid 2 Les 7 Eenheid 2 Les 8 Eenheid 2 Les 9 Eenheid 2 Les 10 Eenheid 2 Les 11
E2.5	Derive and solve linear equations in one unknown.		Eenheid 6 Les 2 Eenheid 6 Les 3
	Derive and solve simultaneous linear equations in two unknowns.		
	Derive and solve simultaneous equations, involving one linear and one quadratic.		
	Derive and solve quadratic equations by factorisation, completing the square and by use of the formula.		
	Derive and solve linear inequalities,	Including representing and interpreting inequalities on a number line. Interpretation of results may be required.	
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.		Eenheid 9 Les 1
	Recognise patterns in sequences including the term-to-term rule and relationships between different sequences.	Subscript notation may be used.	Eenheid 9 Les 1 Eenheid 9 Les 7
	Find and use the n^{th} term of sequences.	Linear, quadratic, cubic and exponential sequences and	Eenheid 9 Les 2 Eenheid 9 Les 3 Eenheid 9 Les 4 Eenheid 9 Les 5

		simple combinations of these.	Eenheid 9 Les 6
E2.8	Express direct and inverse proportion in algebraic terms and use this form of expression to find unknown quantities.		
E2.9	Use function notation.	e.g. $f(x) = 3x - 5$	
	To describe simple functions.	$f: x \mapsto 3x - 5$	
	Find inverse functions	$f^{-1}(x)$	
	Form composite functions as defined by $gf(x) = g(f(x))$.		
E2.10	Interpret and use graphs in practical situations including travel graphs and conversion graphs.		
	Draw graphs from given data.		
	Apply the idea of rate of change to simple kinematics involving distance-time and speed-time graphs, acceleration, and deceleration.	May include estimation and interpretation of the gradient of a tangent at a point.	
	Calculate distance travelled as area under a speed-time graph.		
E2.11	Construct tables of values and draw graphs for functions of the form ax^n (and simple sums of these) and functions of the form $ax^x + c$	a and c are rational constants, b is a positive integer, and $n = -2, -1, 0, 1, 2, 3$ Sums would not include more than three functions.	
	Solve associated equations approximately, including finding and interpreting roots by graphical methods.	Find turning points of quadratics by completing the square.	
	Draw and interpret graphs representing exponential growth and decay problems.		
	Recognise, sketch, and interpret graphs of functions.	<ul style="list-style-type: none"> • Linear, • quadratic, 	

		<ul style="list-style-type: none"> • cubic, • reciprocal, and • exponential. Knowledge of turning points and asymptotes is required.	
E2.12	Estimate gradients of curves by drawing tangents.		
E2.13	Understand the idea of a derived function.		
	Use the derivatives of functions of the form ax^n , and simple sums of not more than three of these.	a is a rational constant and n is a positive integer or 0.	
	Apply differentiation to gradients and turning points (stationary points).	e.g. $2x^3 + x - 7$	
	Discriminate between maxima and minima by any method.		

3. Coordinate Geometry

		Notes / Examples	Videos Verwysing
E3.1	Demonstrate familiarity with Cartesian coordinates in two dimensions.		
E3.2	Find the gradient of a straight line.		
	Calculate the gradient of a straight line from the coordinates of two points on it.		
E3.3	Calculate the length and the coordinates of the midpoint of a straight line from the coordinates of its end points.		

E3.4	Interpret and obtain the equation of a straight-line graph.		
E3.5	Determine the equation of a straight line parallel to a given line.	e.g. find the equation of a line parallel to $y = 4x - 1$ that passes through $(0, -3)$	
E3.6	Find the gradient of parallel and perpendicular lines.	e.g. find the gradient of a line perpendicular to $y = 3x + 1$ e.g. find the equation of a line perpendicular to one passing through the coordinates $(1,3)$ and $(-2, -9)$	

4. Geometry

		Notes / Examples	Videos Verwysing
E4.1	Use and interpret the geometrical terms: <ul style="list-style-type: none"> • point, • line, • parallel, • right angle, • acute, • obtuse, and • reflex angles, • perpendicular, • Bearing • Similarity • Congruence 		Eenheid 3 Les 1
	Use and interpret vocabulary of		

	<ul style="list-style-type: none"> triangles, quadrilaterals, circles, polygons, and <ul style="list-style-type: none"> simple solid figures including nets. 		Eenheid 3 Les 4 Eenheid 3 Les 5 Eenheid 3 Les 9 Eenheid 3 Les 7 Eenheid 3 Les 8
E4.2	Measure and draw lines and angles.		Eenheid 3 Les 10
	Construct a triangle given the three sides using a ruler and a pair of compasses only.		Eenheid 3 Les 10
E4.3	Read and make scale drawings.		
E4.4	Calculate lengths of similar figures.		
	Use the relationships between areas of similar triangles, with corresponding results for similar figures and extension to volumes and surface areas of similar solids.		
E4.5	Use the basic congruence criteria for triangles (SSS, ASA, SAS, RHS)		
E4.6	Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions.	Includes properties of triangles, quadrilaterals and circles directly related to their symmetries.	
	Recognise symmetry properties of the prism (including cylinder) and the pyramid (including cone).		
	Use the following symmetry properties of circles: <ul style="list-style-type: none"> Equal chords are equidistant from the centre 		

	<ul style="list-style-type: none"> The perpendicular bisector of a chord passes through the centre Tangents from an external point are equal in length. 		
E4.7	Calculate unknown angles using the following geometrical properties:	Candidates will be expected to use the correct geometrical terminology when giving reasons for answers.	
	<ul style="list-style-type: none"> Angles at a point 		Eenheid 3 Les 2
	<ul style="list-style-type: none"> Angles at a point on a straight line and intersecting straight lines. 		Eenheid 3 Les 2
	<ul style="list-style-type: none"> Angles formed within parallel lines. 		Eenheid 3 Les 3
	<ul style="list-style-type: none"> Angle properties of triangles and quadrilaterals. 		Eenheid 3 Les 4 Eenheid 3 Les 5
	<ul style="list-style-type: none"> Angle properties of regular polygons. 		Eenheid 3 Les 7 Eenheid 3 Les 8
	<ul style="list-style-type: none"> Angle in a semicircle. 		
	<ul style="list-style-type: none"> Angle properties of irregular polygons. 		
	<ul style="list-style-type: none"> Angle at the centre of a circle is twice the angle at the circumference. 		
	<ul style="list-style-type: none"> Angles in the same segment are equal. 		
	<ul style="list-style-type: none"> Angles in opposite segments are supplementary, cyclic quadrilaterals. 		
	<ul style="list-style-type: none"> Alternate segment theorem. 		

5. Mensuration

		Notes / Examples	Videos Verwysing
E5.1	Use current units of mass, length, area, volume and capacity in practical situation and express quantities in terms of larger or smaller units.	Convert between units including units of area and volume.	

E5.2	Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.		
E5.3	Carry out calculations involving the circumference and area of a circle.	Answers may be asked for in multiples of π	
	Solve problems involving the arc length and sector area as fractions of the circumference and area of a circle.		
E5.4	Carry out calculations involving the surface area and volume of a cuboid, prism and cylinder.	Answers may be asked for in multiples of π	
	Carry out calculations involving the surface area and volume of a sphere, pyramid, and cone.	Formulae will be given for the surface area and volume of the sphere, pyramid, and cone in the question.	
E5.5	Carry out calculations involving the areas and volumes of compound shapes.	Answers may be asked for in multiples of π	

6. Trigonometry

		Notes / Examples	Videos Verwysing
E6.1	Interpret and use three-figure bearings.	Measured clockwise from the North, i.e. $000^\circ - 360^\circ$	
E6.2	Apply Pythagoras' theorem and the sine, cosine, and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle.	Angles will be quoted in degrees. Answers should be written in degrees and decimals to one decimal place.	
	Solve trigonometric problems in two dimensions involving angles of elevation and depression.		
	Know that the perpendicular distance from a point to a line is the shortest distance to the line.		
E6.3	Recognise, sketch, and interpret graphs of simple trigonometric functions.		

	Graph and know the properties of trigonometric functions.		
	Solve simple trigonometric equations for values between 0° and 360°	e.g. $\sin x = \frac{\sqrt{3}}{2}$ for values of x between 0° and 360°	
E6.4	Solve problems using the sine and cosine rules for any triangle and the formula area of triangle = $\frac{a}{b} ab \sin C$	Includes problems involving obtuse angles.	
E6.5	Solve simple trigonometrical problems in three dimensions including angle between a line and a plane.		

7. Vectors and transformations

		Notes / Examples	Videos Verwysing
E7.1	Describe a translation by using a vector represented by e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$, \vec{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.	Positive, fractional, and negative scale factors for enlargements.	
	Recognise and describe reflections, rotations, translations, and enlargements.	Positive, fractional, and negative scale factors for enlargements.	

E7.3	Calculate the magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2 + y^2}$	Vectors will be printed as \vec{AB} or \underline{a} and their magnitudes denoted by modulus signs, e.g. $ \vec{AB} $ or $ a $	
	Represent vectors by directed line segments.		
	Use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors.	In their answers to questions, candidates are expected to indicate a in some definite way, e.g. by an arrow or by underlining, thus \vec{AB} or \underline{a}	
	Use position vectors.		

8. Probability

		Notes / Examples	Videos / Verwysing
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.	Eenheid 8 Les 1
E8.2	Understand and use the probability scale from 0 to 1		Eenheid 8 Les 1
E8.3	Understand that the probability of an event occurring = 1 – the probability of the event not occurring.		Eenheid 8 Les 3
E8.4	Understand relative frequency as an estimate of probability.		Eenheid 8 Les 1
	Expected frequency of occurrences.		
E8.5	Calculate the probability of simple combined events, using <ul style="list-style-type: none"> 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.	Eenheid 8 Les 4
E8.6	Calculate conditional probability using Venn diagrams and tables.	e.g., Two dice are rolled.	Eenheid 8 Les 6 Eenheid 8 Les 7

		Given that the total showing on the two dice is 7, find the probability that one of the dice shows the number 2.	
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9. Statistics

		Notes / Examples	Videos Verwysing
E9.1	Collect, classify, and tabulate statistical data.		Eenheid 4 Les 1 Eenheid 4 Les 2
E9.2	Read, interpret, and draw inferences from tables and statistical diagrams.		
	Compare sets of data using tables, graphs, and statistical measures.		
	Appreciate restrictions on drawing conclusions from given data.		
E9.3	Construct and interpret bar charts, pie charts, pictograms, stem-and-leaf diagrams, simple frequency distributions, histograms with equal and unequal intervals and scatter diagrams.	For unequal intervals on histograms, areas are proportional to frequencies and the vertical axis is labelled "frequency density".	Eenheid 4 Les 3 Eenheid 4 Les 4 Eenheid 4 Les 5 Eenheid 4 Les 6
E9.4	Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purposes for which they are used.		
E9.5	Calculate an estimate of the mean for grouped and continuous data.		
	Identify the modal class from a grouped frequency distribution.		
E9.6	Construct and use cumulative frequency diagrams.		

	Estimate and interpret the median, percentiles, quartiles, and interquartile range.		
	Construct and interpret box-and-whisker plots.		
E9.7	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram.		
E9.8	Draw, interpret and use lines of best fit by eye.		