

Maths Formulae

ALGEBRA

$$y = \log_b x \Leftrightarrow x = b^y$$

$$\log_b(xy) = \log_b x + \log_b y$$

$$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$$

$$\log_b(x^n) = n \log_b x$$

MEASUREMENT

Rectangle:

$$\begin{aligned} \text{Area: } & l \times w \\ \text{Perimeter: } & 2l + 2w \end{aligned}$$

Parallelogram:

$$\begin{aligned} \text{Area: } & l \times h \\ \text{Perimeter: } & 2l + 2w \end{aligned}$$

Triangle:

$$\begin{aligned} \text{Area: } & \frac{1}{2}bh \text{ or } \frac{1}{2}bc \sin A \\ \text{Perimeter: } & a + b + c \end{aligned}$$

Circle:

$$\begin{aligned} \text{Area: } & \pi r^2 \\ \text{Circumference: } & 2\pi r \end{aligned}$$

Cylinder:

$$\begin{aligned} \text{Volume: } & \pi r^2 l \\ \text{Surface Area: } & 2\pi r l + 2\pi r^2 \end{aligned}$$

Sphere:

$$\begin{aligned} \text{Volume: } & \frac{4}{3}\pi r^3 \\ \text{Surface Area: } & 4\pi r^2 \end{aligned}$$

Cone:

$$\begin{aligned} \text{Volume: } & \frac{1}{3}\pi r^2 h \\ \text{Surface Area: } & \pi r^2 + \pi r l \text{ (} l \text{ slant ht.)} \end{aligned}$$

Rectangular Prism:

$$\begin{aligned} \text{Volume: } & l \times w \times h \\ \text{Surface Area: } & \text{sum of all surfaces} \end{aligned}$$

Triangular Prism:

$$\begin{aligned} \text{Volume: } & \frac{1}{2}bh \times l \\ \text{Surface Area: } & \text{sum of all surfaces} \end{aligned}$$

Pyramid

(regular square)

$$\begin{aligned} \text{Volume: } & \frac{1}{3} \times \text{base area} \times \text{vertical height} \\ \text{Surface Area: } & \text{sum of all surfaces} \end{aligned}$$

QUADRATIC FORMULA

(For equation $ax^2 + bx + c = 0$)

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

TRIGONOMETRY

Sine Rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine Rule:

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

OTHER USEFUL FORMULAE

$$\text{Density} \times \text{Volume} = \text{Mass}$$

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

$$\text{nautical miles} = \text{knots} \times \text{hours}$$

$$1 \text{ nautical mile} = 1852 \text{ metres}$$

$$360^\circ = 2\pi \text{ radians}$$

$$\text{Gravity acceleration} = 9.81 \text{ m/s}^2$$

CALCULUS

Differentiation:

y	dy/dx
Ax^n	nAx^{n-1}
e^x	e^x
$\cos x$	$-\sin x$
$\sin x$	$\cos x$
$\tan x$	$\sec^2 x$
$\ln x$	$1/x$

Integration:

$$\int dx(Ax^n) = \frac{A}{n+1}x^{n+1} + c$$

Simpson's Rule:

$$\int_a^b f(x)dx = \frac{1}{3}h[y_0 + y_n + 4(y_1 + y_3 + \dots + y_{n-1}) + 2(y_2 + y_4 + \dots + y_{n-2})]$$

$$\text{where } h = \frac{b-a}{n} \text{ and } y_r = f(x_r) \text{ and } n \text{ is even}$$