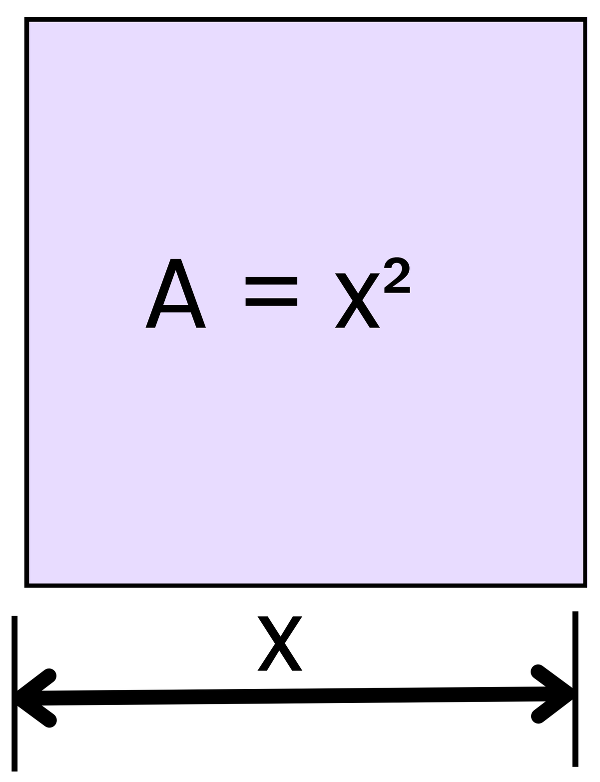
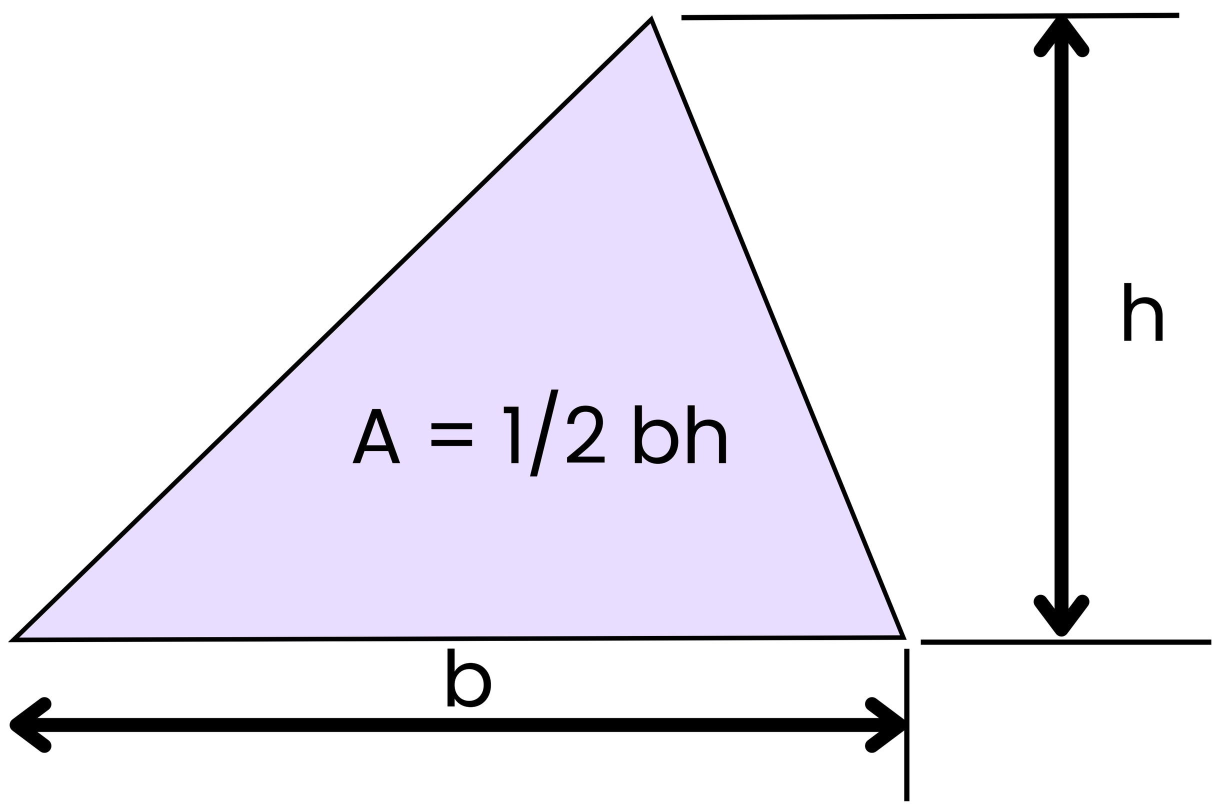
Geometry Formulas

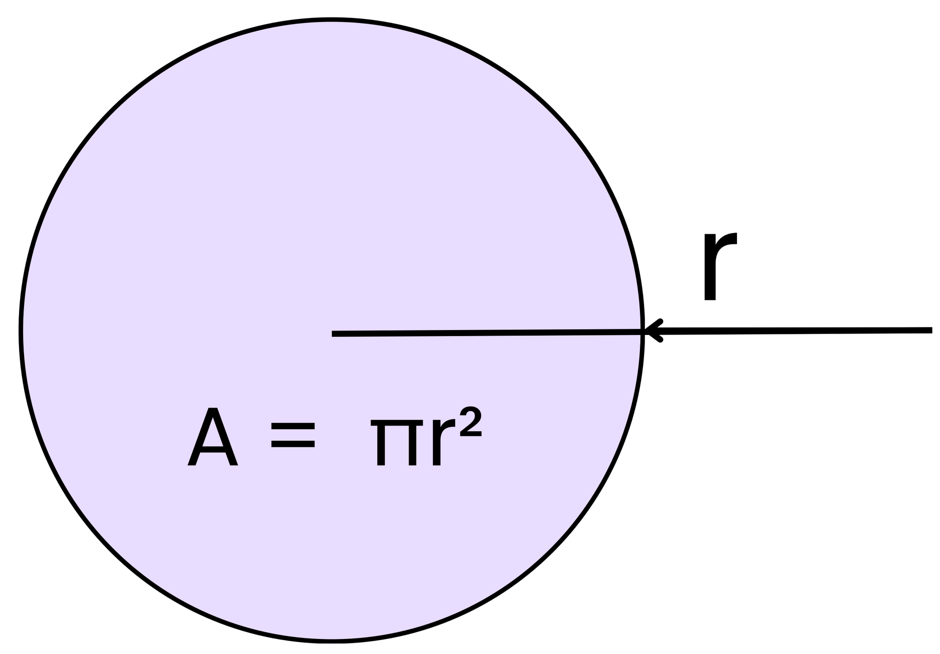
Square



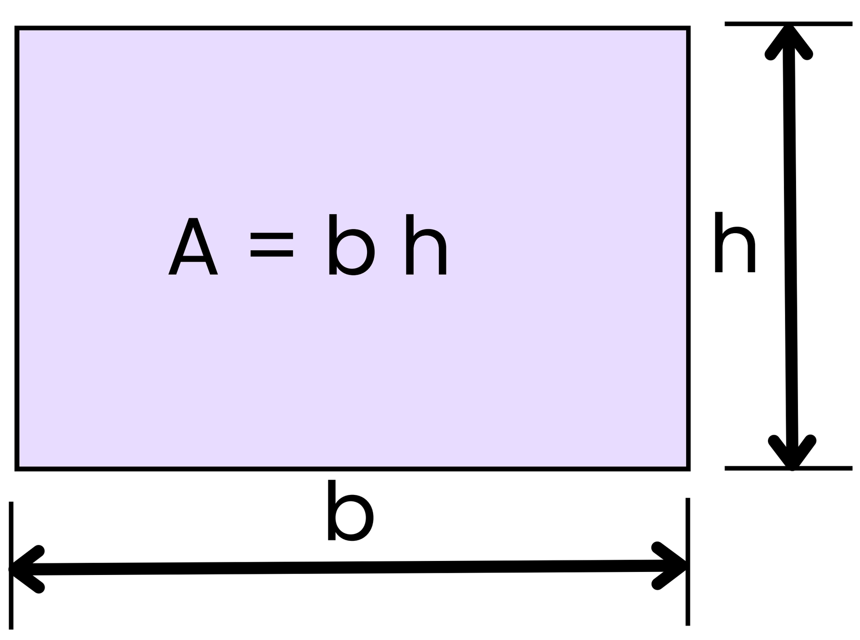
Triangle



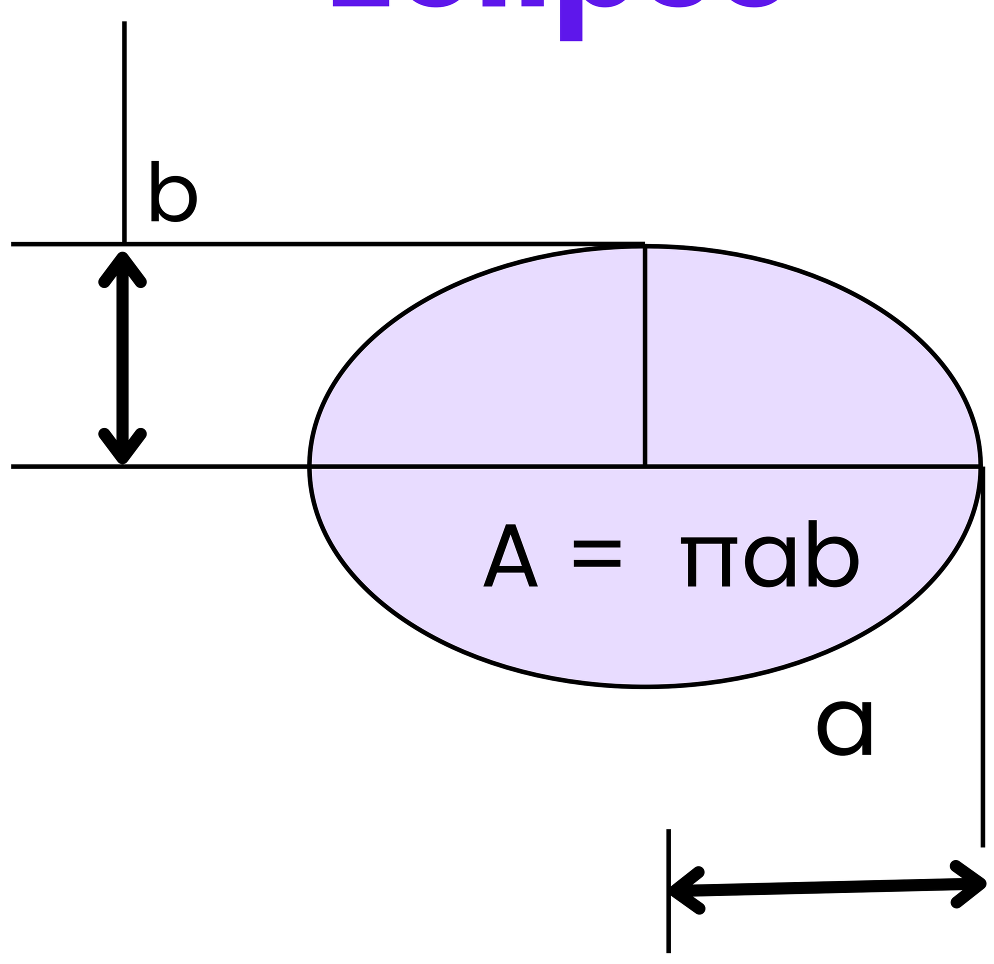
Circle



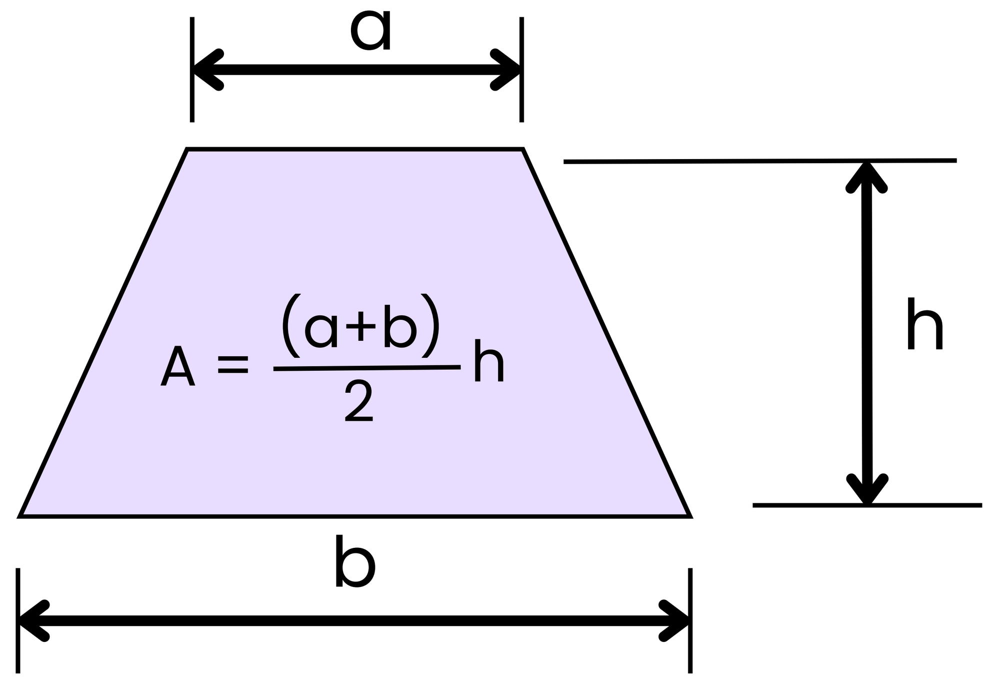
Rectangle



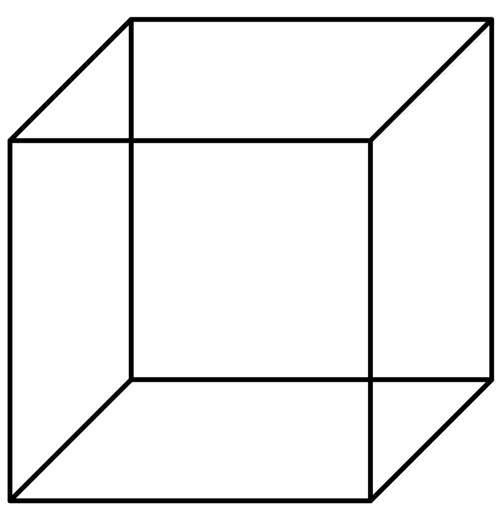
Eclipse



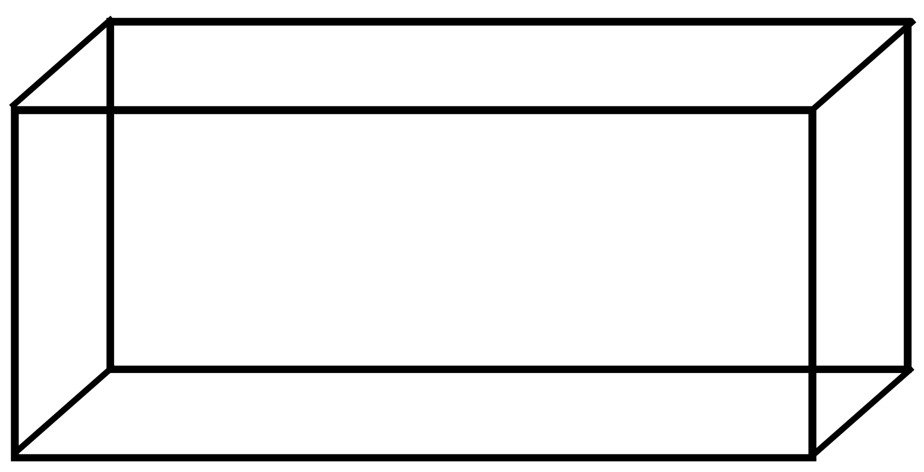
Trapezoid



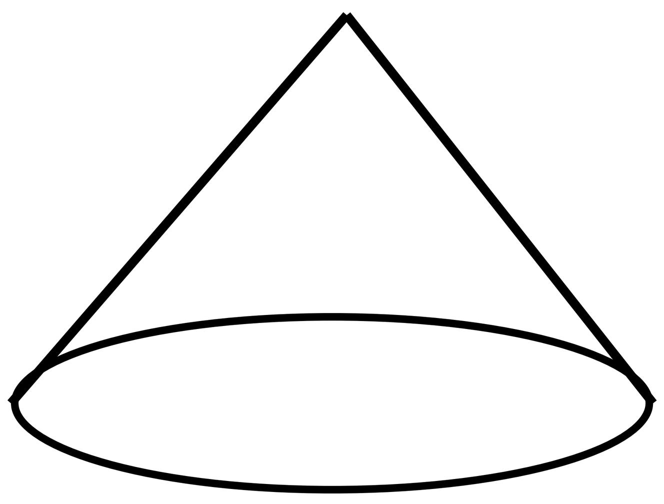
Cube



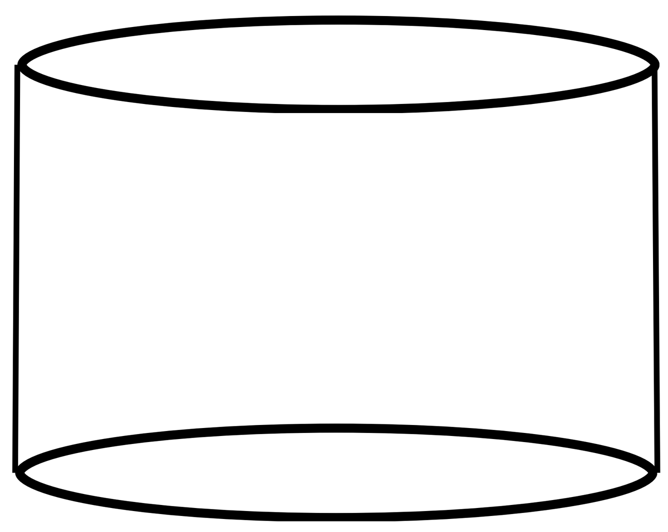
Cuboid



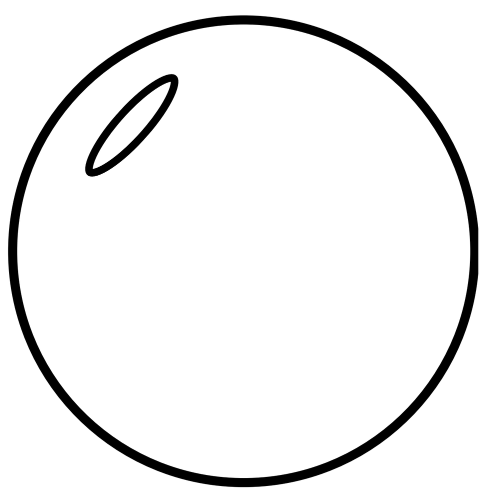
Cone



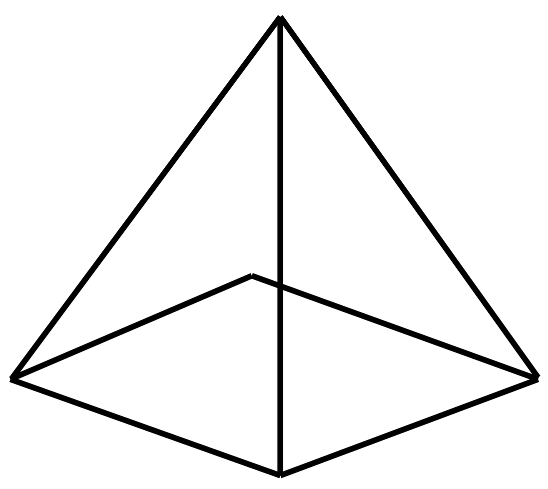
Cylinder



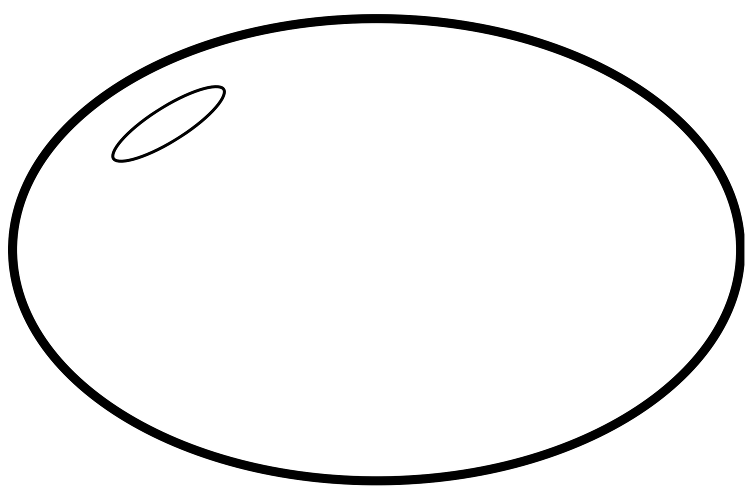
Sphere



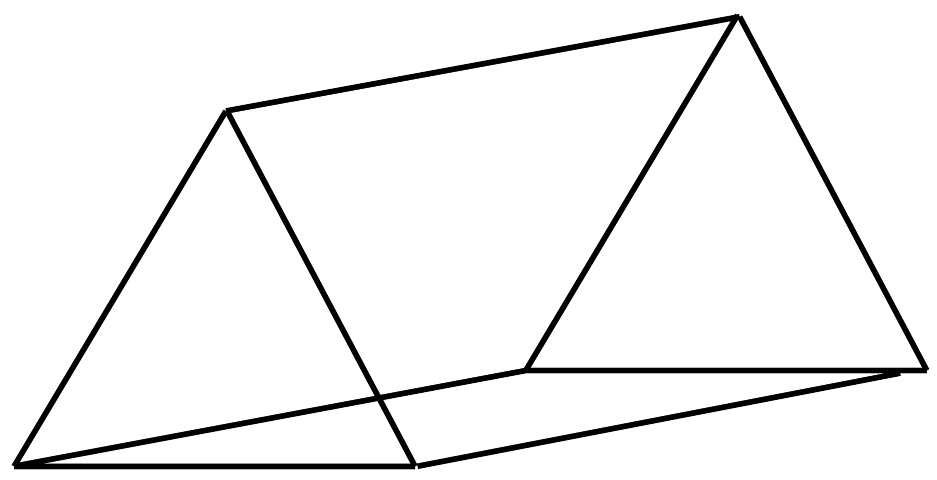
Pyrmid



Ellipsoid



Prism



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: $P = 4s$

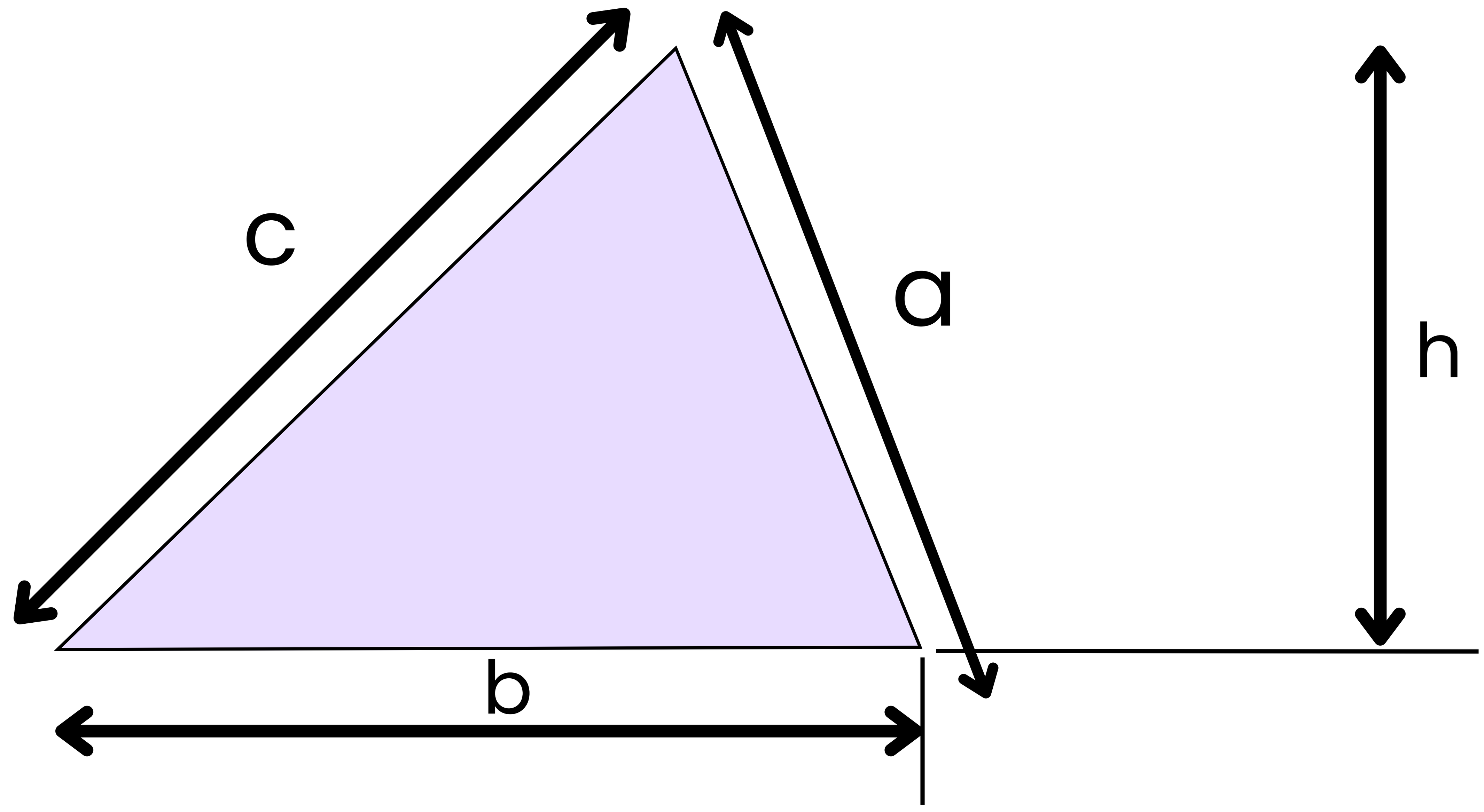
Perimeter of a rectangle: $P = 2(l + w)$

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:

$$Area = 1/2 \times base \times height$$

Heron's Formula :

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

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

Area of an Equilateral Triangle:

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

Ex Examples.com

Triangle Formulas

Perimeter 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).

Perimeter Formulas

Length of Median

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

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):

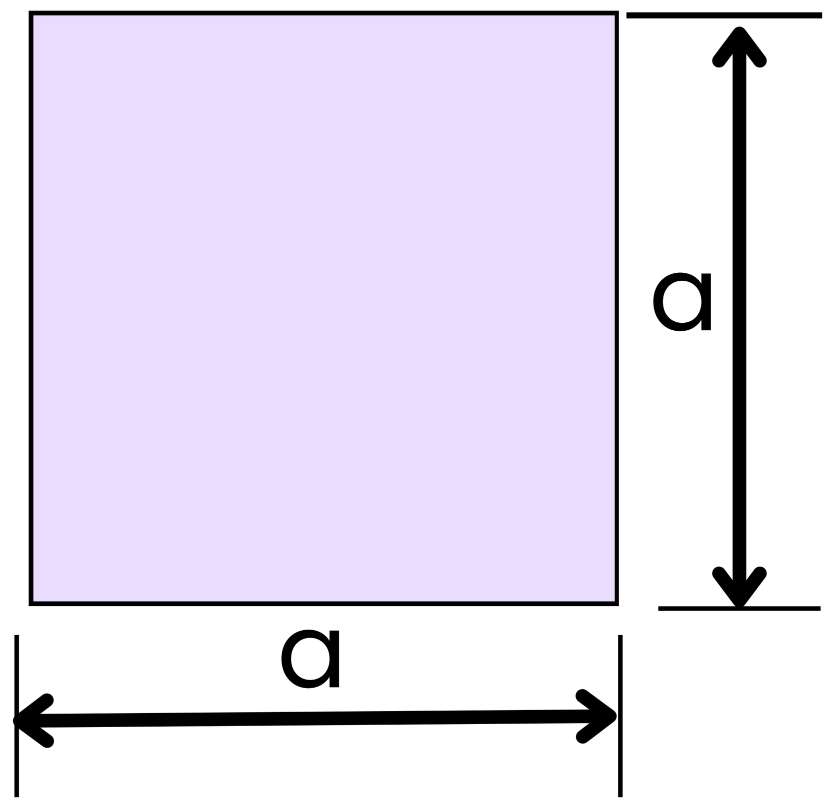
Exradius

$$r_a = \frac{\text{Area}}{s-a}$$

(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

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

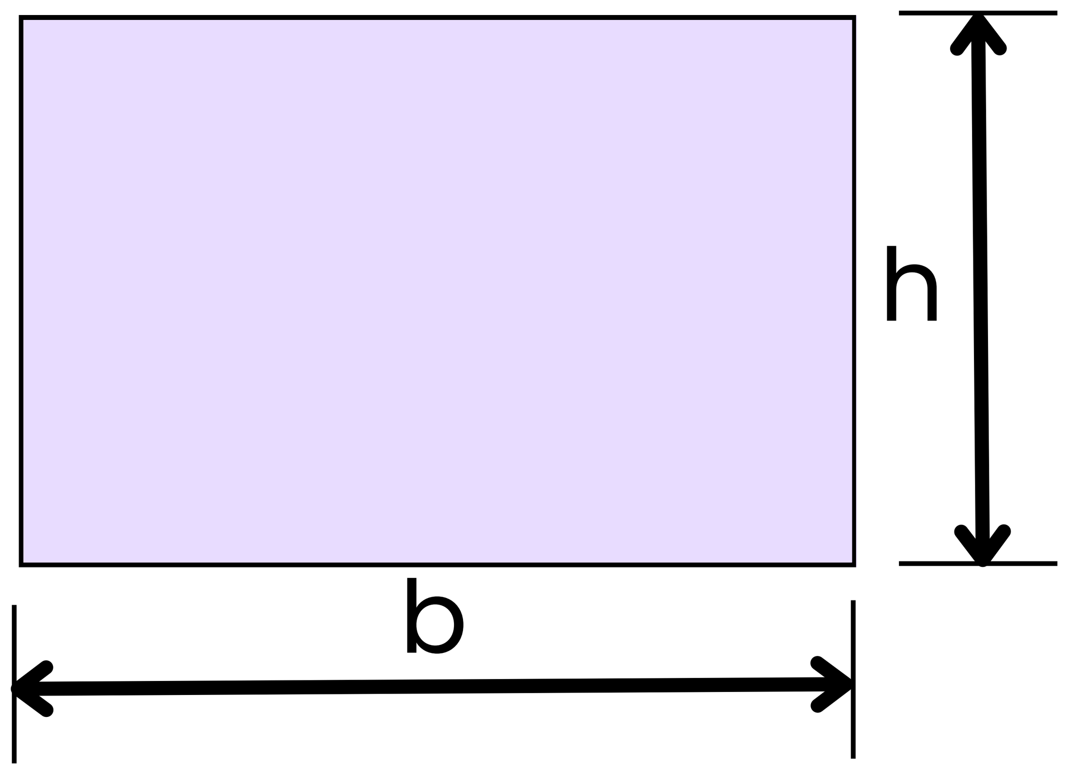
(The incircle is a circle that is tangent to all four sides of the square.)

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)

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

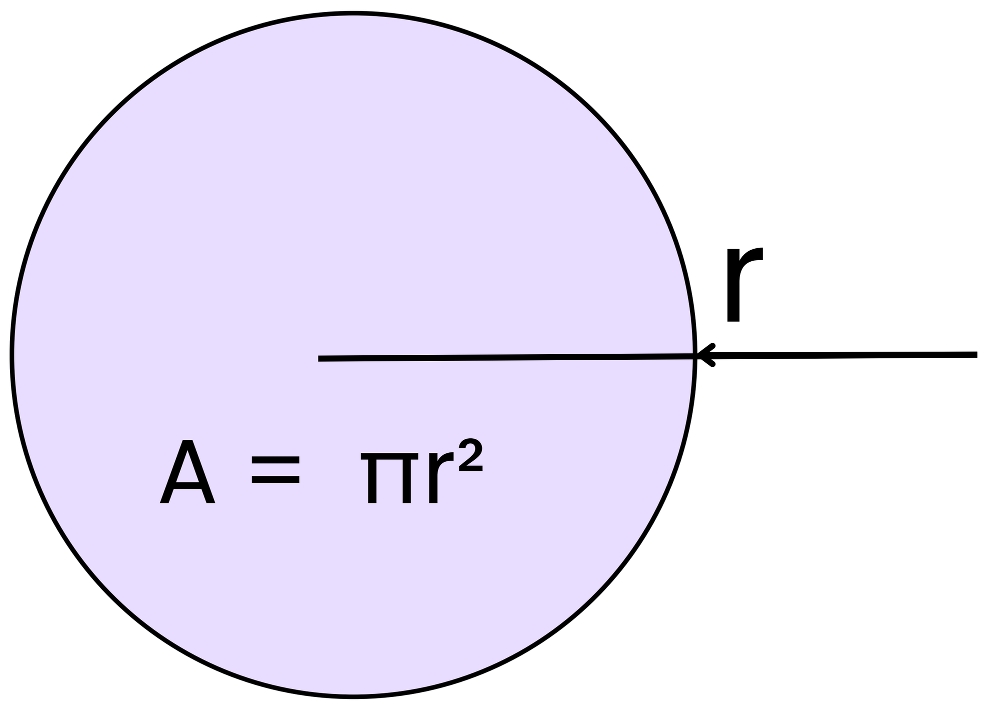
(If you know the area and length, you can find the width.)

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.

3D Geometry Formulas

Surfac Area Formulas

Surface Area of Cube : $6a^2$

Area of Rectangular Prism : $2(lw + lh + wh)$

Surface Area of Sphere : $4\pi r^2$

Surface Area Cylinder: $2\pi r(h + r)$

Surface Area of Cone: $\pi r(r + \sqrt{h^2 + r^2})$

Area (Square Base of Pyramid): $B + \frac{1}{2}P\ell$

Area of Triangular Prism: $bh + (s_1 + s_2 + s_3)l$

Volume Formulas

Volume of a cube: $V = s^3$

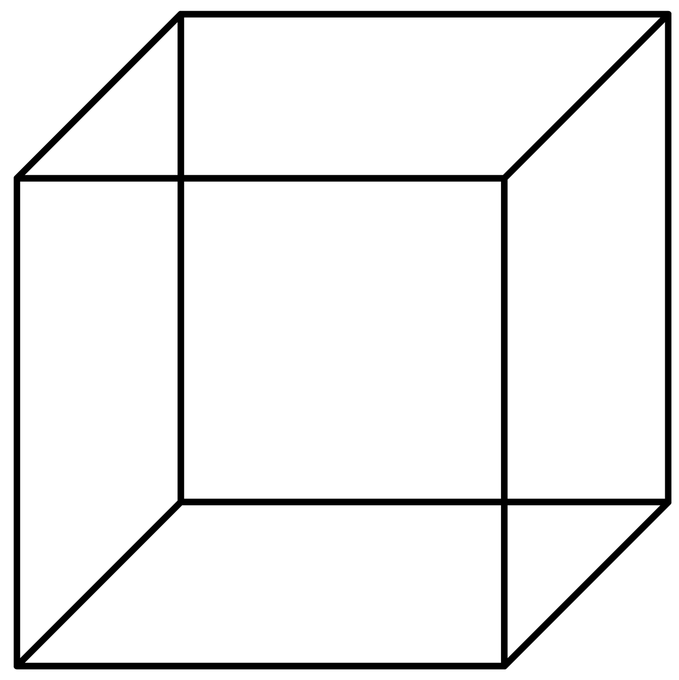
Volume of a rectangular prism: $V = l \cdot w \cdot h$

Volume of a cylinder: $V = \pi r^2 h$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

Cube Formulas

(s = side length of the cube)



Surface Area

$$A = 6s^2$$

The surface area (A) of a cube is the total area of all six faces.

Volume

$$V = s^3$$

The volume (V) of a cube is the amount of space enclosed within the cube.

Diagonal of a Face

$$d_f = s\sqrt{2}$$

The diagonal (d_f) of any face of the cube can be found using the Pythagorean theorem.

Space Diagonal

$$d_s = s\sqrt{3}$$

The space diagonal (d_s) of the cube, it can be found using the three-dimensional Pythagorean theorem.

Perimeter of One Face

$$P_f = 4s$$

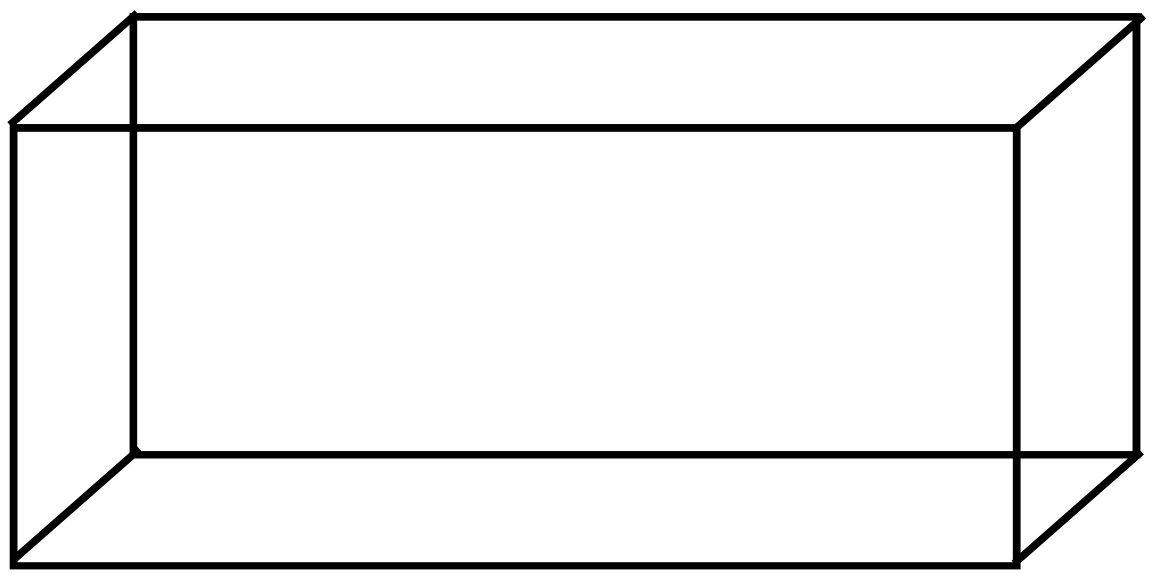
The perimeter (P_f) of one face of the cube is the sum of the lengths of the four edges forming that face.

Total Edge Length

$$E = 12s$$

The total edge length (E) of a cube is the sum of the lengths of all twelve edges.

Cuboid Formulas



- Length (l)
- Width (w)
- Height (h)

Surface Area

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

The surface area is the total area of all six faces of the cuboid.

Volume

$$V = l \times w \times h$$

The volume of a cuboid is the amount of space it occupies.

Diagonal Length

$$D = \sqrt{l^2 + w^2 + h^2}$$

The diagonal of a cuboid stretches from one vertex to the opposite vertex through the interior of the cuboid.

Face Diagonals

- **Face Diagonal on Length and Width (Front/Back Face)**

$$\text{Face Diagonal (l, w)} = \sqrt{l^2 + w^2}$$

- **Face Diagonal on Length and Width (Front/Back Face)**

$$\text{Face Diagonal (l, h)} = \sqrt{l^2 + h^2}$$

- **Face Diagonal on Length and Width (Front/Back Face)**

$$\text{Face Diagonal (w, h)} = \sqrt{w^2 + h^2}$$

Cuboid Formulas

Perimeter of Edges

$$\text{Total Edge Length} = 4(l + w + h)$$

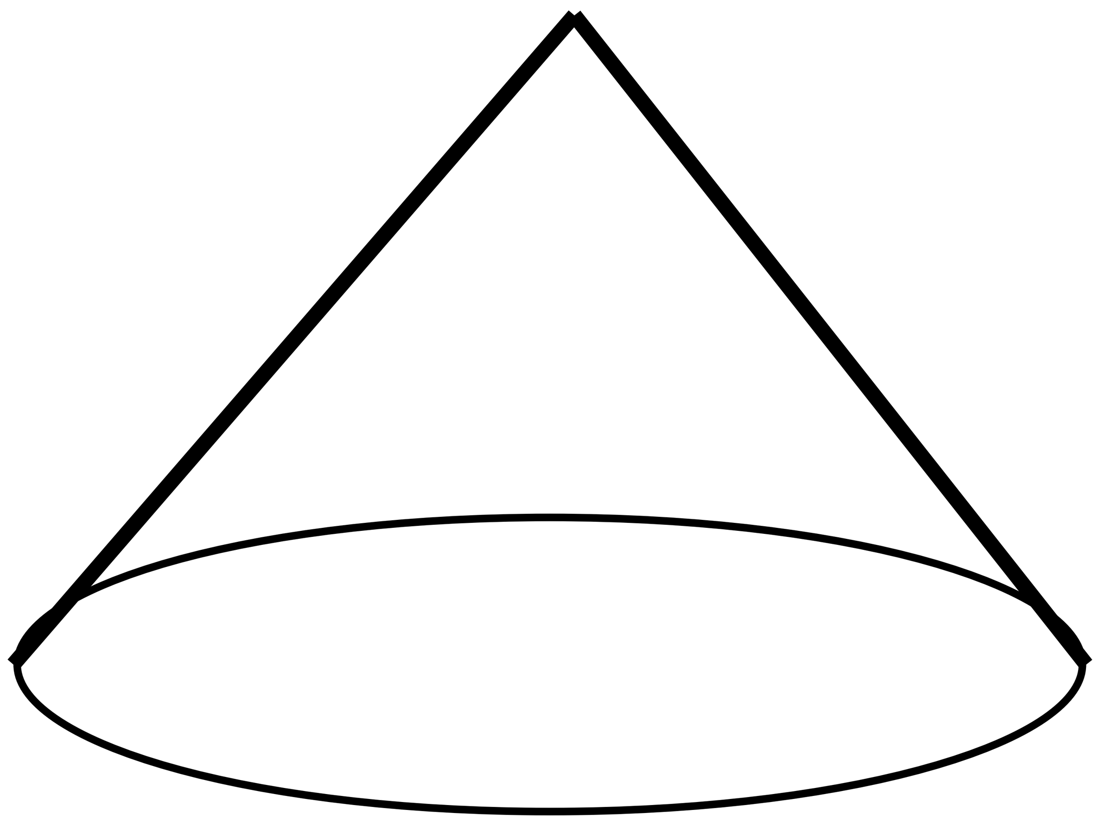
The total perimeter of all the edges of a cuboid.

Lateral Surface Area

$$\text{Lateral Surface Area} = 2h(l + w)$$

The lateral surface area of a cuboid is the sum of the areas of the four vertical faces.

Cone Formulas



Volume of a Cone

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

The volume V of a cone can be calculated using the following formula:

- r is the radius of the base
- h is the height of the cone

Surface Area

a. Base Area

$$A_{\text{base}} = \pi r^2$$

b. Lateral Surface Area

$$A_{\text{lateral}} = \pi r l$$

c. Total Surface Area

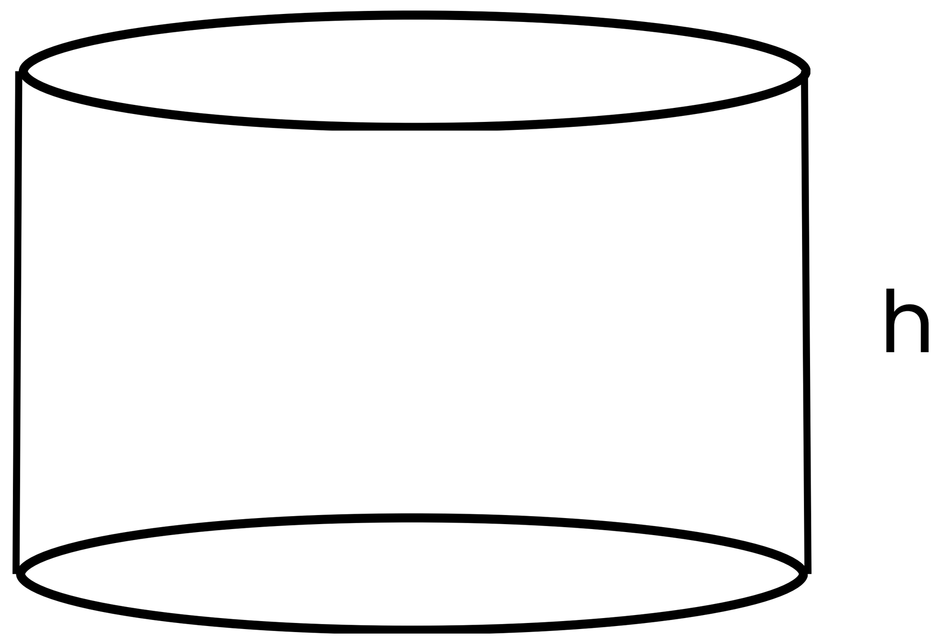
$$l = \sqrt{r^2 + h^2}$$

Total Edge Length

$$A = \pi r(r + l)$$

The slant height l is the distance from the base to the apex along the surface of the cone.

Cylinder Formulas



- V is the volume
- r is the radius of the base
- h is the height

Surface Area

$$A = 2\pi r(r + h)$$

Volume

$$V = \pi r^2 h$$

Lateral Surface Area (Curved Surface Area)

$$A_{\text{lateral}} = 2\pi rh$$

Area of the Circular Bases

$$A_{\text{base}} = \pi r^2$$

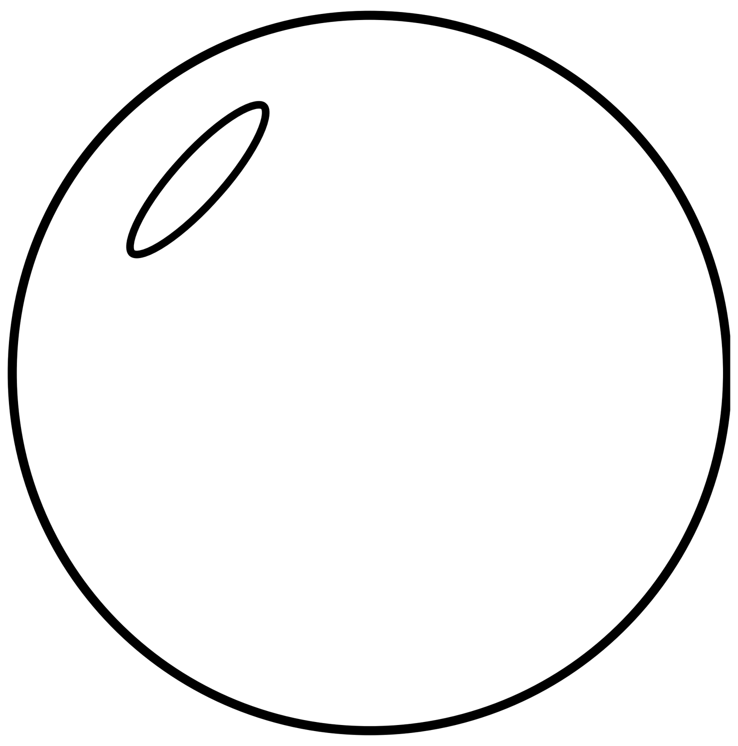
Total Surface Area Calculation

$$A_{\text{total}} = A_{\text{lateral}} + 2A_{\text{base}}$$

$$A_{\text{total}} = 2\pi rh + 2\pi r^2$$

$$A_{\text{total}} = 2\pi r(r + h)$$

Sphere Formulas



- r = Radius of the sphere
- π (Pi) = Approximately 3.14159

Surface Area

$$A = 4\pi r^2$$ (A = Surface Area)

Volume

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

Lateral Surface Area (Curved Surface Area)

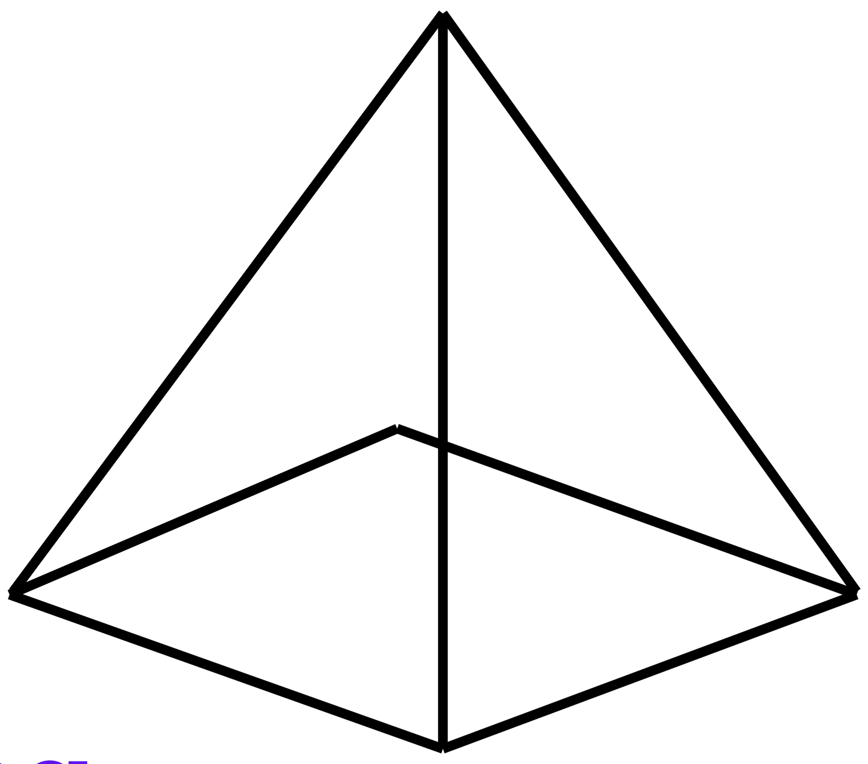
$$C = 2\pi r$$ C = Circumference of the great circle

Area of the Circular Bases

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

- (x, y, z) = Coordinates of any point on the surface of the sphere
- (h, k, l) = Coordinates of the center of the sphere

Pyrmid Formulas



- r = Radius of the sphere
- π (Pi) = Approximately 3.14159

Surface Area

$$SA = B + \text{Lateral Surface Area}$$

Square Base

$$B = a^2$$

Rectangular Base

$$B = l \times w$$

Triangular Base

$$B = \frac{1}{2} \times b \times h_b$$

Volume

$$V = \frac{1}{3} \times B \times h$$

Lateral surface area (regular pyramid)

$$LateralSurfaceArea = \frac{1}{2} \times P \times s$$

Slant height (square base and rectangular base)

$$s = \sqrt{\left(\frac{a}{2}\right)^2 + h^2}$$

Perimeter (square base, rectangular base & triangular base)

Square Base

$$P = 4a$$

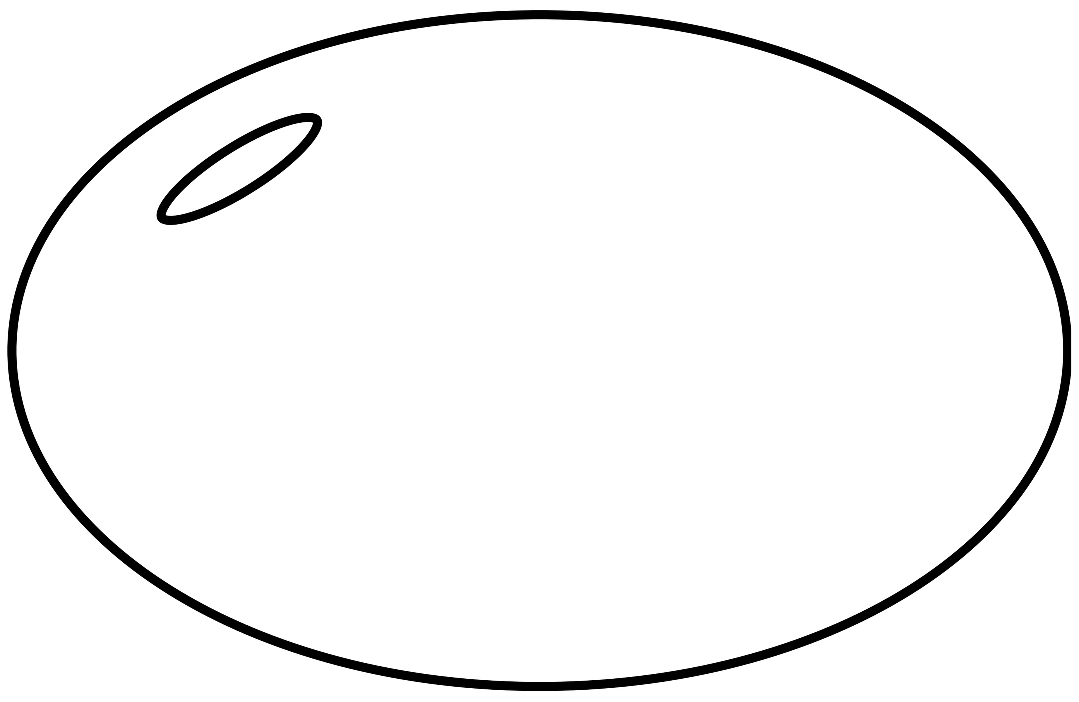
Rectangular Base

$$P = 2(l + w)$$

Triangular Base

$$P = a + b + c$$

Ellipsoid Formulas



Surface Area

$$S \approx 4\pi\left(\frac{(a^p b^p + a^p c^p + b^p c^p)}{3}\right)^{\frac{1}{p}} \quad \text{where} \quad p \approx 1.6075$$

Volume

$$V = \frac{4}{3}\pi abc$$

Eccentricity of an Ellipsoid

$$e_{xy} = \sqrt{1 - \frac{b^2}{a^2}}$$

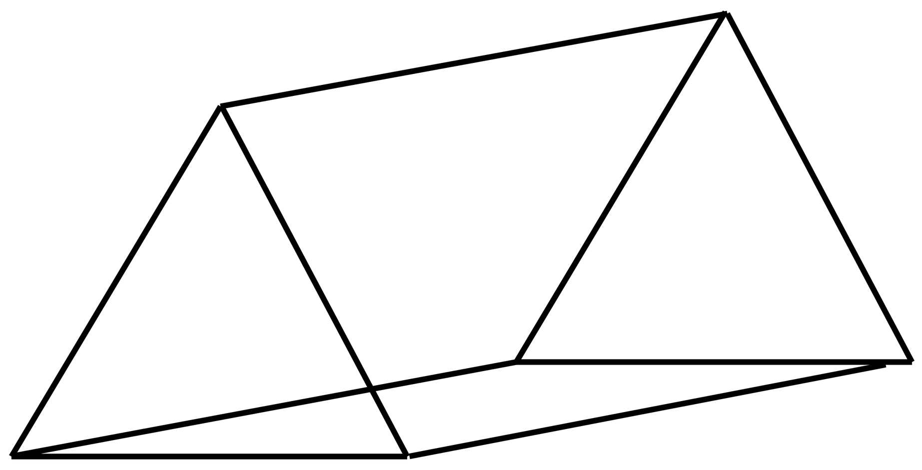
Slant height (square base and rectangular base)

$$e_{xz} = \sqrt{1 - \frac{c^2}{a^2}}$$

Perimeter (square base, rectangular base & triangular base)

$$e_{yz} = \sqrt{1 - \frac{c^2}{b^2}}$$

Prism Formulas



- B is the area of the base
- P is the perimeter of the base
- h is the height of the prism

Volume

$$V = B \times h$$

The volume V of a prism

Surface Area

$$SA = 2B + Ph$$

The surface area SA of a prism

Lateral Surface Area of a Prism

$$LSA = P \times h$$

The lateral surface area LSA

Base Area Formulas for Specific Prisms

Rectangular Prism

$$B = l \times w$$
$$P = 2(l + w)$$

- B is Area of the base
- P is Perimeter of the base
- l is the length
- w is the width

Triangular Prism

$$B = \frac{1}{2} b \times h_b$$
$$P = a + b + c$$

- P is Perimeter of the base
- b is the base length of the triangle
- h_b is the height of the trianglew is the width
- a, b, and c are the side lengths of the triangle

Cylinder (as a Circular Prism)

$$B = \pi r^2$$
$$P = 2\pi r$$

- B is the Area of the base
- r is the radius of the base
- P is the Perimeter of the base

Geometry Shapes Formulas for Class 8,9,10,11, 12

Geometry Shapes Formulas for Class 8

Name of the Solid	Lateral / Curved Surface Area	Total Surface Area	Volume
Cuboid	$2h(l+b)$	$2(lb+bh+hl)$	lbh
Cube	$4a^2$	$6a^2$	a^3
Right Prism	Perimeter of base × height	Lateral Surface Area + 2(Area of One End)	Area of Base × Height
Right Circular Cylinder	$2\pi rh$	$2\pi r(r+h)$	πr^2h
Right Pyramid	½ × Perimeter of Base × Slant Height	Lateral Surface Area + Area of the Base	⅓ × (Area of the Base) × height
Right Circular Cone	πrl	$\pi r(l+r)$	$\frac{1}{3} \times \pi r^2h$
Sphere	$4\pi r^2$	$4\pi r^2$	$4/3 \times \pi r^3$
Hemisphere	$2\pi r^2$	$3\pi r^2$	$2/3 \times \pi r^3$

Geometry Shapes Formulas for Class 9

Geometric Figure	Area	Perimeter
Rectangle	$A= l \times w$	$P = 2 (l+w)$
Triangle	$A = 1/2\times bh$	$P = a + b + c$
Trapezoid	$A = 1/2\times h(b_1+b_2)$	$P = a + b + c + d$
Parallelogram	$A = bh$	$P = 2 (a+b)$
Circle	$A= \pi r^2$	$C = 2\pi r$

Geometry Shapes Formulas for Class 8,9,10,11, 12

Geometry Shapes Formulas for Class 10

Name	Formula
Area of Triangle	Area= ½ × base × height
Pythagorean Theorem	$a^2 + b^2 = c^2$
Area of a Circle	Area = πr^2
Circumference of a Circle	C = $2\pi r$ or πd
Area of a Parallelogram	Area = base × height
Area of a Trapezoid	Area = ½ × $(base_1 + base_2)$ × height
Area of a Kite or a Rhombus	Area = ½ × (diagonal1 × diagonal2)
Area of a Square	Area = $side^2$
Area of a Regular Polygon	Area = ½ × perimeter × apothem
Number of Diagonal in n-sided Polygon	Diagonals = ½ × n(n-3)
Slope	$m = (y_2-y_1)/(x_2-x_1)$ = rise/run
Midpoint Formula	$(x_{mp}, y_{mp}) = [(x_2+x_1)/2][(y_2+y_1)/2]$
Distance Formula	$d = \sqrt{[(x_2-x_1)^2+(y_2-y_1)^2]}$
Equation of a Circle	$(x-h)^2+(y-k)^2 = r^2$

Geometry Shapes Formulas for Class 8,9,10,11, 12

Geometry Shapes Formulas for Class 11

Pythagoras Theorem Formula	$c = a^2 + b^2$
Area of a Triangle	$\frac{1}{2} \times b \times h$
Perimeter of Triangle	$a + b + c$
Area of a Square	a^2
Perimeter of a Square	$4a$
Area of a Rectangle	$l \times b$
Perimeter of a Rectangle	$2 (l + b)$
Area of a Circle	$\pi \times r^2$
Circumference of a Circle	$2\pi r$
Surface Area of a Cube	$6a^2$
Volume of a Cube	a^3
Volume of a Cylinder	$\pi r^2 h$
Volume of a Cone	$\frac{1}{3} \pi r^2 h$
Surface Area of a Sphere	$4\pi r^2$
Volume of a Sphere	$4/3 \pi r^3$
Distance Between Two Points in 3D	$\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2]}$
Distance of a Point From Origin	$\sqrt{(x^2 + y^2 + z^2)}$
Midpoint of a Line Segment	$[\frac{1}{2} (x_1 + x_2), \frac{1}{2}(y_1 + y_2), \frac{1}{2}(z_1 + z_2)]$
Coordinates of the Centroid of a Triangle	$[\frac{1}{3} (x_1 + x_2 + x_3), \frac{1}{3} (y_1 + y_2 + y_3), \frac{1}{3} (z_1 + z_2 + z_3)]$

Geometry Shapes Formulas for Class 8,9,10,11, 12

Geometry Shapes Formulas for Class 12

Concept	Formula
Position Vector	$\vec{OP}=\vec{r}=\sqrt{(x^2+y^2+z^2)}$
Direction Ratios	$l=ar,\ m=br,\ n=cr$
Vector Addition	$\vec{PQ}+\vec{QR}=\vec{PR}$
Properties of Vector Addition	Commutative Property: $\vec{a}+\vec{b}=\vec{b}+$Associative Property: $\vec{a}+(\vec{b}+\vec{c})=(\vec{a}+\vec{b})+\vec{c}$
Vector Joining Two Points	$P_1\vec{P2}=\vec{OP2}-\vec{OP1}$
Equation of a Line	$(x-x_1)/a=(y-y_1)/b=(z-z_1)/c$

Area Formulas in 2D and 3D Geometry

2D Shapes

Rectangle

$$A = l \times w$$

where l is the length and w is the width.

Square

$$A = s^2$$

where s is the side length.

Triangle

$$A = \frac{1}{2} b \times h$$

where b is the base and h is the height.

Circle

$$A = \pi r^2$$

where r is the radius.

Parallelogram

$$A = b \times h$$

where b is the base and h is the height.

Trapezoid

$$A = \frac{1}{2}(b_1 + b_2) \times h$$

where b1 and b2 are the lengths of the two parallel sides, and h is the height.

Rhombus

$$A = \frac{1}{2} d_1 \times d_2$$

where d1 and d2 are the lengths of the diagonals

Ellipse

$$A = \pi a \times b$$

where a is the semi-major axis and b is the semi-minor axis.

Area Formulas in 2D and 3D Geometry

3D Shapes

Cube

$$A = 6s^2$$

where s is the side length.

Rectangular Prism

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

where l is the length, w is the width, and hhh is the height

Sphere

$$A = 4\pi r^2$$

where r is the radius.

Cylinder

$$A = 2\pi r(r + h)$$

where r is the radius and h is the height.

Cone

$$A = \pi r(r + l)$$

where r is the radius and l is the slant height.

Triangular Prism

$$A = bh + Ph$$

where b is the base area, h is the height, and P is the perimeter of the base.

Volume Formulas 3D Geometry

3D Shapes

Cube

$$V = s^3$$

where a is the edge length.

Rectangular Prism

$$V = l \times w \times h$$

where l is the length, w is the width, and h is the height.

Cylinder

$$V = \pi r^2 h$$

where r is the radius and h is the height.

Cone

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

where r is the radius and h is the height.

Sphere

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

where r is the radius.

Pyramid

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

where b is the base area, h is the height, and P

Triangular Prism

$$V = \frac{1}{2}bh_pL$$

where b is the base area, h is the height, and P is the perimeter of the base.

Perimeter Formulas 2D Geometry

2D Shapes

Triangle

$P = a + b + c$	Where a is the edge length.where b and c are the lengths of the sides.

Square

$P = 4a$	Where a is the length of a side.

Rectangle

$P = 2(l + w)$	where l is the length and w is the width.

Parallelogram

$P = 2(a + b)$	where a and b are the lengths of the adjacent sides.

Rhombus

$P = 4a$	where a is the length of a side.

Trapezoid

$P = a + b + c + d$	where a,b,c and d are the lengths of the sides

Circle

$C = 2\pi r$	where r is the radius.

Perimeter Formulas 2D Geometry

3D Shapes

Cube (Base is a Square)

$$P_{base} = 4a$$

Where a is the length of a side of the base.

Rectangular Prism (Base is a Rectangle)

$$P_{base} = 2(l + w)$$

Where l is the length and w is the width of the base.

Triangular Prism (Base is a Triangle)

$$P_{base} = a + b + c$$

Where a,b and c are the lengths of the sides of the bas

Cylinder (Base is a Circle)

$$P_{base} = 2\pi r$$

Where r is the radius of the base

Pyramid (Base can be any Polygon)

Square Pyramid : $P_{base} = 4a$ (Where a, b, and c are the side lengths of the base)

Square Pyramid : $P_{base} = 2(l + w)$

Square Pyramid : $P_{base} = a + b + c$