Geometry Formulas

Rectangle

Area of a rectangle: $A = lw$ Where l is the length and w is the width of the rectangle
Perimeter: $P = 2l + 2w$ Two times the length plus two times the width

Square

Area: $A = s^2$ Where s is the length of the side
Perimeter: $P = 4s$ Four times the length of the side

Triangle

Area (when the base and the height are known): $A = \frac{1}{2}bh$

Where b is the base and h is the height of the triangle.

Area using Heron's formula to calculate the area of any triangle given only the lengths of its sides (a, b, and c):

Semiperimeter: $s = \frac{1}{2}(a+b+c)$ Where a, b, and c are the lengths of the sides of the triangle.

Heron's Formula: $A = \sqrt{s(s-a)(s-b)(s-c)}$ Where s is the semiperimeter.

Example:

Find the area of a triangle given three sides, a = 4 meters, b = 6 meters, and c = 8 meters.

First determine the semiperimeter $s = \frac{1}{2}(a+b+c)$:

$$s = \frac{1}{2}(4+6+8) = 9$$

Then substitute the values into Heron's formula:

$$A = \sqrt{9(9-4)(9-6)(9-8)} = \sqrt{9(5)(3)(1)} = \sqrt{135} \approx 11.6\, meters^2$$

Perimeter: $P = s_1 + s_2 + s_3$ The perimeter is the sum of sides where s is a side of the triangle.

Parallelogram

$A = bh$ Where b is the base and h is the height.

Trapezoid

Area: $A = \frac{1}{2}h(a+b)$ Where h is the height, b is the base and a is the side opposite the base.

Circle

Area: $A = \pi r^2$ Where r is the radius.
Circumference: $C = 2\pi r$ Where r is the radius.

Area of a Sector

The formula for a sector of a circle is the portion of a circle (area of sector) divided by the whole circle (area of the circle):

$$A = \frac{c\pi r^2}{360}$$

Where:

A is the area of a sector
c is the central angle in degrees
r is the radius of the circle of which the sector is part

Central angles are angles formed by any two radii in a circle. The vertex is the center of the circle. The arc of a circle is the two points on the circle and the continuous (unbroken) part of the circle between the two points.

Example:

The central angle for a sector is 60 degrees and the radius is 10 miles. Find the area of the sector.

$$A = \frac{(60)(3.14)(10)^2}{360} = 52.3 \text{ Square miles}$$

Rectangular Solid

Volume: $V = lwh$ Where l is the length, w is the width, and h is the height.

Cube

Volume: $V = s^3$ Where s is a side of the cube.
Surface area: $S = 6s^2$

Right Circular Cylinder

Volume: $V = \pi r^2 h$ Where r is the radius of the base and h is the height.
Lateral surface area: $L = 2\pi rh$
Total surface area: $S = 2\pi rh + 2\pi r^2$

Right Circular Cone

Volume: $V = \frac{1}{3}\pi r^2 h$
Lateral surface area: $L = \pi rs$ Where r is the radius of the base and s is the slant height.
Total surface area: $S = \pi r^2 + \pi rs$
Slant height: $s = \sqrt{r^2 + h^2}$

Sphere

Volume: $V = \frac{4}{3}\pi r^3$
Surface area: $S = 4\pi r^2$

Pyramid

Lateral area: $L = \frac{1}{2} pl$ The lateral area L of a square pyramid is one half the perimeter p of the base times the slant height l.

Surface area: $S = L + b$ The surface area S of a square pyramid is the sum of the areas of the lateral faces L of the pyramid plus the area of the base b.