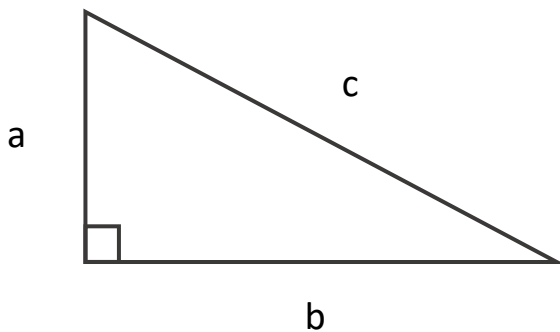


## National 5 Maths Formulas

These are some of the formulas & rules that are not on the formula sheet and easily forgotten. These should be committed to memory for the final exam.

### Pythagoras' Theorem

Pythagoras' Theorem says that for any right-angled triangle the 'sum of the squares of the two short sides equals the square of the long side.'



For the above triangle with short sides  $a$  and  $b$ , and long side  $c$  we have  $a^2 + b^2 = c^2$

### Circle Circumference

$$C = \pi d \quad \text{where } d \text{ is the diameter}$$

### Circle Area

$$A = \pi r^2 \quad \text{where } r \text{ is the radius}$$

### Arc Length

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

### Sector Area

$$\text{Sector area} = \frac{\text{angle}}{360} \times \pi r^2$$

## Magnitude (Length) of a Vector

For the vector  $\underline{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$ , the magnitude of  $\underline{a}$ , denoted  $|\underline{a}|$ , is given by

$$|\underline{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

## Quartile Range

$$\text{Interquartile range} = Q_3 - Q_1$$

$$\text{Semi-Interquartile range} = \frac{Q_3 - Q_1}{2}$$

## Gradient of a Straight Line

For any two points on a line  $(x_1, y_1)$  and  $(x_2, y_2)$  the gradient is given by:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

## Equation of a Straight Line

$$y = mx + c \quad \text{where } m \text{ is the gradient and } c \text{ is the } y - \text{intercept}$$

Or

$$y - b = m(x - a) \quad \text{where } (a, b) \text{ is any point on the line and } m \text{ is the gradient}$$

## Quadratic Equations

For the quadratic equation  $ax^2 + bx + c = 0$  the discriminant is defined by  $b^2 - 4ac$

If  $b^2 - 4ac < 0$  the quadratic equation has **zero** solutions / roots

If  $b^2 - 4ac = 0$  the quadratic equation has **one** solution / root

If  $b^2 - 4ac > 0$  the quadratic equation has **two** solutions / roots

## Graphs of Quadratic Functions

For the quadratic  $ax^2 + bx + c$  written in the form  $(x + p)^2 + q$  the co-ordinate of the turning point is  $(-p, q)$ .

For example, for the quadratic  $y = (x - 3)^2 + 4$ , the turning point is  $(3, 4)$ .

## Rules for Indices

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

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

A Power on a Power  $(a^m)^n = a^{mn}$

There are also two special cases you should be familiar with

Power of zero  $a^0 = 1$  for any number  $a$

Negative powers  $a^{-m} = \frac{1}{a^m}$

## Trigonometric Identities

$$\frac{\sin x}{\cos x} = \tan x$$

$$\sin^2 x + \cos^2 x = 1$$

Note that  $\sin^2 x$  means  $(\sin x)^2$  not  $\sin(x^2)$