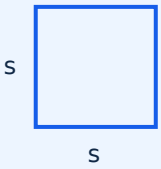
ALL GEOMETRY FORMULAS

2D shapes

Area and perimeter | Use matching units before substituting values.

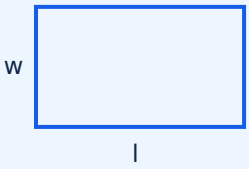
Square



$A = s^2$

$P = 4s$

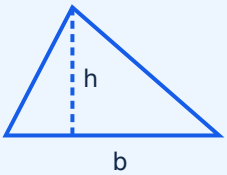
Rectangle



$A = lw$

$P = 2(l + w)$

Triangle



$A = ½bh$

$P = a + b + c$

a, b and c are the three side lengths.

Circle

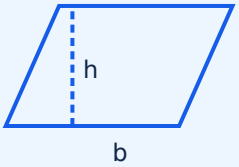


$A = \pi r^2$

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

d = 2r; circumference is the perimeter.

Parallelogram

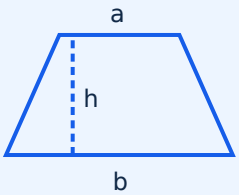


$A = bh$

$P = 2(a + b)$

a is the sloping side; h is perpendicular.

Trapezoid / trapezium



$A = ½(a + b)h$

$P = a + b + c + d$

a and b are parallel; c and d are legs.

SYMBOLS & UNITS

A = area; P = perimeter; C = circumference; s = side; r = radius.

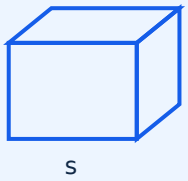
l = length; w = width; b = base; h = perpendicular height.

Perimeter: cm or m. Area: cm^2 or m^2. Diagrams are not to scale.

3D solids

Volume and total surface area | Right circular cones and cylinders.

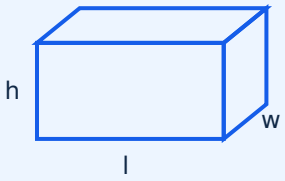
Cube



$V = s^3$

$SA = 6s^2$

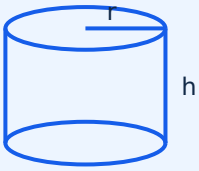
Rectangular prism



$V = lwh$

$SA = 2(lw + lh + wh)$

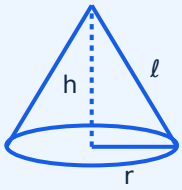
Cylinder



$V = \pi r^2 h$

$SA = 2\pi r^2 + 2\pi rh$

Cone



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

$SA = \pi r^2 + \pi r\ell$

Slant height: $\ell = \sqrt{(r^2 + h^2)}$.

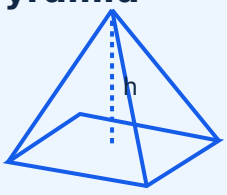
Sphere



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

$SA = 4\pi r^2$

Pyramid



$V = \frac{1}{3}Bh$

$SA = B +$ areas of side faces

B = base area; h = perpendicular height.

SURFACE AREA & UNITS

SA includes every outside face, including the base or bases.

Curved area only: cylinder = $2\pi rh$; cone = $\pi r\ell$.

V = volume (cm^3 or m^3). SA = surface area (cm^2 or m^2).

Coordinates & triangles

Useful relationships for distances, angles and scale factors.

Coordinate geometry

Distance: $d = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$

Midpoint: $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$

Slope: $m = (y_2 - y_1)/(x_2 - x_1)$, with $x_2 \neq x_1$

Right triangles

Pythagorean theorem: $a^2 + b^2 = c^2$; c is the hypotenuse.

45°-45°-90° sides: s, s, $s\sqrt{2}$

30°-60°-90° sides: x, $x\sqrt{3}$, 2x (opposite 30°, 60°, 90°)

Trigonometry in a right triangle

$\sin \theta$ = opposite / hypotenuse

$\cos \theta$ = adjacent / hypotenuse

$\tan \theta$ = opposite / adjacent; θ is an acute angle.

Circles and sectors

Circle equation: $(x - h)^2 + (y - k)^2 = r^2$; centre (h, k).

Arc length: $s = r\theta$; sector area: $A = \frac{1}{2}r^2\theta$ (θ in radians).

Degrees to radians: multiply by $\pi/180$. A full turn = 2π.

Similar figures and angles

Length factor k → area factor k^2 → volume factor k^3.

Triangle angles total 180°; a straight angle is 180°.

Interior angle sum of a simple n-sided polygon: $(n - 2) \times 180°$.

Read symbols in context: h and k in a circle equation are coordinates.

Keep π exact unless a question asks for an approximation.