STUDY FORMULA BOOKLET

AQA Level 2 Certificate Further Maths 8365 formulae sheet

The sheet prints area, quadratic, trigonometry, straight-line and circle formulae. You must learn calculus rules, matrix transformations, cylinder formulae, exact trig values and circle theorems.

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

Based on the official **Level 2 Certificate Further Mathematics Formulae Sheet (8365), AQA insert IB/M/Insert to Level 2 Certificate Further Mathematics/E2, for exams in June 2022 only**, with what to learn and exam tips added by CuratedPrep.

Perimeter, area and volume

Printed on the insert.

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, which you must also know.	$V = \text{area of cross section} \times \text{length}$	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

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 Right-angled triangle ABC: opposite over hypotenuse (a is opposite A).	$\sin A = \frac{a}{c}$	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 C is the angle between sides a and b.	$\text{Area} = \frac{1}{2}ab\sin C$	IN THE BOOKLET
Tangent in terms of sine and cosine Holds for any angle θ (where cos θ is not zero). Used to simplify expressions and prove identities.	$\tan\theta = \frac{\sin\theta}{\cos\theta}$	IN THE BOOKLET
Trigonometric identity Holds for any angle θ. Rearrange to swap $\sin^2$ for 1 - $\cos^2$.	$\sin^2\theta + \cos^2\theta = 1$	IN THE BOOKLET

Coordinate geometry

Straight line through a point Line through (x_1, y_1) with gradient m.	$y - y_1 = m(x - x_1)$	IN THE BOOKLET
Equation of a circle Centre (a, b), radius r. With centre (0, 0) it becomes $x^2 + y^2 = r^2$.	$(x-a)^2 + (y-b)^2 = r^2$	IN THE BOOKLET

Given in the question, not on the sheet

AQA's specification says these are given in 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 of the base 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 or pyramid h is the perpendicular height.	$V = \frac{1}{3} \times \text{area of base} \times h$	SEE NOTE

Learn these: not in the booklet

Curved surface area of a cylinder

$A = 2\pi rh$

The spec lists this as a formula to know, not given.

Volume of a cylinder

$V = \pi r^2 h$

Area of a triangle

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

Base times perpendicular height. Only the sine form is printed.

Area of a parallelogram

$A = bh$

Pythagorean triples

$3, 4, 5 \quad 5, 12, 13 \quad 8, 15, 17 \quad 7, 24, 25$

Plus simple multiples, for example 6, 8, 10.

Pythagoras in three dimensions

$d^2 = a^2 + b^2 + c^2$

Space diagonal of a cuboid with sides a, b and c.

Exact trig ratios

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

From the 30, 60, 90 triangle (sides 1 : √3 : 2) and the 45, 45, 90 triangle (sides 1 : 1 : √2).

Trig graphs and angles of any size

$\sin(180^\circ - x) = \sin x, \quad \cos(360^\circ - x) = \cos x, \quad \tan x$ repeats every 180°

Sketch y = sin x, cos x and tan x for 0 to 360 degrees and read off the other solutions.

Gradient of a line

$m = \frac{y_2 - y_1}{x_2 - x_1}$

Straight line, gradient-intercept form

$y = mx + c$

m is the gradient and c is the y-intercept.

Parallel and perpendicular lines

$m_1 = m_2$ (parallel), $\quad m_1 m_2 = -1$ (perpendicular)

Distance between two points

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

Pythagoras on the horizontal and vertical differences.

Midpoint of a line segment

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

For a point dividing the line in another ratio, use the ratio of the differences.

Circle centred on the origin

$$x^2 + y^2 = r^2$$

Tangent to a circle

$$\text{tangent} \perp \text{radius}$$

The tangent is at 90 degrees to the radius at the point of contact, so its gradient is the negative reciprocal of the radius gradient.

Circle theorems

Angle in a semicircle is 90 degrees. Perpendicular from the centre to a chord bisects the chord. Tangents from an external point are equal in length. Angle at the centre is twice the angle at the circumference. Angles in the same segment are equal. Opposite angles of a cyclic quadrilateral add to 180 degrees. Alternate segment theorem.

Differentiation of a power

$$\frac{d}{dx}\left(kx^n\right) = knx^{n-1}$$

For integer n and sums of such terms. Expand brackets and write $1/x^3$ as x^{-3} first.

Tangent and normal to a curve

$$m_{\text{tangent}} = \frac{dy}{dx}, \qquad m_{\text{normal}} = -\frac{1}{m_{\text{tangent}}}$$

Then use $y - y_1 = m(x - x_1)$.

Stationary points

$$\frac{dy}{dx} = 0, \quad \frac{d^2y}{dx^2} > 0 \Rightarrow \text{minimum}, \quad \frac{d^2y}{dx^2} < 0 \Rightarrow \text{maximum}$$

Or test the sign of the gradient either side. Gradient positive means increasing, negative means decreasing.

Completing the square

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

For $ax^2 + bx + c$, take out the factor a first.

Factor theorem

$$f(a) = 0 \iff (x - a) \text{ is a factor of } f(x)$$

For $(px - q)$ test $x = q/p$. Use it to factorise cubics and quartics.

Difference of two squares

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

Index laws

$$a^m \times a^n = a^{m+n}, \ \frac{a^m}{a^n} = a^{m-n}, \ (a^m)^n = a^{mn}, \ a^{-n} = \frac{1}{a^n}, \ a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$$

Rationalising the denominator

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

Multiply top and bottom by the conjugate.

Binomial expansion

$$(a + b)^n$$

Expand with Pascal's triangle for positive integer n. Row 5 is 1, 5, 10, 10, 5, 1.

Product rule for counting

$$\text{total} = m \times n$$

If one choice can be made in m ways and a second in n ways, there are m times n outcomes.

Linear sequence, nth term

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

a is the first term and d the common difference.

Quadratic sequence, nth term

$$u_n = an^2 + bn + c$$

The second difference is 2a. Find a first, then b and c from the first terms.

Function notation

$$fg(x) = f(g(x))$$

g is applied first. The inverse f^{-1} undoes f; swap x and y and rearrange.

Matrix product

Multiply a 2 by 2 matrix by a 2 by 2 or 2 by 1 matrix: row times column. Order matters. The identity matrix I leaves any matrix unchanged.

Identity matrix

$$I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

Rotation 90 degrees anticlockwise about the origin

$$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

Rotation 180 degrees about the origin

$$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$

Rotation 270 degrees anticlockwise about the origin

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

Reflection in y = 0 (the x-axis)

$$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

Reflection in x = 0 (the y-axis)

$$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

Reflection in y = x

$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

Reflection in y = -x

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

Enlargement, scale factor k, centre the origin

$$\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$$

The columns of a transformation matrix are the images of (1, 0) and (0, 1) from the unit square.

Combining transformations

$\mathbf{BA}$ means A first, then B

Multiply the matrices in reverse order of the transformations.

Using the booklet in the exam

- Open the insert at the start of the paper and note what is printed, so you do not waste time recalling it.
- Label the right-angled triangle with opposite, adjacent and hypotenuse before using the sheet's a, b and c ratios.
- Check the sine and cosine rules are matched to the correct sides: capital A is opposite lowercase a.
- Calculus, matrix transformations, sequences and circle theorems are not on the sheet, so revise them from your own list.
- Cone and sphere formulae appear in the question stem, so read it before trying to recall them.

Based on: AQA Level 2 Certificate in Further Mathematics 8365, Formulae Sheet insert, exams in June 2022; AQA Level 2 Certificate in Further Mathematics 8365 specification, Version 1.4, Appendix: 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.