

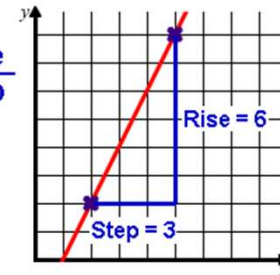
Key Words

- **Compound Interest** – calculating interest on both the amount plus previous interest.
- **Chord** – a straight line joining the end of a curve.
- **Decay** – the process of reducing an amount by a consistent percentage over time.
- **Gradient** – the steepness of a line.
- **Growth** – where a value increases in proportion to its current value, e.g., doubling
- **Depreciation** – a decrease in the value of something over time.
- **Direct Proportion** – relationships wherein as one variable increases so does the other (e.g., cost of items & number of items).
- **Inverse Proportion** – relationships wherein as one variable increases the other decreases (e.g., number of workers & time taken to complete task).
- **Iteration** – the repetition of a mathematical procedure applied to the result of a previous application.
- **Proportion** – a statement that links two ratios
- **Tangent** – a straight line that meets a curve at a right-angle.

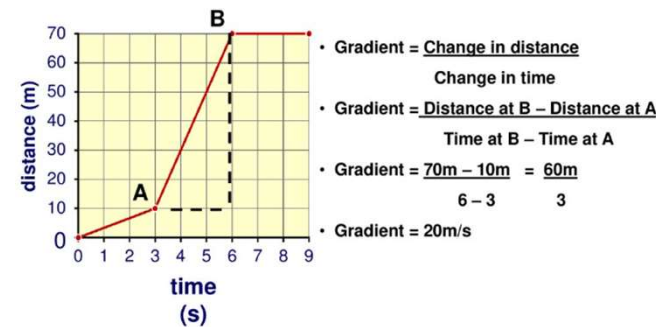
Gradient

Calculated as difference along the y-axis divided by

$$\begin{aligned} \text{Gradient} &= \frac{\text{Rise}}{\text{Step}} \\ &= \frac{6}{3} \\ &= 2 \end{aligned}$$



The gradient on a distance-time graph represents speed, since speed is the compound measure derived from distance divided by time.



Compound Interest

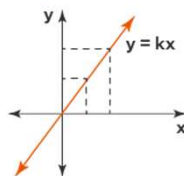
Year	Amount
Original amount	£100
Y1	£110
Y2	£121
Y3	£132.10

The multiplier 1.10 repeats each year

Direct Proportion Equation & Graph

$$y \propto x$$

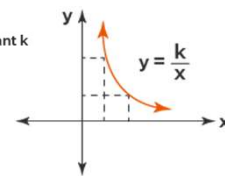
$$y = kx \text{ for a constant } k$$



Indirect Proportion Equation & Graph

$$y \propto \frac{1}{x}$$

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



Iteration

The iterative formula to determine the next integer is $x_{n+1} = x_n + 1$

If we know that $x_0 = 3$ and we want to calculate the value of x_1 , we substitute into the iterative formula above with $n = 0$: $x_1 = x_0 + 1$
 $x_1 = 3 + 1 = 4$

We can use this process of iteration to find approximate solutions for equations.

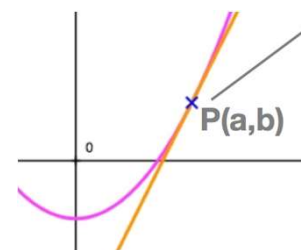
Indirect Proportion

Example
 4 people can take 3 hours to dig a trench.

How long would it take 6 people working at the same rate?

People	Time
4	3 hrs
2	6 hrs
6	2 hrs

+2 (from 4 to 2) $\times 2$
 +3 (from 3 to 2) $\div 3$



The tangent to the curve at P has the same gradient as the curve at that point.

Perimeter and Area

Perimeter

Perimeter: This is the total distance around the outside of the shape.



Area

Area: This is the space that a 2D shape takes up.

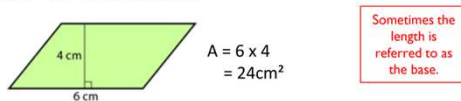
Squares and rectangles:

The formula is the same for both shapes: **A = Length x Width**



Parallelograms:

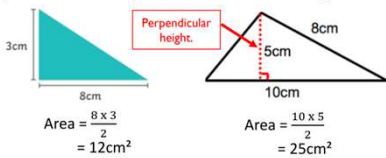
The formula is similar to a rectangle but instead of width we use the height. **A = Length x Height**



Triangles: To find the area of a triangle we use the following formula:

$$\text{Area} = \frac{\text{Base} \times \text{perpendicular height}}{2}$$

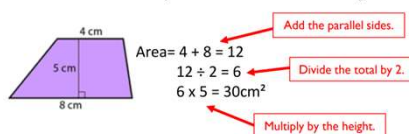
The formula is very similar to a rectangle but we must divide by 2 because a triangle is half the size of a rectangle.



Trapeziums: To find the area of a trapezium we use the following formula:

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

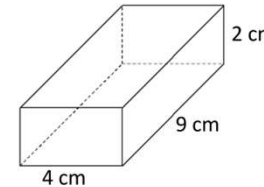
Where a and b are the parallel sides and h is the height.



Volume and Surface area

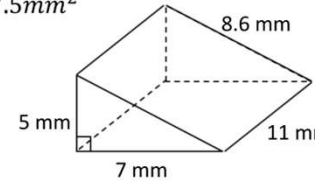
Examples

$$\text{Volume} = 4 \times 9 \times 2 = 72\text{cm}^3$$



$$\text{Area of triangle} = \frac{5 \times 7}{2} = 17.5\text{mm}^2$$

$$\text{Volume} = 17.5 \times 11 = 192.5\text{mm}^3$$



Surface area:

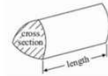
$$\begin{aligned} \text{Front} &= 4 \times 2 = 8 \\ \text{Back} &= 4 \times 2 = 8 \\ \text{Side 1} &= 9 \times 2 = 18 \\ \text{Side 2} &= 9 \times 2 = 18 \\ \text{Bottom} &= 4 \times 9 = 36 \\ \text{Top} &= 4 \times 9 = 36 \\ \text{Total} &= 124\text{cm}^2 \end{aligned}$$

Surface area:

$$\begin{aligned} \text{Front} &= \frac{7 \times 5}{2} = 17.5 \\ \text{Back} &= \frac{7 \times 5}{2} = 17.5 \\ \text{Side} &= 5 \times 11 = 55 \\ \text{Bottom} &= 7 \times 11 = 77 \\ \text{Top} &= 11 \times 8.6 = 94.6 \\ \text{Total} &= 261.6\text{cm}^2 \end{aligned}$$

The **volume** of an object is the amount of space that it occupies. It is measured in units cubed e.g. cm^3 .

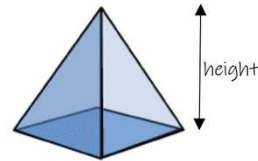
To calculate the volume of any prism we use:
 $\text{area of cross section} \times \text{length}$



A **prism** is a 3D shape which has a continuous cross-section.

The **surface area** of an object is the sum of the area of all of its faces. It is measured in units squared e.g. cm^2 .

Volume of a Pyramid and Sphere



$$\text{Volume} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$

$$\text{Surface area} = \text{area of base} + \text{area of all the triangles}$$

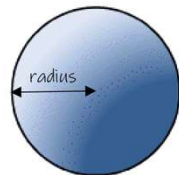
Given to you in an exam!

$$\text{Volume} = \frac{4}{3} \times \pi \times \text{radius cubed}$$

$$= \frac{4}{3} \pi r^3$$

$$\text{Surface area} = 4 \times \pi \times \text{radius squared}$$

$$= 4\pi r^2$$



Circles

Parts of a circle

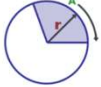


Circumference

of a circle is calculated by πd and is the distance around the circle.

Arc length of a sector is

calculated by $\frac{\theta}{360} \pi d$.



The **area** of a circle is calculated by πr^2

The **area of a sector** is calculated by $\frac{A}{360} \pi r^2$

