themathstudio

Cambridge IGCSE

Additional Mathematics 0606

Syllabus content, assessment and formulas

For examinations in 2028, 2029 and 2030 (syllabus version 1, September 2025)

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Paper 1: written, 2 hours, 80 marks, calculator not allowed.
Paper 2: written, 2 hours, 80 marks, scientific calculator required.
Both papers can test any part of the content. Grades A* to E are available.

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3 Subject content

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

Knowledge of the content of Cambridge IGCSE Mathematics (or an equivalent syllabus) is assumed. Cambridge IGCSE material which is not included in the subject content, such as surds and indices, will not be tested directly but it may be required in response to questions on other topics.

Proofs of results will not be required unless specifically mentioned in the syllabus.

Candidates will be expected to be familiar with the scientific notation for the expression of compound units, e.g. $5\,\text{m}\,\text{s}^{-1}$ for 5 metres per second.

A List of formulas is provided on page 2 of the examination papers for candidates to refer to during the examinations. Please note that not all required formulas are given; the 'Notes and examples' column of the subject content will indicate where a formula is given in the examination papers and when a formula is **not** given i.e. knowledge of a formula is required.

Formulas for:

- curved surface area of a cone
- surface area of a sphere
- volume of a pyramid or a cone
- volume of a sphere
- sine rule
- cosine rule
- area of a non-right-angled triangle (no diagram is given in the List of formulas)

are also given in the List of formulas to assist candidates in the examinations.

Syllabus content

1 Functions

Candidates should be able to:		Notes/Examples
1.1	Understand the terms: function, domain, range (image set), one–one function, many–one function, inverse function and composition of functions.	Includes explaining in words why a given function is a function.
1.2	Find the domain and range of functions.	Includes inverse functions and composite functions. The domain of f may need to be restricted for f^{-1} and/or gf to exist. Domain $\text{gf} \subseteq$ Domain f Range $\text{gf} \subseteq$ Range g

continued

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1 Functions continued

1.3	Recognise and use function notation.	Examples include: • $f(x) = 2e^x$ • $f: x \mapsto \lg x$, for $x > 0$ • $f^{-1}(x)$ • $fg(x)$ [= $f(g(x))$] • $f^2(x)$ [= $f(f(x))$] The notation $f^2(x)$ will not be used with trigonometric functions.
1.4	Understand the relationship between $y = f(x)$ and $y = \lvert f(x) \rvert$, where $f(x)$ may be linear, quadratic, cubic or trigonometric.	If $f(x)$ is trigonometric it will be one of the following: • $y = a \sin bx + c$ • $y = a \cos bx + c$ • $y = a \tan bx + c$ where a is a positive integer, b is a simple fraction or integer, and c is an integer. Fractions will have a denominator of 2, 3, 4, 6 or 8 only.
1.5	Explain in words why a given function does not have an inverse.	
1.6	Find the inverse of a one–one function.	Correct notation must be used. For example: • $f(x) = e^{2x}$ • $f^{-1}(x) = \frac{1}{2} \ln x$
1.7	Form and use composite functions.	Understand that order of functions is important, i.e. fg may not be the same as gf.
1.8	Use sketch graphs to show the relationship between a function and its inverse.	Understand that each function is the reflection of the other in the line $y = x$.

2 Quadratic functions

Candidates should be able to:		Notes/Examples
2.1	Find the maximum or minimum value of the quadratic function $f: x \mapsto ax^2 + bx + c$ by completing the square or by differentiation.	
2.2	Use the maximum or minimum value of $f(x)$ to sketch the graph of $y = f(x)$ or determine the range for a given domain.	Candidates should use correct notation to write a domain or range.
2.3	Know the conditions for $f(x) = 0$ to have:	Understand how the discriminant relates to the roots of the equation.
(i)	two real roots	
(ii)	two equal roots	
(iii)	no real roots	
	and the related conditions for a given line to:	
(i)	intersect a given curve	
(ii)	be a tangent to a given curve	
(iii)	not intersect a given curve.	

continued

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2 Quadratic functions continued

2.4	Solve quadratic equations for real roots.	Formula is given in the List of formulas. Students are expected to be able to use factorisation, the quadratic formula and completing the square. On the calculator paper, correct answers are acceptable without working.
2.5	Find the solution set for quadratic inequalities either graphically or algebraically.	Solutions should be written in the correct form. For example: • $-3 < x < 4$ • $x < 1$ or $x > 6$

3 Factors of polynomials

Candidates should be able to:		Notes/Examples
3.1	Know and use the remainder and factor theorems.	
3.2	Find factors of polynomials.	For a cubic polynomial, students are first expected to obtain a product of a linear factor and a quadratic factor, for example by observation or by algebraic long division.
3.3	Solve cubic equations.	

4 Equations, inequalities and graphs

Candidates should be able to:		Notes/Examples
4.1	Solve equations of the type • $\|ax + b\| = c \ (c \geqslant 0)$ • $\|ax + b\| = cx + d$ • $\|ax + b\| = \|cx + d\|$ • $\|ax^2 + bx + c\| = d$ using algebraic or graphical methods.	For graphical solutions, an accurate graph is expected. For algebraic methods, any valid method is acceptable.
4.2	Solve graphically or algebraically inequalities of the type • $k\|ax + b\| > c \ (c \geqslant 0)$ • $k\|ax + b\| \leqslant c \ (c > 0)$ • $k\|ax + b\| \leqslant \|cx + d\|$ where $k > 0$ • $\|ax + b\| \leqslant cx + d$ • $\|ax^2 + bx + c\| > d$ • $\|ax^2 + bx + c\| \leqslant d$	For graphical solutions, an accurate graph is expected. For algebraic methods, any valid method is acceptable.

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4 Equations, inequalities and graphs continued

4.3	Use substitution to form and solve a quadratic equation in order to solve a related equation.	For example: • $x^{\frac{4}{3}} + x^{\frac{2}{3}} - 12 = 0$ • $2(\ln 5x)^2 + \ln 5x - 6 = 0$ • $3e^x = 12 - 5e^{-x}$ Candidates are expected to identify the appropriate substitution.
4.4	Sketch the graphs of cubic polynomials and their moduli, when given as a product of three linear factors.	The points of intersection of the graph with the coordinate axes should be clearly labelled.
4.5	Solve graphically cubic inequalities of the form • $f(x) \geqslant d$ • $f(x) > d$ • $f(x) \leqslant d$ • $f(x) < d$ where $f(x)$ is a product of three linear factors and d is a constant.	

5 Simultaneous equations

Candidates should be able to:		Notes/Examples
5.1	Solve simultaneous equations in two unknowns by elimination or substitution.	For example: • $y - x + 3 = 0$ and $x^2 - 3xy + y^2 + 19 = 0$ • $xy^2 = 4$ and $xy = 3$ • $\frac{x}{y} + \frac{2y}{x} = 4$ and $y = x - 2$

6 Logarithmic and exponential functions

Candidates should be able to:		Notes/Examples
6.1	Know and use simple properties and graphs of the logarithmic and exponential functions, including $\ln x$ and e^x.	Logarithms may be given to any base. Understand that $f(x) = e^x$ and $g(x) = \ln x$ are each the inverse of the other. Understand the asymptotic nature of the graphs of logarithmic and exponential functions. State the equations of any asymptotes. Graphs are limited to $y = ke^{nx} + a$ and $y = k\ln(ax + b)$ where n, k, a and b are integers. Series expansions are **not** required.

continued

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6 Logarithmic and exponential functions continued

6.2	Know and use the laws of logarithms, including change of base of logarithms.	For example: • Write $3 + 2\lg p - \lg q$ as a single base 10 logarithm. • Write $\frac{1}{\log_5 e}$ as a natural logarithm.
6.3	Solve equations of the form $a^x = b$.	

7 Straight-line graphs

Candidates should be able to:		Notes/Examples
7.1	Use the equation of a straight line.	
7.2	Know and use the condition for two lines to be parallel or perpendicular.	
7.3	Solve problems involving midpoint and length of a line, including finding and using the equation of a perpendicular bisector.	
7.4	Transform given relationships to and from straight-line form, including determining unknown constants by calculating the gradient or intercept of the transformed graph.	For example: • To straight-line form $y = Ax^n$ $y = Ab^x$ • From straight-line form to an equation of the form $y^2 = Ax^3 + B$ $e^{2y} = Ax^2 + B$ $y^3 = A\ln x + B$

8 Coordinate geometry of the circle

Candidates should be able to:		Notes/Examples
8.1	Know and use the equation of a circle with radius r and centre (a, b).	Identify the centre and radius of a circle using a circle equation in any form. For example: • $(x-a)^2 + (y-b)^2 = r^2$ • $x^2 + y^2 + 2gx + 2fy + c = 0$ Formula is given in the List of formulas.
8.2	Solve problems involving the intersection of a circle and a straight line.	Includes finding points of intersection. Includes determining whether a straight line: • is a tangent • is a chord • does not intersect the circle.

continued

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8 Coordinate geometry of the circle continued

8.3	Solve problems involving tangents to a circle.	Includes finding equations of tangents. No use of calculus is expected.
8.4	Solve problems involving the intersection of two circles.	Includes finding points of intersection, finding the equation of a common chord or determining whether two circles: • intersect • touch • do not intersect.

9 Circular measure

Candidates should be able to:		Notes/Examples
9.1	Solve problems involving the arc length and sector area of a circle, including knowledge and use of radian measure.	Use of radian measure is expected in the solution of problems which may involve compound shapes. Formulas are not given.

10 Trigonometry

Candidates should be able to:		Notes/Examples
10.1	Know and use the six trigonometric functions of angles of any magnitude.	sine, cosine, tangent, secant, cosecant, cotangent
10.2	Understand and use the amplitude and period of a trigonometric function, including the relationship between graphs of related trigonometric functions.	For example: $y = \sin x$ and $y = 3\sin 2x$ The period may be in either degrees or radians.
10.3	Draw and use the graphs of $y = a \sin bx + c$ $y = a \cos bx + c$ $y = a \tan bx + c$ where a is a positive integer, b is a simple fraction or integer, and c is an integer.	Graphs will be drawn over a given domain which may be in either degrees or radians. For a graph of $y = a \tan bx + c$, the x-coordinate of any asymptote should be clearly labelled. Fractions will have a denominator of 2, 3, 4, 6 or 8 only.
10.4	Use the relationships: • $\sin^2 A + \cos^2 A = 1$ • $\sec^2 A = 1 + \tan^2 A$ • $\operatorname{cosec}^2 A = 1 + \cot^2 A$	Trigonometric identities are given in the List of formulas.

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10 Trigonometry continued

10.5	Solve, for a given domain, trigonometric equations involving the six trigonometric functions.	Includes the use of the relationships in 10.4. For example: • $4 \cot \theta = \tan \theta$ • $2 \sec^2 \theta + \tan \theta - 3 = 0$ • $5 \sin \frac{\theta}{3} + 2 \cos \frac{\theta}{3} = 0$ • $3 \operatorname{cosec} \left(2\theta - \frac{\pi}{12}\right) = 4$
10.6	Prove trigonometric relationships involving the six trigonometric functions.	Includes the use of the relationships in 10.4. For example: • $\sin x \tan x + \cos x = \sec x$ • $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$

11 Permutations and combinations

Candidates should be able to:		Notes/Examples
11.1	Recognise the difference between permutations and combinations and know when each should be used.	
11.2	Know and use the notation $n!$ and the expressions for permutations and combinations of n items taken r at a time.	Includes 0! = 1.
11.3	Solve problems on arrangement and selection using permutations or combinations.	Problems will be either in an everyday context or based on an algebraic problem. Problems involving: • repetition of objects • objects arranged in a circle • both permutations and combinations, are **not** included.

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12 Series

Candidates should be able to:		Notes/Examples
12.1	Use the binomial theorem for expansion of $(a+b)^n$ for positive integer n.	Includes simplification of coefficients. Formula is given in the List of formulas.
12.2	Use the general term $\binom{n}{r}a^{n-r}b^r,\ 0 \leqslant r \leqslant n$.	For example: Find the term independent of x in the expansion of $\left(2x+\frac{1}{x}\right)^{10}$. Knowledge of the greatest term and properties of the coefficients is **not** required.
12.3	Recognise arithmetic and geometric progressions and understand the difference between them.	
12.4	Use the formulas for the nth term and for the sum of the first n terms to solve problems involving arithmetic or geometric progressions.	Problems may be in context. Formulas are given in the List of formulas.
12.5	Use the condition for the convergence of a geometric progression, and the formula for the sum to infinity of a convergent geometric progression.	Includes explaining why a particular geometric progression has or does not have a sum to infinity. Formula is given in the List of formulas.

13 Vectors in two dimensions

Candidates should be able to:		Notes/Examples
13.1	Understand and use vector notation.	Vectors will be given in any form including: $\begin{pmatrix}a\\b\end{pmatrix}$, $\overrightarrow{AB}$, $\mathbf{p}$, $a\mathbf{i}-b\mathbf{j}$ Candidates are expected to use correct vector notation.
13.2	Know and use position vectors and unit vectors.	For example: The unit vector in the same direction as $\mathbf{a}$ is $\frac{a}{\lvert a\rvert}$.
13.3	Find the magnitude of a vector; add and subtract vectors and multiply vectors by scalars.	Includes: • equating like vectors • solving problems using vector geometry, with a diagram given in more complex cases.
13.4	Compose and resolve velocities.	Determine a resultant vector by adding two or more vectors together. Includes the use of a velocity vector to determine position and solve problems in context such as particles colliding.

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14 Calculus

No formulas will be given in the List of formulas for the Calculus section.

Candidates should be able to:		Notes/Examples
14.1	Understand the idea of a derived function.	Only an informal understanding of the idea of a limit is expected, and the technique of differentiation from first principles is **not** required.
14.2	Use the notations $f'(x)$, $f''(x)$, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$, δx, $\delta x \to 0$, $\frac{\delta y}{\delta x}$.	
14.3	Know and use the derivatives of the standard functions x^n (for any rational n), $\sin x$, $\cos x$, $\tan x$, e^x, $\ln x$.	Includes constant multiples, sums and composite functions (use of chain rule). For example, differentiate $(3x^2 + 4)^{\frac{1}{3}}$. For trigonometric functions angles will always be in radians.
14.4	Differentiate products and quotients of functions.	
14.5	Use differentiation to find gradients, tangents and normals.	
14.6	Use differentiation to find stationary points.	Points of inflexion are **not** included.
14.7	Apply differentiation to connected rates of change, small increments and approximations.	
14.8	Apply differentiation to practical problems involving maxima and minima.	
14.9	Use the first and second derivative tests to discriminate between maxima and minima.	Points of inflexion are **not** included. Full justification of conclusions is expected. An explanation of how to distinguish between a maximum point and a minimum point may be required. Unless specified otherwise, any valid method is allowed.
14.10	Understand integration as the reverse process of differentiation.	Solutions for indefinite integrals should include an arbitrary constant.
14.11	Integrate sums of terms in powers of x, including $\frac{1}{x}$ and $\frac{1}{ax+b}$.	Solutions for indefinite integrals should include an arbitrary constant.

continued

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14 **Calculus** continued

14.12	Integrate functions of the form: • $(ax + b)^n$ for any rational n • $\sin(ax + b)$ • $\cos(ax + b)$ • $\sec^2(ax + b)$ • e^{ax+b}	Includes the case where $n = -1$. For trigonometric functions angles will always be in radians. Solutions for indefinite integrals should include an arbitrary constant.
14.13	Evaluate definite integrals and apply integration to the evaluation of plane areas.	Plane areas include: • between a line and a curve • between two curves • a sum of two areas.
14.14	Apply differentiation and integration to kinematics problems that involve displacement, velocity and acceleration of a particle moving in a straight line with variable or constant acceleration.	For example: Given the velocity of a particle is $v = 3t^2 - 30t + 72$ find its acceleration when $t = 2$.
14.15	Make use of the relationships in 14.14 to draw and use the following graphs: • displacement–time • distance–time • velocity–time • speed–time • acceleration–time.	For example: A particle moves in a straight line. Its displacement s, from a fixed point at time, t, is given by $s = 3t^3 - 10t^2 + 4t + 8$ for $0 \leqslant t \leqslant 3$. Sketch its displacement–time graph, its speed–time graph, its acceleration–time graph.

Faculty feedback: ‘Understanding how and why our climate is changing and providing the knowledge and skills to explore the challenges plays a key role in every student’s education.’

Feedback from: Dr Amy Munro-Faure, Head of Education and Student Engagement of Cambridge Zero

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4 Details of the assessment

All candidates take **two** written papers.

Grades A* to E will be available for candidates who achieve the required standards. Grades F and G will not be available. Therefore, candidates who do not achieve the minimum mark for grade E will be unclassified.

Candidates must show all necessary working.

Paper 1

Written paper, 2 hours, 80 marks

Use of a calculator is **not** allowed.

Candidates answer **all** questions.

Structured and unstructured questions.

This paper consists of questions based on any part of the content.

This is a compulsory component for all candidates.

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

Paper 2

Written paper, 2 hours, 80 marks

A scientific calculator is required.

Candidates answer **all** questions.

Structured and unstructured questions.

This paper consists of questions based on any part of the content.

This is a compulsory component for all candidates.

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

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List of formulas

Equation of a circle with centre (a, b) and radius r. $(x-a)^2+(y-b)^2=r^2$

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

Surface area, A, of sphere of radius r. $A=4\pi r^2$

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

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

Quadratic Equation

For the equation $ax^2+bx+c=0$,

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Binomial Theorem

$$(a+b)^n=a^n+\binom{n}{1}a^{n-1}b+\binom{n}{2}a^{n-2}b^2+\ldots+\binom{n}{r}a^{n-r}b^r+\ldots+b^n$$

where n is a positive integer and $\binom{n}{r}=\frac{n!}{(n-r)!r!}$

Arithmetic series

$$u_n=a+(n-1)d$$

$$S_n=\frac{1}{2}n(a+l)=\frac{1}{2}n\{2a+(n-1)d\}$$

Geometric series

$$u_n=ar^{n-1}$$

$$S_n=\frac{a(1-r^n)}{1-r}\quad(r\neq1)$$

$$S_\infty=\frac{a}{1-r}\quad(|r|<1)$$

Identities

$$\sin^2A+\cos^2A=1$$
$$\sec^2A=1+\tan^2A$$
$$\operatorname{cosec}^2A=1+\cot^2A$$

Formulas for ΔABC

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

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

$$\Delta=\frac{1}{2}ab\sin C$$

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