

Year 11 Curriculum Overview Mathematics 2025-2026

Year 11	Term 1												
Unit Title	Gradients and lines			Non-linear graphs		Using graphs		Expanding and factorising		Changing the subject		Functions	
Approximate Number of Lessons	3			3		3		3		3		3	
Curriculum Content Higher content in bold	- Equations of lines parallel to the axis - Plot and draw straight lines - Interpret $y = mx + c$ - Find the equation of a line from a graph, given one point and gradient, or two points - Determine whether a point is on a line - Solve linear simultaneous equations Recognise and find equations of perpendicular lines			- Plot and read from quadratic, cubic and reciprocal graphs - Recognise graph shapes - Identify and interpret roots and intercepts Understand and use exponential graphs Find and use the equation of a circle Find the equation of the tangent to any curve		- Reflect shapes - Construct and interpret conversion and other real-life straight-line graphs - Interpret and construct distance/time, speed/time and piece-wise graphs - Recognise and interpret graphs that illustrate direct and inverse proportion - Find approximate solutions to equations using graphs Estimate the area under a curve		- Expand and factorise with a single bracket - Expand binomials Factorise quadratics expressions, including where $a \neq 1$ - Solve equations equal to zero - Solve quadratic equations by factorisation Complete the square of an expression Use the quadratic formula to solve an equation		- Solve linear equations and inequalities - Form and solve equations and inequalities in the context of shape - Change the subject of a formula, including where the subject appears more than once Solve equations by iteration		- Use function machines - Substitute into expressions and formulae - Use function notation Work with composite and inverse functions - Graphs of quadratic functions Solve quadratic inequalities Understand and use trigonometric functions	
	Identification and focused teaching on weaker topic areas from weekly past paper practice, accounting for approximately 4 lessons a fortnight.												
Links to prior learning	- Plotting coordinates and using graphs - Parallel and perpendicular lines - Substitution			- Coordinates - Table of values - Reciprocal - Intercepts - Names for parts of a circle		- Transformations - Straight line graphs - Problems involving direct and inverse proportion - Area of rectangles, triangles and trapeziums		- Expanding and factorising expressions - Identify factors - Sum and product - Coefficients - Substitution		- Solve simple linear equations - Recognise inequality signs - Recall a range of formulae - Use of ANS button on calculator		- Function machines - Substitution into expressions - Inputs and outputs - Quadratic functions - Trigonometric functions	
Cultural Capital Opportunities	Looking forward to Key Stage 5 Maths												
Assessment Focus	/	/	Paper 1.1.1 (non-calc)	Paper 1.1.2 (non-calc)	Paper 1.2.1 (calc)	Paper 1.2.2 (calc)	Paper 1.3.1 (calc)	Paper 1.3.2 (calc)	Paper 2.1.1 (non-calc)	Paper 2.1.2 (non-calc)	Catch up		
Knowledge Organiser	KS4 GCSE Mathematics Foundation Tier KS4 GCSE Mathematics Higher Tier												

From Christmas to May/June, lessons are more tailored to the needs of the respective groups, as well as focusing on revision for the January Mock and addressing gaps identified by past paper practice.

BIDMAS N3

...or BODMAS. Use the correct order of operations; take care when using a calculator.

- Brackets
- Indices (or powers)
- Division and Multiplication
- Addition and Subtraction

Types of number N4

Integer: a "whole" number
Factors; the divisors of an integer
➔ **Factors of 12 are 1, 2, 3, 4, 6, 12**
Multiples; a "times table" for an integer (will continue indefinitely)
➔ **Multiples of 12 are 12, 24, 36 ...**
Prime number: an integer which has exactly two factors (1 and the number itself). Note: 1 is not a prime number.

HCF, LCM N4

Highest Common Factor (HCF)
➔ **Factors of 6 are 1, 2, 3, 6**
Factors of 9 are 1, 3, 9
HCF of 6 and 9 is 3
Lowest Common Multiple (LCM)
➔ **Multiples of 6 are 6, 12, 18, 24, ...**
Multiples of 9 are 9, 18, 27, 36, ...
LCM of 6 and 9 is 18

Prime factors N4

Write a number as a product of its prime factors; use indices for repeated factors:
➔ $720 = 5 \times 3^2 \times 2^4$

Powers and roots N6, N7

Special indices: for any value a :
 $a^0 = 1$
 $a^{-n} = \frac{1}{a^n}$
➔ $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

Calculating with fractions N8

Adding or subtracting fractions; use a common denominator...

➔ $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$
Multiplying fractions; multiply numerators and denominators...

➔ $\frac{4}{7} \times \frac{2}{3} = \frac{8}{21}$

Dividing fractions; "flip" the second fraction, then multiply...

➔ $\frac{2}{7} \div \frac{5}{6} = \frac{2}{7} \times \frac{6}{5} = \frac{12}{35}$

Fractions, decimals N10

Fraction is numerator $\div$ denominator

➔ $\frac{5}{8} = 5 \div 8 = 0.625$

Use place values to change decimals to fractions. Simplify where possible.

➔ $0.45 = \frac{45}{100} = \frac{9}{20}$

Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{4}$
0.5	0.25	0.1	0.2	0.75

Surds N8

Look for the biggest square number factor of the number:
➔ $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

Standard form N9

Standard form numbers are of the form $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

Standard units N13

1 tonne = 1000 kilograms
1 kilogram = 1000 grams

1 kilometre = 1000 metres
1 metre = 100 centimetres
= 1000 millimetres
1 centimetre = 10 millimetres

1 day = 24 hours
1 hour = 60 minutes = 3600 seconds
1 minute = 60 seconds

Rounding N15

Truncate the number, then use a "decider digit" to round up or down.
Decimal places: use the decimal point
➔ **162.3681 to 2dp;**
162.36 | 81 = 162.37 to 2dp
Significant figures: use the first non-zero digit.

➔ **162.3681 to 2sf;**
16 | 2.3681 = 160 to 2sf
➔ **0.007 039 to 3sf;**
0.007 03 | 9 = 0.007 04 to 3sf

Error intervals N15

Find the range of numbers that will round to a given value:
➔ **$x = 5.83$ (2 decimal places)**
 $5.825 \leq x < 5.835$
➔ **$y = 46$ (2 significant figures)**
 $45.5 \leq y < 46.5$
Note use of $\leq$ and $<$, and that the last significant figure of each is 5

Algebraic notation A1

$ab = a \times b$
 $3y = y + y + y$
 $a^2 = a \times a$
 $a^3 = a \times a \times a$
 $a^2b = a \times a \times b$
 $\frac{a}{b} = a \div b$

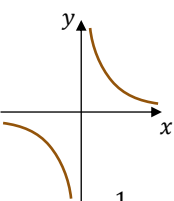
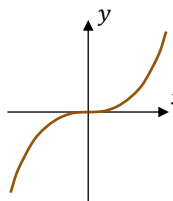
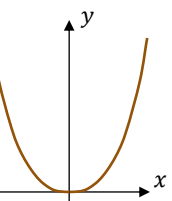
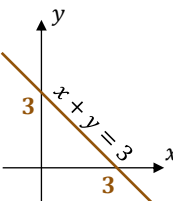
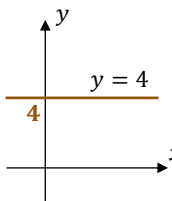
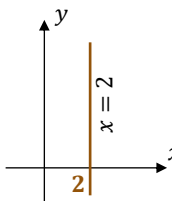
Equations and identities A3

An equation is true for some particular value of x
➔ **$2x + 1 = 7$ is true if $x = 3$**
...but an identity is true for every value of x
➔ **$(x + a)^2 \equiv x^2 + 2ax + a^2$**
(note the use of the symbol $\equiv$)

Laws of indices A4

For any value a :
 $a^x \times a^y = a^{x+y}$
 $\frac{a^x}{a^y} = a^{x-y}$
 $(a^x)^y = a^{xy}$
➔ $\left(\frac{2pq^4}{p^3q}\right)^3 = \frac{8p^3q^{12}}{p^9q^3} = \frac{8q^9}{p^6}$ or $8q^9p^{-6}$

Standard graphs A12



$y = mx + c$ A9

Equation of straight line $y = mx + c$
 m is the gradient; c is the y intercept:
➔ **Find the equation of the line that joins (0, 3) to (2, 11)**
Find its gradient...

$$\frac{11-3}{2-0} = \frac{8}{2} = 4$$

...and its y intercept...
Passes through (0, 3), so $c = 3$
Equation is $y = 4x + 3$

Parallel lines: gradients are equal;
➔ **$y = 2x + 3$ and $y = 2x - 5$ both have gradient 2 so are parallel.**

Expanding brackets A4

$p(q + r) = pq + pr$
➔ **$5(x - 2y) = 5x - 10y$**
 $(x + a)(x + b) = x^2 + ax + bx + ab$
➔ **$(2x - 3)(x + 5)$**
 $= 2x^2 - 3x + 10x - 15$
 $= 2x^2 + 7x - 15$

Reverse of expanding is factorising - putting an expression into brackets.

Quadratics A18

Solve a quadratic by factorising.
➔ **Solve $x^2 - 8x + 15 = 0$**
Put into brackets (taking care with any negative numbers)...
 $(x - 3)(x - 5) = 0$
...then either $x - 3 = 0$ or $x - 5 = 0$
so that **$x = 3$ or $x = 5$.**

Difference of two squares A4

$a^2 - b^2 = (a + b)(a - b)$
➔ **$x^2 - 25 = (x + 5)(x - 5)$**

Simultaneous equations A19

➔ **Solve $\begin{cases} 2x + 3y = 11 \\ 3x - 5y = 7 \end{cases}$**
Multiply to match a term in x or y
 $\begin{cases} 10x + 15y = 55 \\ 9x - 15y = 21 \end{cases}$

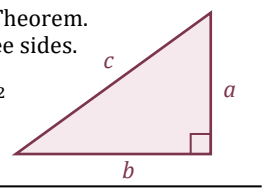
Add or subtract to cancel...
 $19x = 76$, so $x = 4$
Finally, substitute and solve...
 $2 \times 4 + 3y = 11$, so $y = 1$

Rearrange a formula A5

The subject of a formula is the term on its own. Use rules that "balance" the formula to change its subject
➔ **Make x the subject of $2x + 3y = z$**
Here, subtract $3y$ from both sides...
 $2x = z - 3y$
...then divide both sides by 2
 $x = \frac{z - 3y}{2}$

Right angled triangles G20, G22

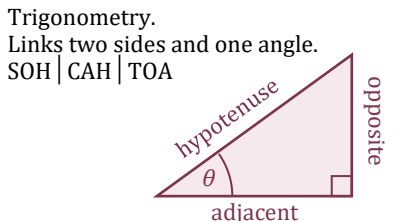
Pythagoras Theorem.
Links all three sides.
No angles.
 $a^2 + b^2 = c^2$



The longest side of any right angled triangle is the hypotenuse; check that your answer is consistent with this.

Special values of sin, cos, tan
Learn (or be able to find without a calculator)...

θ°	$\sin\theta^\circ$	$\cos\theta^\circ$	$\tan\theta^\circ$
0	0	1	1
30	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	1	0	

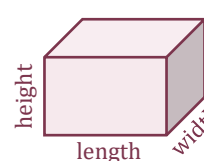
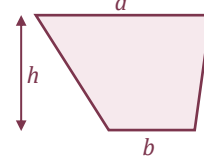
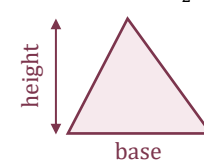


$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \quad \cos\theta = \frac{\text{adj}}{\text{hyp}} \quad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

Use "2ndF" or "SHIFT" key to find a missing angle

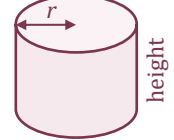
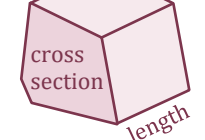
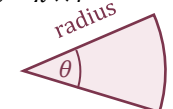
Areas and volumes G16, G17, G18, G23

Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$ Volume of cuboid = length $\times$ width $\times$ height



$$\text{Area of trapezium} = \frac{1}{2}(a + b) \times h$$

Circumference of circle = $\pi \times D$
Area of circle = $\pi \times r^2$



Arc length = $\frac{\theta}{360^\circ} \times \pi \times D$
Area of sector = $\frac{\theta}{360^\circ} \times \pi \times r^2$

Volume of cylinder = $\pi r^2 \times \text{height}$

Volume of prism = area of cross section $\times$ length

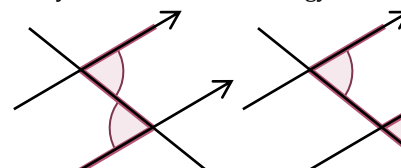
Transformations G7, G8

Reflection
• Line of reflection
Translation
• Vector
Rotation
• Centre of rotation
• Angle of rotation
• Clockwise or anticlockwise

Enlargement
• Centre of enlargement
• Scale factor (if SF < 1 the shape will get smaller).

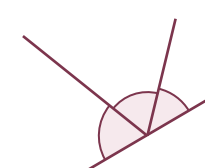
Angle facts

Equal angles in parallel lines: always use correct terminology...



Alternate angles Corresponding angles

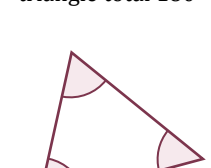
Angles on a straight line total 180°



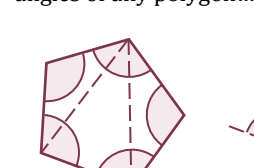
Angles in a full turn total 360°



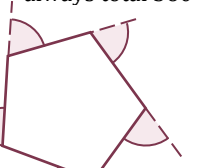
Interior angles in a triangle total 180°



Use this for the interior angles of any polygon...



Exterior angles always total 360°



...or $180^\circ \times (n - 2)$

Sequences A24, A25

Triangular numbers:

1st	2nd	3rd	4th	5th
1	3	6	10	15

Square numbers ($n^2 = n \times n$):

1^2	2^2	3^2	4^2	5^2
1	4	9	16	25

Cube numbers ($n^3 = n \times n \times n$):

1^3	2^3	3^3	4^3	5^3
1	8	27	64	125

n th term of an arithmetic (linear) sequence is $an + d$
➔ **n th term of 5, 8, 11, 14, ... is $3n + 2$ (always increases by 3 first term is $3 \times 1 + 2 = 5$)**
Geometric sequence; multiply each term by a constant ratio
➔ **3, 6, 12, 24, ... (ratio is 2)**
Fibonacci sequence; make the next term by adding the previous two ...
➔ **2, 4, 6, 10, 16, 26, 42, ...**

Probability P8, P9

$p = \frac{n(\text{equally likely favourable outcomes})}{n(\text{equally likely possible outcomes})}$
 $p = 0$ impossible
 $0 < p < 0.5$ unlikely
 $p = 0.5$ evens
 $0.5 < p < 1$ likely
 $p = 1$ certain

Probability rules P8, P9

Multiply for independent events
➔ **P(6 on dice and H on coin)**

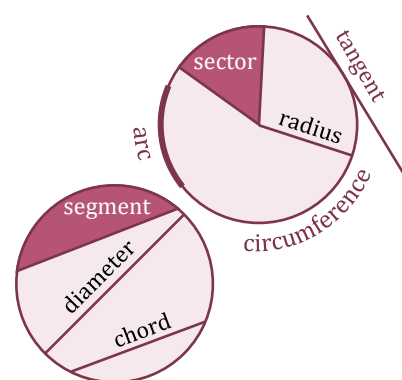
$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

Add for mutually exclusive events
➔ **P(5 or 6 on dice)**

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

Apply these rules to tree diagrams.

Parts of a circle G9



Division using ratio R5

Use a ratio for unequal sharing
➔ **Divide £480 in the ratio 7 : 5**
 $7 + 5 = 12$, then $\text{£}480 \div 12 = \text{£}40$
 $7 \times \text{£}40 = \text{£}280$, $5 \times \text{£}40 = \text{£}200$
(check: $\text{£}280 + \text{£}200 = \text{£}480$ ✓)

Ratio and fractions R8

Link between ratios and fractions
➔ **Boys to girls in ratio 2 : 3**
 $\frac{2}{5}$ are boys, $\frac{3}{5}$ are girls.

Percentages R9

y percent of $x = \frac{y}{100} \times x$
➔ **Increase £58 by 26%.**
 $\frac{26}{100} \times \text{£}58 = \text{£}15.08$
 $\text{£}58 + \text{£}15.08 = \text{£}73.08$
 y as a percentage of $x = \frac{y}{x} \times 100\%$
➔ **The population of a town increases from 3500 to 4620**
Find the percentage increase.
 $\frac{1120}{3500} \times 100\% = 32\%$
Note: fraction = $\frac{\text{increase}}{\text{original}}$

Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{100}$
50%	25%	10%	20%	1%

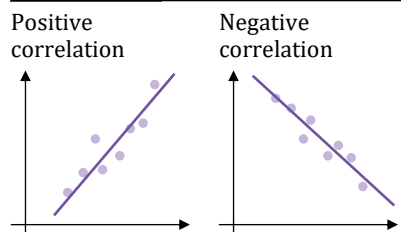
Speed, distance, time R11

Speed = $\frac{\text{distance}}{\text{time}}$
➔ **A car travels 90 miles in 1 hour, 30 minutes. Find its average speed.**
 $90 \text{ miles} \div 1.5 \text{ hours} = 60 \text{ mph}$

Averages S4

Mode: most frequently occurring
Median: put the data in numerical order, then choose the middle one
Mean = $\frac{\text{total of items of data}}{\text{number of items of data}}$

Correlation S6



G3

Listing strategies N5

Product rule for counting:
➔ $4 \times 3 \times 2 \times 1 = 24$ ways to arrange the letters P, I, X and L

Powers and roots N6, N7

Special indices: for any value a :

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

$$a^{\left(\frac{p}{q}\right)} = \sqrt[q]{a^p}$$

$$\rightarrow 3^{-4} = \frac{1}{3^4} = \frac{1}{81}$$

$$\rightarrow 8^{\left(\frac{2}{3}\right)} = \sqrt[3]{8^2} = 4$$

Surds N8

Look for the biggest square number factor of the number:

$$\rightarrow \sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$$

Rationalise the denominator N8

Multiply the numerator and denominator by an expression that makes the denominator an integer:

$$\rightarrow \frac{4}{\sqrt{7}} = \frac{4 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{4\sqrt{7}}{7}$$

$$\rightarrow \frac{2}{4 + \sqrt{5}} = \frac{2}{4 + \sqrt{5}} \times \frac{4 - \sqrt{5}}{4 - \sqrt{5}} = \frac{2(4 - \sqrt{5})}{4^2 - (\sqrt{5})^2} = \frac{2(4 - \sqrt{5})}{16 - 5} = \frac{2(4 - \sqrt{5})}{11}$$

Standard form N9

Standard form numbers are of the form $a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

Recurring decimals N10

Make a recurring decimal a fraction:

$$\rightarrow n = 0.23\bar{6}$$

(two digits are in the recurring pattern, so multiply by 100)

$$100n = 23.\bar{6}$$

(this is the same as $23.6\bar{3}$)

$$99n = 23.6\bar{3} - 0.23\bar{6} = 23.4$$

$$n = \frac{23.4}{99} = \frac{234}{990} = \frac{13}{55}$$

Error intervals N15

Find the range of numbers that will round to a given value:

$$\rightarrow x = 5.83 \text{ (2 decimal places)}$$

$$5.825 \leq x < 5.835$$

$$\rightarrow y = 46 \text{ (2 significant figures)}$$

$$45.5 \leq y < 46.5$$

Note use of $\leq$ and $<$, and that the last significant figure of each is 5

Equations and identities A3

An equation is true for some particular value of x

$$\rightarrow 2x + 1 = 7 \text{ is true if } x = 3$$

...but an identity is true for every value of x

$$\rightarrow (x + a)^2 \equiv x^2 + 2ax + a^2$$

(note the use of the symbol $\equiv$)

Laws of indices A4

For any value a :

$$a^x \times a^y = a^{x+y}$$

$$\frac{a^x}{a^y} = a^{x-y}$$

$$(a^x)^y = a^{xy}$$

$$\rightarrow \left(\frac{2pq^4}{p^3q}\right)^3 = \frac{8p^3q^{12}}{p^9q^3} = \frac{8q^9}{p^6} \text{ or } 8q^9p^{-6}$$

Difference of two squares A4

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

$$\rightarrow x^2 - 25 = (x + 5)(x - 5)$$

Rearrange a formula A5

The subject of a formula is the term on its own. Rearrange to

$$\rightarrow \text{Make } x \text{ the subject of}$$

$$2x + ay = y - bx$$

$$2x + bx = y - ay$$

$$x(2 + b) = y - ay$$

$$x = \frac{y - ay}{2 + b}$$

Functions A7

Combining functions:

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

$$\rightarrow \text{If } f(x) = x + 3 \text{ and } g(x) = x^2$$

$$fg(x) = x^2 + 3$$

$$gf(x) = (x + 3)^2$$

The inverse of f is f^{-1}

$$\rightarrow \text{If } f(x) = 2x + 5 \text{ then}$$

$$f^{-1}(x) = \frac{x - 5}{2}$$

$y = mx + c$ A9

Equation of straight line $y = mx + c$ m is the gradient; c is the y intercept:

➔ Find the equation of the line that joins $(0, 3)$ to $(2, 11)$

Find its gradient...

$$\frac{11 - 3}{2 - 0} = \frac{8}{2} = 4$$

...and its y intercept...

Passes through $(0, 3)$, so $c = 3$

Equation is $y = 4x + 3$

Parallel lines: gradients are equal; perpendicular lines: gradients are "negative reciprocals".

➔ $y = 2x + 3$ and $y = 2x - 5$ are parallel to each other; $y = 2x + 3$

and $y = -\frac{1}{2}x + 3$ are perpendicular

Transformations of curves A13

Starting with the curve $y = f(x)$:

Translate $\begin{pmatrix} 0 \\ a \end{pmatrix}$ for $y = f(x) + a$

Translate $\begin{pmatrix} -a \\ 0 \end{pmatrix}$ for $y = f(x + a)$

Reflect in x axis for $y = -f(x)$

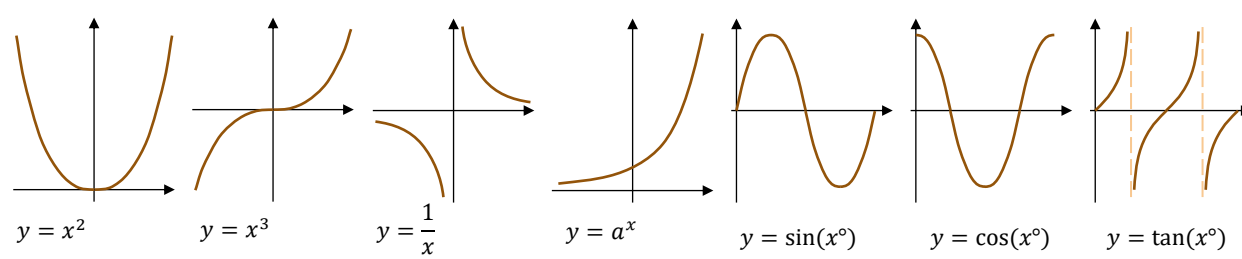
Reflect y axis for $y = f(-x)$

Velocity - time graph A15

Gradient = acceleration (you may need to draw a tangent to the curve at a point to find the gradient);

Area under curve = distance travelled.

Standard graphs A12



Quadratics A11, A18

If a quadratic equation cannot be factorised, use the formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\rightarrow \text{Solve } 2x^2 + 3x - 7 = 0$$

$$x = \frac{-3 \pm \sqrt{9 - (-56)}}{2 \times 2} = -2.73$$

$$\text{or } x = \frac{-3 + \sqrt{9 - (-56)}}{2 \times 2} = 1.23$$

Complete the square to find the turning point of a quadratic graph.

$$\rightarrow y = x^2 - 6x + 2$$

$$y = (x - 3)^2 - 9 + 2$$

$$y = (x - 3)^2 - 7$$

Turning point is at $(3, -7)$

Equation of a circle A16

$x^2 + y^2 = r^2$ is a circle with centre $(0, 0)$ and radius r .

➔ $x^2 + y^2 = 25$ has centre $(0, 0)$ and radius 5

Simultaneous equations A19

One linear, one quadratic;

$$\rightarrow \text{Solve } \begin{cases} x + 3y = 10 \\ x^2 + y^2 = 20 \end{cases}$$

Rearrange the linear, and substitute into the quadratic

$$x = 10 - 3y$$

$$\text{so } (10 - 3y)^2 + y^2 = 20$$

$$\text{Expand and solve the quadratic}$$

$$100 - 60y + 9y^2 + y^2 = 20$$

$$10y^2 - 60y + 80 = 0$$

$$y = 2 \text{ or } y = 4$$

Finally, substitute into the linear and solve, pairing values...

$$x + 3 \times 2 = 10 \text{ so } (x, y) = (4, 2)$$

$$x + 3 \times 4 = 10 \text{ so } (x, y) = (-2, 4)$$

Sequences A24, A25

n th term of an arithmetic (linear) sequence is $bn + c$

➔ n th term of 5, 8, 11, 14, ... is $3n + 2$ (always increases by 3 first term is $3 \times 1 + 2 = 5$)

n th term of a quadratic sequence is $an^2 + bn + c$

➔ First three terms of $n^2 + 3n - 1$ are 3, 9, 17, ... Geometric sequence; multiply each term by a constant ratio

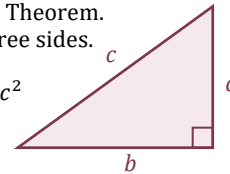
➔ 3, 6, 12, 24, ... (ratio is 2) Fibonacci sequence; make the next term by adding the previous two ...

$$\rightarrow 2, 4, 6, 10, 16, 26, 42, \dots$$

Right angled triangles

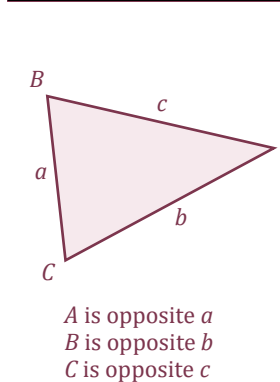
Pythagoras Theorem. Links all three sides. No angles.

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



The longest side of any right angled triangle is the hypotenuse; check that your answer is consistent with this.

Advanced trigonometry



A is opposite a
B is opposite b
C is opposite c

Sine Rule

Use if you are given an angle-side pair

$$\text{Missing side: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Missing angle: } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Cosine Rule

Use if you can't use the sine rule

$$\text{Missing side: } a^2 = b^2 + c^2 - 2bccosA$$

$$\text{Missing angle: } cosA = \frac{b^2 + c^2 - a^2}{2bc}$$

Trigonometry.

Links two sides and one angle. SOH | CAH | TOA

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} \quad \cos \theta = \frac{\text{adj}}{\text{hyp}} \quad \tan \theta = \frac{\text{opp}}{\text{adj}}$$

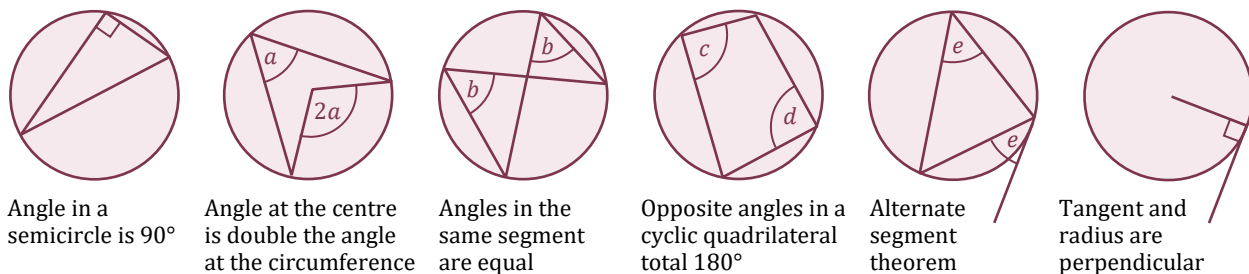
Use "2ndF" or "SHIFT" key to find a missing angle

Special values of sin, cos, tan

Learn (or be able to find without a calculator)...

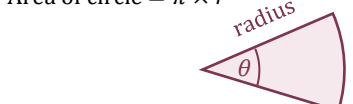
θ°	$\sin \theta^\circ$	$\cos \theta^\circ$	$\tan \theta^\circ$
0	0	1	1
30	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	1	0	

Circle theorems



Areas and volumes

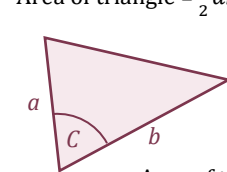
Circumference of circle = $\pi \times D$
Area of circle = $\pi \times r^2$



$$\text{Arc length} = \frac{\theta}{360^\circ} \times \pi \times D$$

$$\text{Area of sector} = \frac{\theta}{360^\circ} \times \pi \times r^2$$

Area of triangle = $\frac{1}{2}ab \sin C$



$$\text{Area of trapezium} = \frac{1}{2}(a + b) \times h$$

Volume of prism = area of cross section $\times$ length

Volume of frustum is difference between the volumes of two cones



Transformations

Reflection
• Line of reflection
Translation
• Vector

Rotation
• Centre of rotation
• Angle of rotation
• Clockwise or anticlockwise

Enlargement
• Centre of enlargement
• Scale factor (if $-1 < SF < 1$ the shape will get smaller).

Iteration A20

You will be given the formula to use:

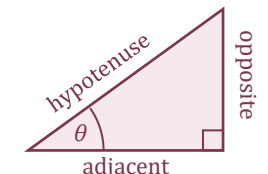
➔ Solve $x^3 + 6x + 4 = 0$ by using the iteration $x_{n+1} = \sqrt[3]{6x_n - 4}$

Start with $x_1 = -2.8$

$$x_2 = \sqrt[3]{6 \times (-2.8) - 4} = -2.750 \dots$$

$$x_3 = \sqrt[3]{6 \times (-2.750 \dots) - 4} = \dots$$

Repeat until you know the solution, or you do as many as the question says.



Percentages: multipliers R9, R16

Percentage increase or decrease; use a multiplier (powers for repetition)

➔ Initially there were 20 000 fish in a lake. The number decreases by 15% each year. Estimate the number of fish after 6 years.

$$20\,000 \times 0.85^6 = 7500 \text{ (2sf)}$$

Formula for compound interest

$$\text{Total accrued} = P \left(1 + \frac{r}{100}\right)^n$$

➔ I invest £600 at 3% compound interest. What is my account worth after 5 years?

$$£600 \times \left(1 + \frac{3}{100}\right)^5 = £695.56$$

Direct & inverse proportion R10

y is directly proportional to x :

$y = kx$ for a constant k

➔ b is directly proportional to a^2

$a = 6$ when $b = 90$ Find b if $a = 8$

$$b = ka^2 \quad a = 6 \text{ and } b = 90 \text{ for } k$$

$$90 = k \times 6^2 \text{ so } k = 2.5, b = 2.5a^2$$

$$b = 2.5 \times 8^2 = 160$$

y is inversely proportional to x

$$yx = k \text{ or } y = \frac{k}{x} \text{ for a constant } k$$

Probability rules P8, P9

Multiply for independent events

➔ P(6 on dice and H on coin)

$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

Add for mutually exclusive events

$$\rightarrow \text{P(5 or 6 on dice)}$$

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

Apply these rules to tree diagrams.

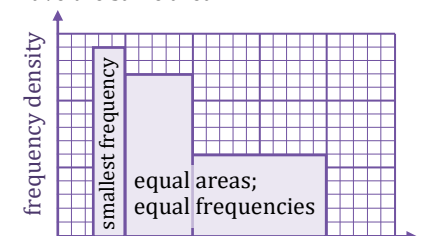
In general...

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

Histograms S3

Frequency = frequency density multiplied by class width. This means that bars with the same frequency have the same area.



Box plots S4

Interquartile range (IQR) = UQ - LQ

