

# Formulae for surface area and volume

Calculating the surface area or volume of geometric shapes is a common problem in mathematics. Below are some of the more common shapes and their formulae.

Common terms used when calculating surface area and volume include:

C – Circumference	L - Length
W – Width	H – Height
B – Base	r - Radius
d – Diameter	$\pi$ (Pi)

Pi or  $\pi$  is one of the most important mathematical constants, approximately equal to 3.14159. It represents the ratio of any circle's circumference to its diameter in Euclidean geometry

Common equations for volume:		
Shape	Equation	Variables
A cube:	$s^3 = s \cdot s \cdot s$	$s$ = length of a side
A rectangular prism:	$l \cdot w \cdot h$	$l$ = length, $w$ = width, $h$ = height
A cylinder (circular prism):	$\pi r^2 \cdot h$	$r$ = radius of circular face, $h$ = height
A sphere:	$\frac{4}{3}\pi r^3$	$r$ = radius of sphere (which is the integral of the surface area of a sphere)
An ellipsoid:	$\frac{4}{3}\pi abc$	$a, b, c$ = semi-axes of ellipsoid
A pyramid:	$\frac{1}{3}Ah$	$A$ = area of the base, $h$ = height of pyramid
A cone (circular-based pyramid):	$\frac{1}{3}\pi r^2 h$	$r$ = radius of circle at base, $h$ = distance from base to tip
Common equations for area:		
Shape	Equation	Variables
Square	$s^2$	$s$ is the length of the side of the square.
Regular hexagon	$\frac{3\sqrt{3}}{2}s^2$	$s$ is the length of one side of the hexagon.
Regular octagon	$2(1 + \sqrt{2})s^2$	$s$ is the length of one side of the octagon.

Any regular polygon	$\frac{1}{2}ap$	<i>a is the apothem, or the radius of an inscribed circle in the polygon, and p is the perimeter of the polygon.</i>
Any regular polygon	$\frac{P^2/n}{4 \cdot \tan(\pi/n)}$	P is the Perimeter and n is the number of sides.
Any regular polygon (using degree measure)	$\frac{P^2/n}{4 \cdot \tan(180^\circ/n)}$	P is the Perimeter and n is the number of sides.
Rectangle	$l \cdot w$	l and w are the lengths of the rectangle's sides (length and width).
Parallelogram (in general)	$b \cdot h$	b and h are the length of the base and the length of the perpendicular height, respectively.
Rhombus	$\frac{1}{2}ab$	a and b are the lengths of the two diagonals of the rhombus.
Triangle	$\frac{1}{2}b \cdot h$	b and h are the base and altitude (measured perpendicular to the base), respectively.
Triangle	$\frac{1}{2} \cdot a \cdot b \cdot \sin C$	a and b are any two sides, and C is the angle between them.
Circle	$\pi r^2$ $\pi d^2/4$	r is the radius and d the diameter.
Ellipse	$\pi ab$	a and b are the semi-major and semi-minor axes, respectively.
Trapezoid	$\frac{1}{2}(a + b)h$	a and b are the parallel sides and h the distance (height) between the parallels.
Total surface area of a Cylinder	$2\pi r^2 + 2\pi rh$	r and h are the radius and height, respectively.
Lateral surface area of a cylinder	$2\pi rh$	r and h are the radius and height, respectively.
Total surface area of a Cone	$\pi r(l + r)$	r and l are the radius and slant height, respectively.
Lateral surface area of a cone	$\pi rl$	r and l are the radius and slant height, respectively.
Total surface area of a Sphere	$4\pi r^2$ or $\pi d^2$	r and d are the radius and diameter, respectively.