2D Geometry Formulas

Area Formulas

Area of a square: $A = s^2$

Area of a rectangle: $A = l \cdot w$

Area of a triangle: $A = \frac{1}{2} \cdot b \cdot h$

Area of a parallelogram: $A = b \cdot h$

Area of a circle: $A = \pi r^2$

s = Side of the Square

l = length of the rectangle

Perimeter Formulas

Perimeter of a square: $P = 4s$

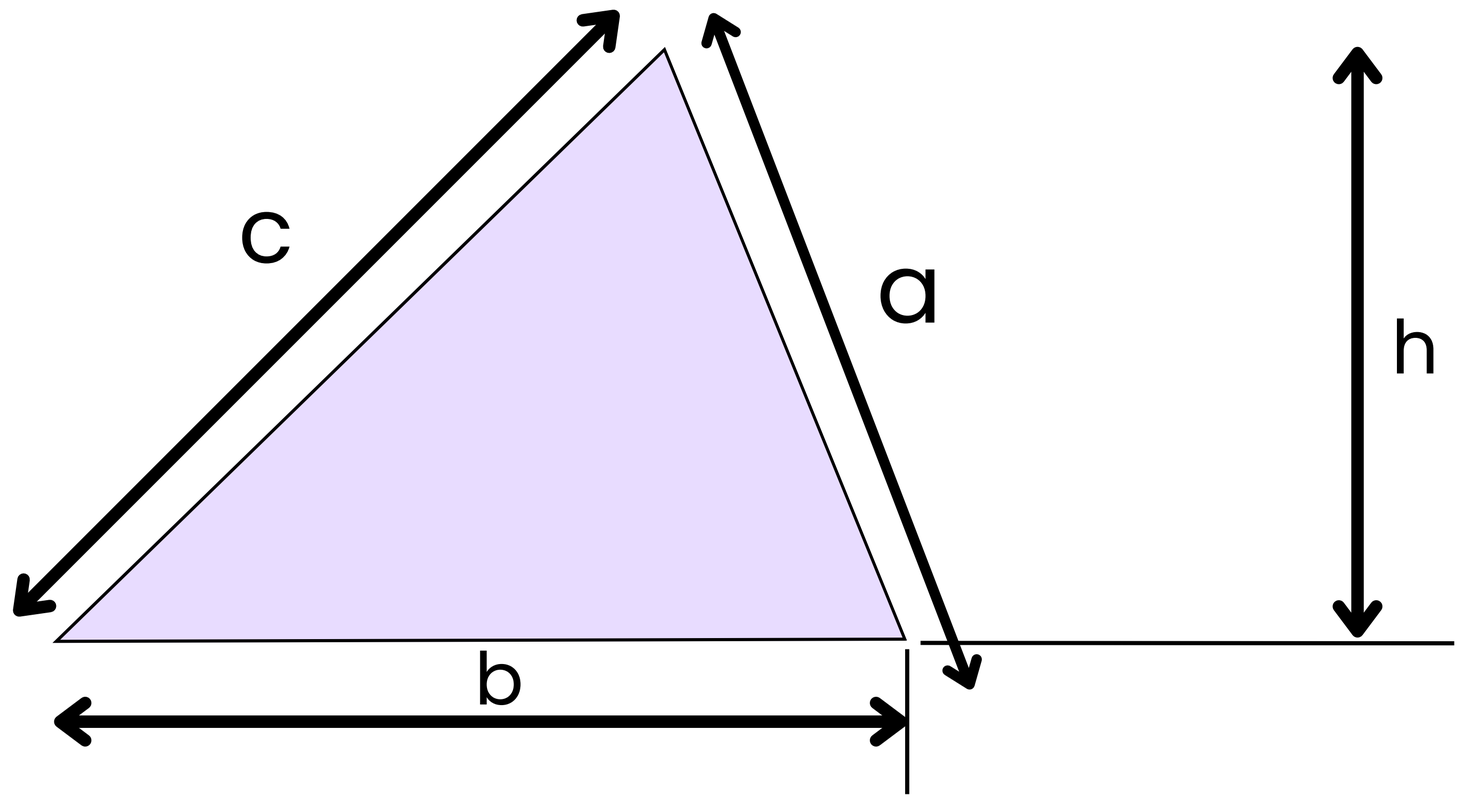
Perimeter of a rectangle: $P = 2(l + w)$

Perimeter of a triangle: $P = a + b + c$

Perimeter (circumference) of a circle: $C = 2\pi r$

Triangle Formulas

a, b, and c
are the lengths of
the sides).



Area Formulas

Standard Area Formula:

$$\text{Area} = 1/2 \times \text{base} \times \text{height}$$

Heron's Formula :

$$s = \frac{a+b+c}{2}$$ (for sides a, b, c and semi-perimeter s):

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

Area of an Equilateral Triangle:

$$\text{Area} = \frac{\sqrt{3}}{4} \times a^2$$ (where a is the length of a side).

Ex Examples.com

Triangle Formulas

Perimeter Formulas

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Perimeter Formulas

Length of Median

$$m_a = \sqrt{\frac{2b^2+2c^2-a^2}{4}}$$

Examples.com

Triangle Formulas

Perimeter Formulas

Altitude

$$h = \frac{2 \times \text{Area}}{\text{base}}$$ (perpendicular segment from a vertex to the line containing the opposite side):

Angle Bisector

$$l_a = \sqrt{bc\left(1 - \frac{a^2}{(b+c)^2}\right)}$$ (line segment that splits an angle into two equal angles)

Circle Formulas Related to Triangles

Circumradius

$$R = \frac{abc}{4 \times \text{Area}}$$ (radius of the circumscribed circle):

Inradius

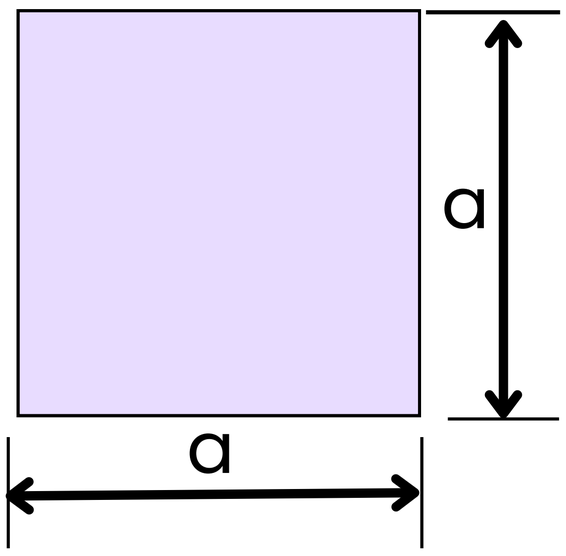
$$r = \frac{\text{Area}}{s}$$ (radius of the inscribed circle):

Exradius

$$r_a = \frac{\text{Area}}{s-a}$$ (radius of the excircle opposite side a):

Square Formulas

(a is the lengths of the sides).



Area of a Square

$$A = a^2$$

The area (A) of a square is the space contained within its four sides.

Perimeter of a Square

$$P = 4a$$

(a = length of one side of the square)
The perimeter (P) of a square is the total distance around the outside of the square.

Diagonal of a Square

$$d = a\sqrt{2}$$

(a = length of one side of the square)
The diagonal (d) of a square is the line segment connecting two opposite corners.

Circumcircle of a Square

$$R = \frac{a\sqrt{2}}{2} = \frac{d}{2}$$

(The circumcircle is a circle that passes through all four vertices of the square.)

Incircle of a Square

$$r = \frac{a}{2}$$

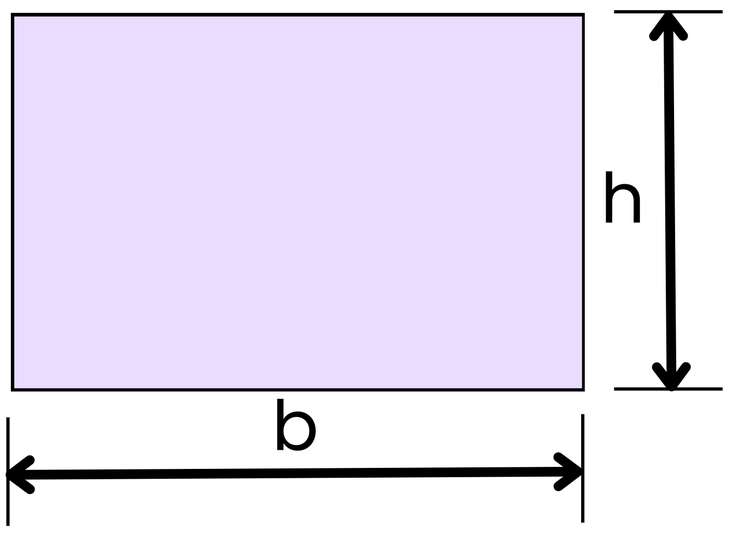
(The incircle is a circle that is tangent to all four sides of the square.)

Relationship Between Diagonal and Side Length

$$a = \frac{d}{\sqrt{2}}$$

If the diagonal (d) is known, the side length(a)

Rectangle Formulas



Area

$$\text{Area} = \text{Length} \times \text{Width}$$

(The area of a rectangle is the amount of space enclosed within its sides.)

Perimeter

$$\text{Perimeter} = 2 \times (\text{Length} + \text{Width})$$

(The area of a rectangle is the amount of space enclosed within its sides.)

Diagonal of a rectangle

$$\text{Diagonal} = \sqrt{(\text{Length}^2 + \text{Width}^2)}$$

(The diagonal of a rectangle is the line segment connecting two opposite corners. It can be calculated using the Pythagorean theorem.)

Length (Given Area and Width)

$$\text{Length} = \frac{\text{Area}}{\text{Width}}$$

(If you know the area and width, you can find the length.)

Length (Given Perimeter and Width)

$$\text{Width} = \frac{\text{Area}}{\text{Length}}$$

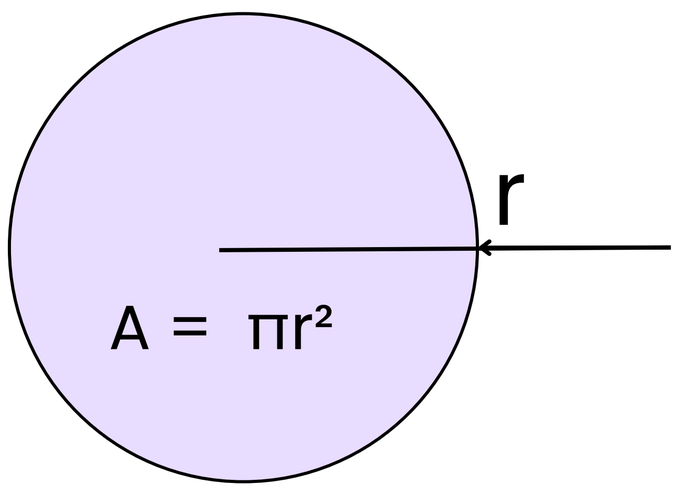
(If you know the area and length, you can find the width.)

Width (Given Perimeter and Length)

$$\text{Length} = \frac{\text{Perimeter}}{2} - \text{Width}$$

(If you know the perimeter and width, you can find the length)

Circle Formulas



Circumference

$$C = 2\pi r$$

C: Circumference
r : Radius
π (pi): Approximately 3.14159

Area

$$A = \pi r^2$$

A: Area
r : Radius
π (pi): Approximately 3.14159

Diameter

$$D = 2r$$

The diameter is the distance across the circle, passing through the center. It is twice the radius.
D: Diameter
r : Radius

Radius

$$r = \frac{D}{2}$$

The radius is the distance from the center of the circle to any point on its circumference.
D: Diameter
r : Radius

Equation of a Circle (Standard Form)

$$(x - h)^2 + (y - k)^2 = r^2$$

The standard form equation of a circle with its center at (h,k) and radius r is:
(h,k): Coordinates of the center
(x,y): Coordinates of any point on the circle

Equation of a Circle (General Form)

$$x^2 + y^2 + Dx + Ey + F = 0$$

D, E, F: Constants
To convert from the standard form to the general form, expand and rearrange the standard form equation.