
Areas and Volumes (Mathematics)

Areas

Rectangle

$$A = \text{length} \times \text{breadth}$$

$$P = 2 \times (\text{length} + \text{breadth})$$



Parallelogram

$$A = \text{height} \times \text{base}$$



Triangle

$$A = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} ab \sin \theta$$

where a and b are the lengths of two sides, θ the included angle between sides a and b

Trapezium

$$A = \frac{1}{2} h(a + b)$$

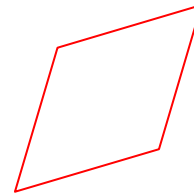
where a and b are the lengths of the two parallel sides



Rhombus

$$A = \frac{1}{2} xy$$

where x and y are the lengths of the two diagonals



Circle

$$A = \pi r^2$$

$$P = C = 2\pi r = \pi d$$

where r is the radius of the circle and d is the diameter of the circle

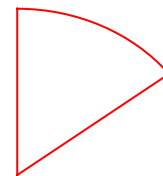
Sector of Circle

$$A = \frac{1}{2} r^2 \theta$$

$$\text{Arc length } l = r\theta$$

$$P = 2r + r\theta$$

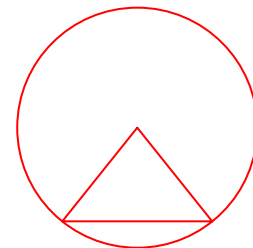
where r is the radius and θ is the central angle in radians



Segment of Circle

$$A = \frac{1}{2} r^2 (\theta - \sin \theta)$$

where r is the radius of the circle and θ is the central angle in radians



Volumes

Rectangular Prism

$$V = lbh$$

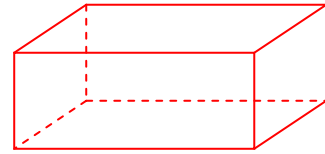
$$S = 2 \times (lb + bh + ah)$$

For a cube, all edges are equal:

$$V = l^3$$

$$S = 6l^2$$

where l is the length, b is the width and h is the height



Cylinder

$$V = \pi r^2 h$$

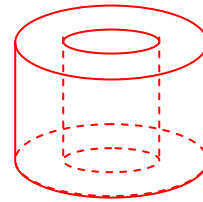
$$S = 2\pi r h + 2\pi r^2 \text{ (closed cylinder)}$$

where r is the radius and h is the height

Cylindrical Pipe

$$V = \pi(R^2 - r^2)h$$

where R is the radius of the external cylinder, r is the radius of internal cylinder and h is the height



Cone

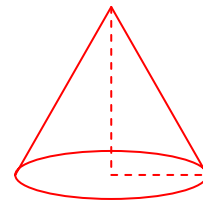
$$V = \frac{1}{3} \pi r^2 h$$

$$l = \sqrt{r^2 + h^2}$$

$$A = \pi r l \text{ (open cone)}$$

$$S = \pi r l + \pi r^2$$

where r is the radius, h is the height and l is the slant height



Sphere

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

$$A = 4\pi r^2$$

where r is the radius

Pyramid

$$V = \frac{1}{3} Ah = \frac{1}{3} abh$$

where a and b are the sides, and h is the height; A is the area of the base = ab

For the surface area, first find the slant height using Pythagoras' Theorem ($a^2 + b^2 = c^2$).