FORMULA POSTER

Edexcel International GCSE Mathematics A (4MA1)

4MA1 · v2 Oct 2026

IGCSE Math Revision
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formula-sheet-igcse
Interactive version

★ Learn it: not on the 4MA1 Higher formulae sheet 🕮 Given on the paper

Number

★ **Indices:** $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$, $a^0 = 1$, $a^{-n} = \frac{1}{a^n}$, $a^{\frac{m}{n}} = (\sqrt[n]{a})^m$ → Multiply, divide and raise powers; simplify expressions
Watch for: Rewrite each side as a power of the same prime

★ **Standard form:** $A \times 10^n$, $1 \le A < 10$, $n \in \mathbb{Z}$ → Convert to and from standard form; order numbers

★ **Surds:** $\sqrt{ab} = \sqrt{a}\sqrt{b}$, $\frac{a}{\sqrt{b}} = \frac{a\sqrt{b}}{b}$, $\frac{1}{c+\sqrt{b}} = \frac{c-\sqrt{b}}{c^2-b}$ → Simplify surds; rationalise denominators

Scan to practise

★ **Percentage change:** $\frac{\text{new}-\text{original}}{\text{original}} \times 100\%$ → Profit or loss as a percentage change

★ **Reverse percentage:** $\text{original} = \frac{\text{new}}{1 \pm \frac{r}{100}}$ → Finding the price before a rise or a discount
Watch for: Write original × multiplier = new, then divide

★ **Compound growth / decay:** $A = P\left(1 \pm \frac{r}{100}\right)^n$ → Savings, depreciation and population questions
Watch for: Use amount $\times \text{multiplier}^n$, not simple interest

★ **Recurring decimal: $x = 0.\dot{2}\dot{7}$, then $100x - x = 27$, so $x = \frac{27}{99} = \frac{3}{11}$** → Convert recurring decimals into fractions using algebra

★ **Bounds: a value to the nearest u lies in $[x - \frac{u}{2},\ x + \frac{u}{2})$; for $a - b$ and $a \div b$ use max with min** → Rounding and accuracy questions
Watch for: For $a \div b$, the upper bound is upper $a \div$ lower b

★ **Compound measures:** $\text{speed} = \frac{\text{distance}}{\text{time}}$, $\text{density} = \frac{\text{mass}}{\text{volume}}$, $\text{pressure} = \frac{\text{force}}{\text{area}}$ → Speed, density and pressure, with consistent units
Watch for: 3 hours 36 minutes is not 3.36 hours

★ **Sets:** $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ → Venn diagrams: find $n(A \cup B)$ and missing numbers

Watch for Use amount $\times \text{multiplier}^n$ for compound interest

Graphs & calculus

★ **Straight line:** $y = mx + c$, $m = \frac{y_2 - y_1}{x_2 - x_1}$ → Gradient and y-intercept from $y = mx + c$ or a graph

★ **Parallel; perpendicular:** $m_1 = m_2$; $m_1 \times m_2 = -1$ → Lines parallel or perpendicular to a given line

★ **Midpoint; length:** $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$, $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$ → Coordinate geometry

★ **Differentiation:** $y = ax^n \Rightarrow \frac{dy}{dx} = anx^{n-1}$ → Gradients of curves and finding maximum and minimum points

Scan to practise

★ **Turning points: $\frac{dy}{dx} = 0$; gradient of the tangent at $x = a$ is $\frac{dy}{dx}$ at a** → Optimisation and kinematics problems
Watch for: Write ± when square-rooting

★ **Kinematics:** $v = \frac{ds}{dt}$, $a = \frac{dv}{dt}$ → Velocity and acceleration of a particle in a straight line

★ **Distance–time gradient = speed; velocity–time gradient = acceleration, area = distance** → Speeds from gradients; distances from areas under graphs

Watch for "Turning point", "gradient" and "maximum" all mean differentiate

Algebra

★ **Expanding:** $(a+b)^2 = a^2 + 2ab + b^2$, $(a-b)^2 = a^2 - 2ab + b^2$, $a^2 - b^2 = (a+b)(a-b)$ → Expand double brackets; difference of two squares
Watch for: Expand $(a-x)^2$ as $a^2 - 2ax + x^2$

Scan to practise

🕮 **Quadratic formula, $ax^2 + bx + c = 0$:** $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

★ **Completing the square:** $x^2 + bx + c = \left(x + \frac{b}{2}\right)^2 - \frac{b^2}{4} + c$ → Solve equations and find turning points
Watch for: Factor out a negative x^2 coefficient first

★ **Turning point of $y = (x+p)^2 + q$: $(-p,\ q)$** → Sketch the graph with its roots, intercept and turning point

🕮 **Arithmetic series, sum of n terms:** $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

★ **Arithmetic nth term:** $u_n = a + (n-1)d$ → Finding a rule and a term of a sequence

★ **Proportion:** $y \propto x^n \Rightarrow y = kx^n$; $y \propto \frac{1}{x^n} \Rightarrow y = \frac{k}{x^n}$ → Direct and inverse proportion: find k from given values

★ **Functions:** $fg(x) = f\big(g(x)\big)$; f^{-1}: **swap x, y and rearrange** → Composite functions; inverse functions by rearranging
Watch for: Get every x term on one side, factorise, divide

★ **Transformations: $f(x) + a$ up a; $f(x+a)$ left a; $-f(x)$ reflect in x-axis; $f(-x)$ reflect in y-axis** → Translations, stretches and reflections of a graph
Watch for: $f(x+a)$ moves left a; $f(x)+$ a moves up a

★ **Inequalities: multiplying or dividing by a negative number reverses the sign** → Solve linear inequalities; show them on a number line

Watch for Factor out the x^2 coefficient first

Statistics & probability

★ **Mean from a table:** $\bar{x} = \frac{\sum fx}{\sum f}$ → Mean from a frequency table of discrete data

★ **Median position (n values):** $\frac{n+1}{2}$**th value** → Median and quartiles from ordered lists

Scan to practise

★ **Interquartile range:** $Q_3 - Q_1$ → Spread from cumulative frequency curves
Watch for: Plot cumulative frequency at the upper class boundary

★ **Histogram:** $\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$ → Drawing and reading histograms
Watch for: Frequency = frequency density × class width

★ **Probability:** $P(\text{not } A) = 1 - P(A)$; $\text{expected frequency} = n \times P(A)$ → Expected frequencies for a number of trials

★ **Mutually exclusive:** $P(A \text{ or } B) = P(A) + P(B)$ → Combined events from sample space diagrams

★ **Any two events:** $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ → Unions and intersections from Venn diagrams

★ **Independent:** $P(A \text{ and } B) = P(A) \times P(B)$ → Tree diagrams for independent events: multiply along branches

★ **Conditional:** $P(B \mid A) = \frac{P(A \cap B)}{P(A)}$ → Conditional probability from two-way tables and Venn diagrams
Watch for: For "given" questions, restrict the sample space first

★ **Tree diagrams: multiply along branches, add the outcomes you want; without replacement, change the second branch** → Selections without replacement where probabilities change

Watch for Frequency = frequency density × class width

Shape & space

★ **Pythagoras:** $a^2 + b^2 = c^2$ → Any right-angled triangle, in 2D or 3D

★ **SOHCAHTOA:** $\sin\theta = \frac{\text{opp}}{\text{hyp}}$, $\cos\theta = \frac{\text{adj}}{\text{hyp}}$, $\tan\theta = \frac{\text{opp}}{\text{adj}}$ → Sides and angles in right-angled triangles, bearings, and elevation

Scan to practise

🕮 **Sine rule:** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

🕮 **Cosine rule:** $a^2 = b^2 + c^2 - 2bc\cos A$

🕮 **Area of a triangle:** $\frac{1}{2}ab\sin C$

★ **Exact values:** $\sin 30° = \frac{1}{2}$, $\cos 60° = \frac{1}{2}$, $\tan 45° = 1$, $\sin 60° = \frac{\sqrt{3}}{2}$, $\sin 45° = \frac{\sqrt{2}}{2}$ → Exact lengths in surd form without a calculator

★ **Polygons (n sides):** $\text{interior sum} = (n-2) \times 180°$, $\text{exterior angle (regular)} = \frac{360°}{n}$ → Number of sides from the exterior angle

★ **Areas: triangle $\frac{1}{2}bh$, parallelogram bh** → Perimeter and area of triangles and parallelograms

🕮 **Area of a trapezium:** $\frac{1}{2}(a+b)h$

★ **Circle:** $C = 2\pi r = \pi d$, $A = \pi r^2$ → Circles, sectors, cylinders and compound shapes

★ **Arc; sector:** $\text{arc} = \frac{\theta}{360} \times 2\pi r$, $\text{sector} = \frac{\theta}{360} \times \pi r^2$ → Sectors with the angle in degrees

🕮 **Prism; cylinder:** $V = \text{cross-section} \times \text{length}$; $V = \pi r^2 h$, curved $A = 2\pi rh$

🕮 **Cone (slant l):** $V = \frac{1}{3}\pi r^2 h$, curved $A = \pi rl$

🕮 **Sphere:** $V = \frac{4}{3}\pi r^3$, $A = 4\pi r^2$

★ **Pyramid:** $V = \frac{1}{3} \times \text{base area} \times h$ → Pyramids and cones (only the cone is on the 4MA1 Higher sheet)

★ **Similar shapes, scale factor k: lengths $\times k$, areas $\times k^2$, volumes $\times k^3$** → Scaling areas and volumes of similar shapes and solids
Watch for: Find k first; area $\times k^2$, volume $\times k^3$

★ **Circle theorems: angle at centre = 2 × angle at circumference; angle in a semicircle = 90°; angles in the same segment are equal; opposite angles of a cyclic quadrilateral sum to 180°; tangent ⊥ radius; two tangents from a point are equal; alternate segment theorem; perpendicular from the centre bisects a chord** → Find angles in circles, giving a reason for each step
Watch for: Quote each theorem in its recognised wording

★ **Intersecting chords:** $AP \times PB = CP \times PD$ → Chord properties to find lengths

★ **Vectors:** $\left|\binom{x}{y}\right| = \sqrt{x^2 + y^2}$, $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ → Magnitude; vectors in terms of a and b

★ **Bearings: measured clockwise from north, written with 3 figures** → Measure and calculate bearings, including a back bearing

Watch for Area $\times k^2$, volume $\times k^3$

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