Area Formula Sheet

Choose a triangle area rule

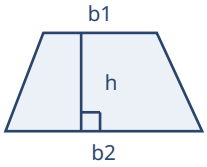
Base and perpendicular height	$A = bh/2$
Two sides, included angle	$A = ab\sin(C)/2$
Three sides	$s = (a + b + c)/2$
Heron	$A = \sqrt{(s(s - a)(s - b)(s - c))}$

The three side lengths must form a triangle. C is the angle between sides a and b.

Area of plane figures

Triangle	$A = \frac{1}{2}bh$
Rectangle or parallelogram	$A = bh$
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$

Measure h perpendicular to the base.
The trapezoid bases are parallel.
Use square units.



Polygons and diagonals

Rhombus or kite	$A = d_1\,d_2/2$
Regular polygon	$A = ap/2$

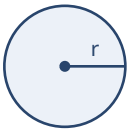
Example: apothem 6, perimeter 40
$A = 120$ square units

The regular polygon apothem a is perpendicular to a side. Use the full perimeter p.

Circles, rings and sectors

Disk	$A = \pi r^2$
Annulus	$A = \pi(R^2 - r^2)$
Sector in radians	$A = r^2\theta/2$
Sector in degrees	$A = (\theta/360°)\pi r^2$

R is the outer radius. Use the formula that matches the angle units.



Area from coordinates

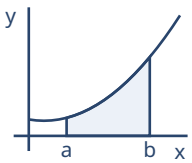
List ordered polygon vertices	$(x_1,y_1), \ldots, (x_n,y_n)$
Shoelace	$A = \frac{1}{2}\lvert\sum(x_i\,y_{i+1} - y_i\,x_{i+1})\rvert$
Example: (0,0), (4,0), (0,3)	$A = \frac{1}{2} \times 12 = 6$

Walk around a simple polygon in order and return to the first vertex for the last product.

Area under and between curves

Geometric area	$A = \int_a^b \lvert f(x)\rvert\,dx$
Area between two graphs	$A = \int_a^b \lvert f(x) - g(x)\rvert\,dx$
Example: y = x, from 0 to 4	$A = 4^2/2 = 8$

Split where a curve crosses the axis or where the upper and lower functions swap.



Surface area

Right prism, lateral	$S = Ph$
Right prism, total	$S = Ph + 2B$
Right cylinder, lateral	$S = 2\pi rh$
Right cylinder, total	$S = 2\pi rh + 2\pi r^2$

P is base perimeter; B is base area.
Total adds both bases. Use square units.

