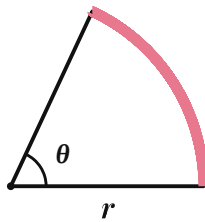


?

Arc length

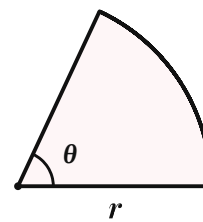
Higher



?

Area of a sector

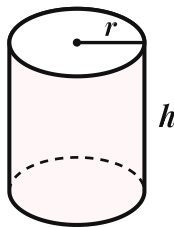
Higher



?

Volume of a cylinder

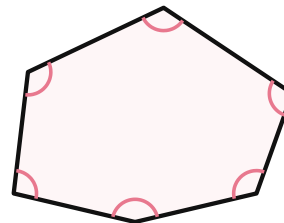
Higher



?

Sum of the interior angles of a polygon

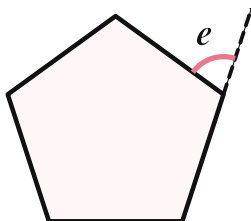
Higher



?

Exterior angle of a regular polygon

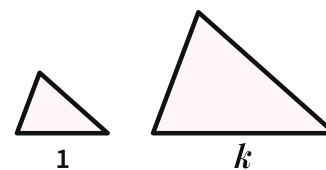
Higher



?

Similar shapes

Higher



?

Speed

Higher

?

Density

Higher

= Area of a sector

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

θ is the angle at the centre

e.g. $\theta = 40^\circ$, $r = 6$ cm: $\frac{40}{360} \times \pi \times 6^2 = 4\pi = 12.6 \text{ cm}^2$

= Arc length

$$\text{Arc length} = \frac{\theta}{360} \times \pi d$$

$$\text{or } \frac{\theta}{360} \times 2\pi r$$

θ is the angle at the centre

e.g. $\theta = 80^\circ$, $r = 9$ cm: $\frac{80}{360} \times \pi \times 18 = 4\pi = 12.6 \text{ cm}$

= Sum of the interior angles of a polygon

$$\text{Sum} = (n - 2) \times 180^\circ$$

n is the number of sides

e.g. A heptagon has 7 sides: $(7 - 2) \times 180^\circ = 900^\circ$

= Volume of a cylinder

$$\text{Volume} = \pi r^2 h$$

the area of the circle $\times$ the height

e.g. $r = 3$ cm, $h = 10$ cm: $\pi \times 3^2 \times 10 = 282.7 \text{ cm}^3$

= Similar shapes

$$\begin{array}{l} \text{lengths} \times k \quad \text{areas} \times k^2 \\ \text{volumes} \times k^3 \end{array}$$

k is the scale factor for length

e.g. Lengths $\times 3$: area $\times 9$, volume $\times 27$.
A 4 cm^2 face becomes 36 cm^2

= Exterior angle of a regular polygon

$$\text{Exterior angle} = 360^\circ \div n$$

n is the number of sides

e.g. A regular 12 sided shape: $360^\circ \div 12 = 30^\circ$

= Density

$$\text{Density} = \text{mass} \div \text{volume}$$

So mass = density $\times$ volume and volume = mass $\div$ density

e.g. 540 g of aluminium filling 200 cm^3 : $540 \div 200 = 2.7 \text{ g/cm}^3$

= Speed

$$\text{Speed} = \text{distance} \div \text{time}$$

So distance = speed $\times$ time and time = distance $\div$ speed

e.g. 1.2 km in 15 minutes is 1.2 km in 0.25 hours:
 $1.2 \div 0.25 = 4.8 \text{ km/h}$

?

Higher

Pressure

?

Higher

Percentage change

?

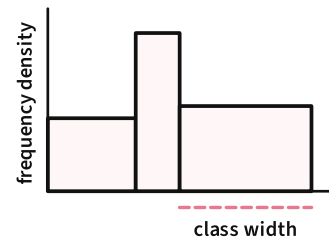
Higher

**Direct and
inverse proportion**

?

Higher

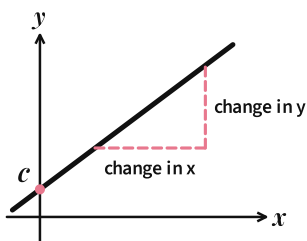
Frequency density



?

Higher

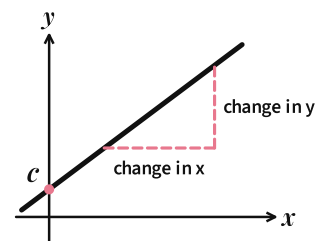
Equation of a straight line



?

Higher

Gradient of a line



?

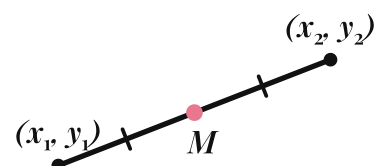
Higher

Perpendicular gradients

?

Higher

Midpoint of a line segment



= Percentage change

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

the change is the difference between the new and original amounts

e.g.: 250 g down to 215 g: $35 \div 250 \times 100 = 14\%$ decrease

= Pressure

$$\text{Pressure} = \text{force} \div \text{area}$$

So force = pressure $\times$ area and area = force $\div$ pressure

e.g.: 720 N on 1.6 m²: $720 \div 1.6 = 450$ N/m²

= Frequency density

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

in a histogram the area of a bar is the frequency

e.g.: Frequency 42 for $10 < t \leq 25$: $42 \div 15 = 2.8$

= Direct and inverse proportion

$$y \propto x \text{ means } y = kx$$

$$y \propto \frac{1}{x} \text{ means } y = \frac{k}{x}$$

find k from a pair of values, then write the formula

e.g.: $y \propto x^2$, $y = 18$ when $x = 3$: $18 = k \times 9$, so $k = 2$ and $y = 2x^2$

= Gradient of a line

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

going up is positive, going down is negative

e.g.: (1, 2) to (4, 11): $9 \div 3 = 3$

= Equation of a straight line

$$y = mx + c$$

m is the gradient, c is where the line crosses the y axis

e.g.: $y = 3x - 2$: gradient 3, crosses the y axis at (0, -2)

= Midpoint of a line segment

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

the mean of the x coordinates and the mean of the y coordinates

e.g.: (2, 7) and (8, -1): (5, 3)

= Perpendicular gradients

$$m_1 \times m_2 = -1$$

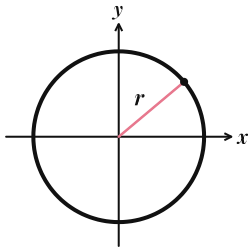
the perpendicular gradient is the negative reciprocal: $-\frac{1}{m}$

e.g.: Gradient 4: the perpendicular gradient is $-\frac{1}{4}$

?

Higher

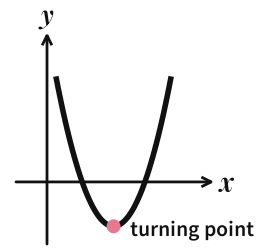
Equation of a circle



?

Higher

Completing the square



?

Higher

**Difference of
two squares**

?

Higher

Laws of indices

?

Higher

**Zero, negative
and fractional indices**

?

Higher

Rules for surds

?

Higher

Expected frequency

?

Higher

**Probability of an
event not happening**

= Completing the square

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

$$y = (x + p)^2 + q \text{ has turning point } (-p, q)$$

halve the coefficient of x

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

= Equation of a circle

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

a circle with its centre at the origin, radius r

e.g.: $x^2 + y^2 = 25$ has radius 5 and passes through $(3, 4)$: $3^2 + 4^2 = 25$

= Laws of indices

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

same base: add, subtract or multiply the powers

e.g.: $5^3 \times 5^4 = 5^7$, $2^9 \div 2^4 = 2^5$, $(3^2)^4 = 3^8$

= Difference of two squares

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

two square terms with a minus between them

e.g.: $x^2 - 49 = (x + 7)(x - 7)$, $9x^2 - 4 = (3x + 2)(3x - 2)$

= Rules for surds

$$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$$

$$\sqrt{a} \div \sqrt{b} = \sqrt{\frac{a}{b}}$$

look for a square number factor to simplify

e.g.: $\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$, $\sqrt{50} \div \sqrt{2} = \sqrt{25} = 5$

= Zero, negative and fractional indices

$$a^0 = 1 \quad a^{-n} = \frac{1}{a^n}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a} \quad a^{\frac{m}{n}} = (\sqrt[n]{a})^m$$

the bottom of the fraction is the root, the top is the power

e.g.: $8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 2^2 = 4$, $5^{-2} = \frac{1}{25}$

= Probability of an event not happening

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

the probabilities of all the outcomes add up to 1

e.g.: $P(\text{late}) = 0.35$, so $P(\text{not late}) = 1 - 0.35 = 0.65$

= Expected frequency

$$\text{Expected frequency} = P(A) \times \text{number of trials}$$

how many times you expect the event to happen

e.g.: A fair dice rolled 120 times:
 $P(\text{six}) \times 120 = \frac{1}{6} \times 120 = 20 \text{ sixes}$