STUDY FORMULA BOOKLET

Edexcel GCSE Maths 1MA1 Higher formulae sheet

The Higher exam aid prints area, volume, quadratic, trigonometry, sine and cosine rules, compound interest and two probability rules. Learn everything else, including exact trig values.

IN THE BOOKLET printed in the official booklet LEARN IT not printed: students must recall it

Based on the official **Pearson Edexcel GCSE (9-1) Mathematics, syllabus reference 1MA1, Higher tier Exam Aid, 2025 Assessment Window (W84362A)**, with what to learn and exam tips added by CuratedPrep.

Perimeter, area and volume

Printed on the exam aid for the Higher papers.

Area of a trapezium a and b are the lengths of the parallel sides; h is their perpendicular separation.	$A = \frac{1}{2}(a+b)h$	IN THE BOOKLET
Volume of a prism Works for cuboids and cylinders: a cylinder is V = πr²h.	$V = \text{area of cross section} \times \text{length}$	IN THE BOOKLET
Circumference of a circle r is the radius and d is the diameter.	$C = 2\pi r = \pi d$	IN THE BOOKLET
Area of a circle r is the radius. Leave answers in terms of π when asked.	$A = \pi r^2$	IN THE BOOKLET

Quadratic formula

Higher tier only.

Solution of a quadratic equation Solves ax² + bx + c = 0 where a is not zero. Rearrange to equal zero first.	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	IN THE BOOKLET

Pythagoras' theorem and trigonometry

Pythagoras' theorem Right-angled triangle; c is the hypotenuse, the longest side.	$a^2 + b^2 = c^2$	IN THE BOOKLET
Sine ratio Opposite over hypotenuse (a is opposite A). In right-angled triangle ABC, c is the hypotenuse.	$\sin A = \frac{a}{c}$	IN THE BOOKLET
Cosine ratio Adjacent over hypotenuse (b is next to A).	$\cos A = \frac{b}{c}$	IN THE BOOKLET
Tangent ratio Opposite over adjacent.	$\tan A = \frac{a}{b}$	IN THE BOOKLET
Sine rule Any triangle ABC. Use it with a matching side and angle pair.	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$	IN THE BOOKLET
Cosine rule Any triangle ABC. Use it for two sides and the included angle, or all three sides.	$a^2 = b^2 + c^2 - 2bc\cos A$	IN THE BOOKLET

Area of a triangle Any triangle ABC. C is the angle between sides a and b.	$\text{Area} = \frac{1}{2}ab\sin C$	IN THE BOOKLET

Compound interest

Total accrued P is the principal amount, r is the interest rate over a given period (as a percentage) and n is the number of times the interest is compounded.	$\text{Total accrued} = P\left(1 + \frac{r}{100}\right)^n$	IN THE BOOKLET

Probability

Addition rule P(A) is the probability of outcome A and P(B) of outcome B. For mutually exclusive events the last term is zero.	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$	IN THE BOOKLET
Conditional probability Rearrange to find P(A given B).	$P(A \text{ and } B) = P(A \text{ given } B)\,P(B)$	IN THE BOOKLET

Given in the question, not on the sheet

Pearson's specification (Appendix 3) says these are provided within the relevant question, so look for them in the question stem. You do not need to memorise them.

Curved surface area of a cone r is the radius and l is the slant height.	$A = \pi rl$	SEE NOTE
Surface area of a sphere r is the radius.	$A = 4\pi r^2$	SEE NOTE
Volume of a sphere r is the radius.	$V = \frac{4}{3}\pi r^3$	SEE NOTE
Volume of a cone h is the perpendicular height.	$V = \frac{1}{3}\pi r^2 h$	SEE NOTE

Learn these: not in the booklet

Area of a triangle

$A = \frac{1}{2}bh$

Area of a parallelogram

$A = bh$

Volume of a cuboid

$V = lwh$; cylinder: $V = \pi r^2 h$

Volume of a pyramid

$V = \frac{1}{3} \times \text{base area} \times \text{height}$

Slant height of a cone

$l = \sqrt{r^2 + h^2}$

Arc length

$l = \frac{\theta}{360} \times 2\pi r$

Area of a sector

$A = \frac{\theta}{360} \times \pi r^2$

Area of a segment

$\text{sector area} - \text{triangle area}$

Exact trig values

$\sin 30^\circ = \frac{1}{2}$, $\cos 60^\circ = \frac{1}{2}$, $\sin 45^\circ = \cos 45^\circ = \frac{\sqrt{2}}{2}$, $\sin 60^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2}$, $\sin 0^\circ = \cos 90^\circ = 0$, $\sin 90^\circ = \cos 0^\circ = 1$

Exact tan values

$\tan 0^\circ = 0$, $\tan 30^\circ = \frac{\sqrt{3}}{3}$, $\tan 45^\circ = 1$, $\tan 60^\circ = \sqrt{3}$

Trig graphs

$\tan\theta = \frac{\sin\theta}{\cos\theta}$, $\sin^2\theta + \cos^2\theta = 1$

3D problems

use Pythagoras and trigonometry in right-angled triangles inside the solid, drawing each triangle separately

Speed, density, pressure

$\text{speed} = \frac{\text{distance}}{\text{time}}$, $\text{density} = \frac{\text{mass}}{\text{volume}}$, $\text{pressure} = \frac{\text{force}}{\text{area}}$

Metric conversions

$1\text{ m} = 100\text{ cm},\ 1\text{ cm}^2 = 100\text{ mm}^2,\ 1\text{ m}^2 = 10\,000\text{ cm}^2,\ 1\text{ m}^3 = 1\,000\,000\text{ cm}^3,\ 1\text{ litre} = 1000\text{ cm}^3$

Simple interest

$$I = \frac{Prt}{100}$$

Percentage change

$$\frac{\text{new} - \text{old}}{\text{old}} \times 100$$

Percentage multipliers

increase by $r\%$: $\times \left(1 + \frac{r}{100}\right)$; decrease by $r\%$: $\times \left(1 - \frac{r}{100}\right)$

Original value (reverse percentage)

$$\text{original} = \frac{\text{new value}}{\text{multiplier}}$$

Growth and decay

$$\text{final} = \text{initial} \times \left(1 \pm \frac{r}{100}\right)^n$$

Bounds

add: $UB + UB$, subtract: $UB - LB$, multiply: $UB \times UB$, divide: $UB \div LB$

Sharing in a ratio

$$\text{one part} = \frac{\text{total}}{\text{total number of parts}}$$

Mean from a frequency table

$$\bar{x} = \frac{\sum fx}{\sum f}, \quad \text{range} = \text{largest} - \text{smallest}$$

Estimated mean from grouped data

$$\bar{x} \approx \frac{\sum f \times \text{midpoint}}{\sum f}$$

Frequency density

$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

Quartiles

Q_1 at $\frac{1}{4}n$, Q_3 at $\frac{3}{4}n$, $\text{IQR} = Q_3 - Q_1$

Probability basics

$P(\text{not } A) = 1 - P(A)$, all outcomes sum to 1, expected number $= P \times n$

Relative frequency

$$\frac{\text{number of times the outcome happens}}{\text{total number of trials}}$$

Independent events

$$P(A \text{ and } B) = P(A) \times P(B)$$

Conditional probability

$$P(A \text{ given } B) = \frac{P(A \text{ and } B)}{P(B)}$$

Angle sums

triangle 180°, quadrilateral 360°, straight line 180°, point 360°

Polygons

interior angle sum $= (n-2) \times 180^\circ$, exterior angle of a regular polygon $= \frac{360^\circ}{n}$, interior $= 180^\circ -$ exterior

Circle theorems

angle at the centre is twice the angle at the circumference; angle in a semicircle is 90°; angles in the same segment are equal; opposite angles of a cyclic quadrilateral sum to 180°

Congruent triangles

SSS, SAS, ASA, RHS

Straight line

$y = mx + c$, $m = \frac{\text{change in } y}{\text{change in } x}$, parallel lines have equal m

Perpendicular lines

$m_1 m_2 = -1$; line through (x_1, y_1) with gradient m : $y - y_1 = m(x - x_1)$

Midpoint of a line segment

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Distance between two points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Circle centred on the origin

$x^2 + y^2 = r^2$; tangent at a point is perpendicular to the radius

Completing the square

$$x^2 + bx + c = \left(x + \frac{b}{2}\right)^2 + c - \frac{b^2}{4}$$

Difference of two squares

$$a^2 - b^2 = (a - b)(a + b)$$

Index laws

$a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$, $a^0 = 1$, $a^{-n} = \frac{1}{a^n}$

Fractional indices

$a^{1/n} = \sqrt[n]{a}$, $a^{m/n} = \left(\sqrt[n]{a}\right)^m$

Surds

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$, $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$, $\frac{1}{\sqrt{a}} = \frac{\sqrt{a}}{a}$, $\frac{1}{a + \sqrt{b}} = \frac{a - \sqrt{b}}{a^2 - b}$

Standard form

$A \times 10^n$, $1 \le A < 10$, n an integer

nth term of a linear sequence

$an + b$, where a is the common difference

nth term of a quadratic sequence

$an^2 + bn + c$, $a = \frac{1}{2} \times$ second difference

Geometric sequence

$\text{term} = ar^{n-1},\ \text{common ratio } r$

Direct and inverse proportion

$y = kx, \quad y = \frac{k}{x}$

Proportion equations

$y \propto x^2 \Rightarrow y = kx^2, \quad y \propto \frac{1}{x^2} \Rightarrow y = \frac{k}{x^2}$

Similar shapes

$\text{area scale factor } k^2, \quad \text{volume scale factor } k^3$

Gradients

$\text{distance-time gradient} = \text{speed},\ \text{velocity-time gradient} = \text{acceleration},\ \text{area under a velocity-time graph} = \text{distance}$

Iteration

$x_{n+1} = f(x_n)$

Functions

$fg(x) = f(g(x)),\ \text{inverse } f^{-1} \text{ undoes } f$

Column vectors

$\begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} a+c \\ b+d \end{pmatrix}, \quad k\begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} ka \\ kb \end{pmatrix}$

Using the booklet in the exam

- Read the exam aid first and note what is printed, so you do not waste time recalling it.
- Label the triangle before choosing a rule: right-angled uses the ratios, any other triangle uses the sine or cosine rule.
- Match capital and lowercase letters in the sine and cosine rules: side a is always opposite angle A.
- For compound interest, make n match the compounding period and use the multiplier 1 + r over 100 for growth or 1 - r over 100 for decay.
- Cone and sphere formulae appear in the question stem, so read it before trying to recall them.

Based on: Pearson Edexcel GCSE (9-1) Mathematics 1MA1 (Higher tier), Higher tier Exam Aid, 2025 assessment window; Pearson Edexcel GCSE (9-1) Mathematics 1MA1 specification, Specification Issue 2, Appendix 3: mathematical formulae. Statistical tables are calculated by CuratedPrep to the same layout. Updated 31 October 2026. Always practise with the version of the official booklet your exam uses. More free sheets and topic worksheets at curatedprep.com.