

A-level Maths formula sheet

Pure mathematics, statistics and mechanics · Checked against the exam boards' booklets on 11 October 2026

An original MathsDaily revision sheet, not an official exam booklet. Each formula is labelled to show whether it is printed in the AQA and Pearson Edexcel A-level Mathematics booklets you get in the exam, or must be learned. OCR prints its formulae inside each question paper, so OCR students should check the list in a recent paper.

In AQA and Edexcel booklets: Printed in both the AQA and the Pearson Edexcel formulae booklets used in the exam.

AQA booklet only: Printed in the AQA booklet but not the Edexcel booklet.

Edexcel booklet only: Printed in the Pearson Edexcel booklet but not the AQA booklet.

Learn: not in the booklets: Not printed in the AQA or Edexcel booklets. You are expected to know it.

Algebra, functions and logarithms

Quadratic formula and discriminant

LEARN: NOT IN THE BOOKLETS

$$ax^2 + bx + c = 0 \Rightarrow x = (-b \pm \sqrt{b^2 - 4ac}) / 2a$$

Discriminant $b^2 - 4ac$: > 0 two real roots, $= 0$ one repeated root, < 0 no real roots

$a \neq 0$.

Laws of logarithms

LEARN: NOT IN THE BOOKLETS

$$\log_a xy = \log_a x + \log_a y; \log_a (x/y) = \log_a x - \log_a y; \log_a x^k = k \log_a x$$

$$a^x = b \Leftrightarrow x = \log_a b; e^{\ln x} = x; \ln e^x = x$$

$x, y > 0$; $a > 0, a \neq 1$. Change of base, $\log_a x = \log_b x / \log_b a$, is printed in the Edexcel booklet only.

Exponential growth and decay

LEARN: NOT IN THE BOOKLETS

$$y = Ae^{kx}: \text{growth if } k > 0, \text{ decay if } k < 0; d/dx (e^{kx}) = ke^{kx}; a^x = e^{x \ln a}$$

Modulus, composite and inverse functions

LEARN: NOT IN THE BOOKLETS

$fg(x) = f(g(x))$: apply g first. f^{-1} reverses f , and its graph is the reflection of $y = f(x)$ in $y = x$.

f must be one-to-one on its domain for f^{-1} to exist; the domain of f^{-1} is the range of f .

Sequences, series and the binomial expansion

Arithmetic series

In AQA and Edexcel booklets

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

Learn the n th term $u_n = a + (n - 1)d$: it is not printed. l is the last term.

Geometric series

In AQA and Edexcel booklets

$$S_n = a(1 - r^n) / (1 - r); S_\infty = a / (1 - r) \text{ for } |r| < 1$$

Learn the n th term $u_n = ar^{n-1}$. S_n needs $r \neq 1$.

Binomial series

In AQA and Edexcel booklets

$$(a + b)^n = a^n + {}^nC_1 a^{n-1}b + {}^nC_2 a^{n-2}b^2 + \dots + b^n \text{ (n a positive integer)}$$

$${}^nC_r = n! / (r!(n - r)!)$$

$$(1 + x)^n = 1 + nx + n(n - 1)x^2/2! + n(n - 1)(n - 2)x^3/3! + \dots (|x| < 1, n \text{ rational})$$

For $(1 + bx)^n$ the validity becomes $|bx| < 1$.

Trigonometry

Sine rule, cosine rule and area**LEARN: NOT IN THE BOOKLETS**

$$a/\sin A = b/\sin B = c/\sin C; a^2 = b^2 + c^2 - 2bc \cos A; \text{Area} = \frac{1}{2}ab \sin C$$

Side a is opposite angle A.

Radians: arc length and sector area**LEARN: NOT IN THE BOOKLETS**

$$s = r\theta; A = \frac{1}{2}r^2\theta; \pi \text{ radians} = 180^\circ$$

 θ in radians.**Pythagorean identities****LEARN: NOT IN THE BOOKLETS**

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

Compound-angle formulae**In AQA and Edexcel booklets**

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = (\tan A \pm \tan B) / (1 \mp \tan A \tan B)$$

tan form needs $A \pm B \neq (k + \frac{1}{2})\pi$.**Double-angle formulae****LEARN: NOT IN THE BOOKLETS**

$$\sin 2A = 2 \sin A \cos A; \cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A; \tan 2A = 2 \tan A / (1 - \tan^2 A)$$

Derived from the compound-angle formulae with $B = A$.**Harmonic form****LEARN: NOT IN THE BOOKLETS**

$$a \sin \theta + b \cos \theta = R \sin(\theta + \alpha), \text{ where } R = \sqrt{a^2 + b^2}, \tan \alpha = b/a$$

Similar forms exist for $R \cos(\theta \pm \alpha)$; choose the form the question asks for.**Small-angle approximations****In AQA and Edexcel booklets**

$$\sin \theta \approx \theta; \cos \theta \approx 1 - \theta^2/2; \tan \theta \approx \theta$$

 θ small and in radians.

Differentiation

Standard derivatives**LEARN: NOT IN THE BOOKLETS**

$$x^n \rightarrow nx^{n-1}; e^{kx} \rightarrow ke^{kx}; \ln x \rightarrow 1/x; \sin kx \rightarrow k \cos kx; \cos kx \rightarrow -k \sin kx; a^x \rightarrow a^x \ln a$$

Trigonometric results require radians.

Further derivatives**In AQA and Edexcel booklets**

$$\tan kx \rightarrow k \sec^2 kx; \sec x \rightarrow \sec x \tan x; \operatorname{cosec} x \rightarrow -\operatorname{cosec} x \cot x; \cot x \rightarrow -\operatorname{cosec}^2 x$$

First principles**In AQA and Edexcel booklets**

$$f'(x) = \lim_{h \rightarrow 0} [f(x+h) - f(x)] / h$$

Product and chain rules**AQA booklet only**

$$d/dx (uv) = u dv/dx + v du/dx; dy/dx = (dy/du)(du/dx)$$

The Edexcel booklet does not print these: Edexcel students must learn them.

Quotient rule

In AQA and Edexcel booklets

$$d/dx (u/v) = (v du/dx - u dv/dx) / v^2$$

 $v \neq 0$.**Parametric and implicit differentiation**

LEARN: NOT IN THE BOOKLETS

$$dy/dx = (dy/dt) / (dx/dt); d/dx [f(y)] = f'(y) dy/dx$$

 $dx/dt \neq 0$.**Stationary points**

LEARN: NOT IN THE BOOKLETS

$dy/dx = 0$ at a stationary point; $d^2y/dx^2 > 0$ minimum, < 0 maximum (test further if $= 0$). Point of inflection: d^2y/dx^2 changes sign.

Integration and numerical methods

Standard integrals

LEARN: NOT IN THE BOOKLETS

$$\int x^n dx = x^{n+1}/(n+1) + c \quad (n \neq -1); \int 1/x dx = \ln|x| + c; \int e^{kx} dx = e^{kx}/k + c; \int \cos kx dx = (1/k) \sin kx + c; \int \sin kx dx = -(1/k) \cos kx + c; \int \sec^2 kx dx = (1/k) \tan kx + c$$

Integration by parts

In AQA and Edexcel booklets

$$\int u (dv/dx) dx = uv - \int v (du/dx) dx$$

Integrals of f'/f , tan and cot

AQA booklet only

$$\int f'(x)/f(x) dx = \ln|f(x)| + c; \int \tan x dx = \ln|\sec x| + c; \int \cot x dx = \ln|\sin x| + c$$

The Edexcel booklet prints tan, cot, sec and cosec integrals but not the f'/f result.

Area and definite integrals

LEARN: NOT IN THE BOOKLETS

$$\text{Area} = \int_a^b y dx; \text{area between curves} = \int_a^b (\text{upper} - \text{lower}) dx$$

Signed area is negative below the x-axis: split at roots for total area.

Newton-Raphson

In AQA and Edexcel booklets

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

Can fail if $f'(x_n)$ is near 0 or the start is far from the root.

Trapezium rule

In AQA and Edexcel booklets

$$\int_a^b y dx \approx \frac{1}{2}h[(y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1})], h = (b - a)/n$$

Overestimates for curves that are concave up (convex), underestimates for concave down.

Vectors

LEARN: NOT IN THE BOOKLETS

$$|a\mathbf{i} + b\mathbf{j} + c\mathbf{k}| = \sqrt{a^2 + b^2 + c^2}; \text{unit vector } \hat{a} = a/|a|; \text{distance between points} = |b - a|$$

Statistics

Probability

In AQA and Edexcel booklets

$$P(A \cup B) = P(A) + P(B) - P(A \cap B); P(A \cap B) = P(A) P(B | A)$$

Independent: $P(A \cap B) = P(A) P(B)$. Mutually exclusive: $P(A \cap B) = 0$.

Summary statistics

In AQA and Edexcel booklets

$$\bar{x} = \Sigma x/n; \sigma = \sqrt{(\Sigma(x - \bar{x})^2/n)} = \sqrt{(\Sigma x^2/n - \bar{x}^2)}$$

Edexcel also prints $S_{xx} = \Sigma(x - \bar{x})^2 = \Sigma x^2 - (\Sigma x)^2/n$ and $IQR = Q_3 - Q_1$. An outlier is often defined as more than $1.5 \times IQR$ beyond a quartile; use the definition given.

Binomial distribution

In AQA and Edexcel booklets

$$X \sim B(n, p): P(X = x) = {}^nC_x p^x (1 - p)^{n-x}; E(X) = np; \text{Var}(X) = np(1 - p)$$

Fixed n , independent trials, two outcomes, constant p .

Normal distribution

LEARN: NOT IN THE BOOKLETS

$$X \sim N(\mu, \sigma^2): Z = (X - \mu)/\sigma \sim N(0, 1)$$

σ is the standard deviation (the square root of the variance).

Distribution of the sample mean

In AQA and Edexcel booklets

For a random sample of n from $N(\mu, \sigma^2)$: $\bar{X} \sim N(\mu, \sigma^2/n)$, so $(\bar{X} - \mu)/(\sigma/\sqrt{n}) \sim N(0, 1)$

Hypothesis testing

LEARN: NOT IN THE BOOKLETS

Reject H_0 when the p -value $\leq$ significance level (or the test statistic is in the critical region). Two-tailed tests split the significance level between tails.

Failing to reject H_0 does not prove it is true. State conclusions in context.

Mechanics**Constant acceleration (SUVAT)**

In AQA and Edexcel booklets

$$v = u + at; s = ut + \frac{1}{2}at^2; s = vt - \frac{1}{2}at^2; s = \frac{1}{2}(u + v)t; v^2 = u^2 + 2as$$

Straight-line motion, constant a . Vector forms: $v = u + at$, $r = ut + \frac{1}{2}at^2$.

Variable acceleration

LEARN: NOT IN THE BOOKLETS

$$v = ds/dt; a = dv/dt = d^2s/dt^2; s = \int v \, dt; v = \int a \, dt$$

Use limits or initial conditions to find constants.

Forces and Newton's laws

LEARN: NOT IN THE BOOKLETS

$$F = ma; W = mg; \text{friction } F \leq \mu R, \text{ with } F = \mu R \text{ when sliding or in limiting equilibrium}$$

Take $g = 9.8 \text{ m s}^{-2}$ unless told otherwise.

Moments

LEARN: NOT IN THE BOOKLETS

Moment = force $\times$ perpendicular distance from the pivot. In equilibrium: resultant force = 0 and total clockwise moment = total anticlockwise moment.

Projectiles

LEARN: NOT IN THE BOOKLETS

$$\text{Horizontal: } x = (u \cos \theta)t. \text{ Vertical: } y = (u \sin \theta)t - \frac{1}{2}gt^2; v_y = u \sin \theta - gt$$

No air resistance; the horizontal velocity is constant.

Checklist: formulae to learn

None of these is printed in the AQA or Edexcel booklets. Tick each one when you can write it from memory.

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- ☐ Quadratic formula and discriminant
- ☐ Laws of logarithms
- ☐ Exponential growth and decay
- ☐ Modulus, composite and inverse functions

Trigonometry

- ☐ Sine rule, cosine rule and area
- ☐ Radians: arc length and sector area
- ☐ Pythagorean identities
- ☐ Double-angle formulae
- ☐ Harmonic form

Differentiation

- ☐ Standard derivatives
- ☐ Parametric and implicit differentiation
- ☐ Stationary points

Integration and numerical methods

- ☐ Standard integrals
- ☐ Area and definite integrals
- ☐ Vectors

Statistics

- ☐ Normal distribution
- ☐ Hypothesis testing

Mechanics

- ☐ Variable acceleration
- ☐ Forces and Newton's laws
- ☐ Moments
- ☐ Projectiles

Official sources

AQA: Formulae for A-level Mathematics (7356/7357), v1.2, August 2017

AQA: Formulae and statistical tables for A-level Mathematics and Further Mathematics, v1.5, February 2018

AQA: current formulae booklet versions

Pearson Edexcel: Mathematical Formulae and Statistical Tables, Issue 1, July 2017 (A level Maths and Further Maths)

OCR: AS and A Level Mathematics A (H230, H240): formulae are printed in each question paper

Department for Education: AS and A level maths subject content, including formulae requirements

Department for Education: AS and A level further maths subject content

Booklet contents can change: always use the version your exam board supplies for the current series.