

Formulas to memorise

Every formula you need to memorise for GCSE Maths. The ones the exam gives you are left off.

 36 formulas to memorise

 None of these are printed in the exam

 Higher-only items marked H

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SECTION 01

Memorise these

Not on the formulae sheet. A worked example under each one.

Memorise everything on this sheet

None of it is printed in the exam. Cover a formula, say it, check it.

The rest is given to you

Pythagoras, SOHCAHTOA, circles, compound interest, the quadratic formula, sine and cosine rules and more are on the official formulae sheet in every exam: mygcsemaths.com/past-papers

Number**Percentage change**

$$\frac{\text{change}}{\text{original}} \times 100$$

e.g. 40 to 50: $10 \div 40 \times 100 = 25\%$ increase

Simple interest

$$\text{interest} = \frac{P \times r \times \text{years}}{100}$$

e.g. £200 at 3% for 4 years: £24

Percentage multipliers

increase by 15%: $\times 1.15$ · decrease by 15%: $\times 0.85$

e.g. £80 up 15%: $80 \times 1.15 = £92$

Reverse percentages

original = new amount $\div$ multiplier

e.g. £92 after a 15% rise: $92 \div 1.15 = £80$

Depreciation (decay)

$$\text{value} = \text{start} \times \left(1 - \frac{r}{100}\right)^n$$

e.g. £2000 losing 10% a year for 2 years: $2000 \times 0.9^2 = £1620$

Ratio, proportion and rates**Speed**

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

e.g. 120 km in 1.5 hours: 80 km/h

Density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

e.g. 600 g, 200 cm³: 3 g/cm³

Pressure

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

e.g. 50 N on 2 m²: 25 N/m²

Direct and inverse proportion

$$\text{direct: } y = kx \cdot \text{inverse: } y = \frac{k}{x}$$

e.g. $y = 12$ when $x = 3$ (direct): $k = 4$, so $y = 4x$



SECTION 01

Memorise these, continued

Algebra

Straight line

$$y = mx + c$$

e.g. m = gradient, c = where it crosses the y -axis

Gradient

$$\frac{\text{change in } y}{\text{change in } x}$$

e.g. (1, 3) to (3, 7): $4 \div 2 = 2$

Midpoint

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

e.g. (2, 3) and (8, 7): (5, 5)

► Not named in the DfE content, but used on papers. Learn it to be safe.

Difference of two squares

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

e.g. $x^2 - 49 = (x + 7)(x - 7)$

nth term of a linear sequence

difference $\times n$ + (first term – difference)

e.g. 5, 8, 11, ... : $3n + 2$

Perpendicular lines H

$$m_1 \times m_2 = -1$$

e.g. perpendicular to $y = 2x + 1$ has gradient $-\frac{1}{2}$

Completing the square H

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

e.g. $x^2 + 6x + 2 = (x + 3)^2 - 7$, turning point $(-3, -7)$

Circle, centre (0, 0) H

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

e.g. $x^2 + y^2 = 25$ has radius 5

Probability

Not happening

$$P(\text{not } A) = 1 - P(A)$$

e.g. $P(\text{rain}) = 0.35$, so $P(\text{no rain}) = 0.65$

Expected frequency

probability $\times$ number of trials

e.g. $P = 0.2$, 50 goes: expect 10

Relative frequency

$$\frac{\text{number of times it happened}}{\text{number of trials}}$$

e.g. 12 sixes in 60 rolls: 0.2

Independent events

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

e.g. head and a six: $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$



SECTION 01

Memorise these, continued

■ Geometry and measures

Area: rectangle, triangle, parallelogram

rectangle $l \times w$ · triangle $\frac{1}{2} \times b \times h$ ·parallelogram $b \times h$

e.g. triangle, base 8, height 5: 20

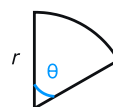
Volume: cuboid and cylinder

cuboid $l \times w \times h$ · cylinder $\pi r^2 h$ e.g. cylinder $r = 2$, $h = 10$: $40\pi \approx 125.7$

Surface area of a cylinder

 $2\pi r^2 + 2\pi rh$ (two circles + the curved side)e.g. $r = 2$, $h = 10$: $8\pi + 40\pi = 48\pi \approx 150.8$

Arc length and sector area

arc = $\frac{\theta}{360} \times \pi d$ · sector = $\frac{\theta}{360} \times \pi r^2$ e.g. 90° , $r = 4$: arc $2\pi \approx 6.28$, area $4\pi \approx 12.57$ 

Angle facts

triangle 180° · straight line 180° · around a point 360° · quadrilateral 360°

Polygons

interior angles add to $(n - 2) \times 180^\circ$ · exterior angles add to 360° · regular: each exterior = $360^\circ \div n$ e.g. hexagon: 720° inside; regular: 60° each outsideSimilar shapes **H**lengths $\times k$ · areas $\times k^2$ · volumes $\times k^3$ e.g. $k = 2$: areas $\times 4$, volumes $\times 8$

Volume of a pyramid

 $\frac{1}{3} \times \text{base area} \times \text{height}$ e.g. base 9 cm^2 , height 4 cm : 12 cm^3

► Not on the formulae sheet and not in the DfE's list of formulae that may be given. Learn it to be safe.

Exact trig values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	n/a

For non-calculator questions. sin and cos swap over; $\tan = \sin \div \cos$.

SECTION 01



Memorise these, continued

Statistics

Mean

$\frac{\text{total of the values}}{\text{number of values}} \cdot \text{from a table: } \frac{\sum fx}{\sum f}$
e.g. 3, 5, 7, 9: $24 \div 4 = 6$

Estimated mean, grouped data

$\frac{\sum(\text{midpoint} \times \text{frequency})}{\sum \text{frequency}}$
e.g. use the middle of each class

Pie chart angle

$\frac{\text{frequency}}{\text{total}} \times 360^\circ$
e.g. 15 out of 60: 90°

Range and median

range = largest – smallest · median is the $(n + 1) \div 2$ th value
e.g. 9 values: the median is the 5th

Interquartile range H

upper quartile – lower quartile
e.g. UQ 18, LQ 11: IQR 7

Frequency density H

$\frac{\text{frequency}}{\text{class width}}$
e.g. 30 in a class 10 wide: 3

How to make them stick

Cover the formula, say it out loud, write it, check it. Five a day, every day.

Then use them

Do past paper questions that need each one. Using a formula is what makes it stay.

Knowing the formula is half of it.

The other half is knowing which one a question wants. That's what we practise live, one past paper at a time.



Free live lesson

An hour with me, live on YouTube, working through a real past paper step by step. Free. Bring a friend.



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Stick this sheet on your wall. Cover a formula, say it out loud, check it. Do that every day for a week and it's yours.

I'm rooting for you.

Matt ⚡

Based on the DfE GCSE mathematics subject content and the AQA, Edexcel and OCR formulae sheets. Ofqual has confirmed formulae sheets for every exam on the current GCSE specifications, including resits.