Mathematics Formula

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Algebra Formula

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $a^2 + b^2 = (a + b)^2 - 2ab$
- $a^2 + b^2 = (a - b)^2 + 2ab$
- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

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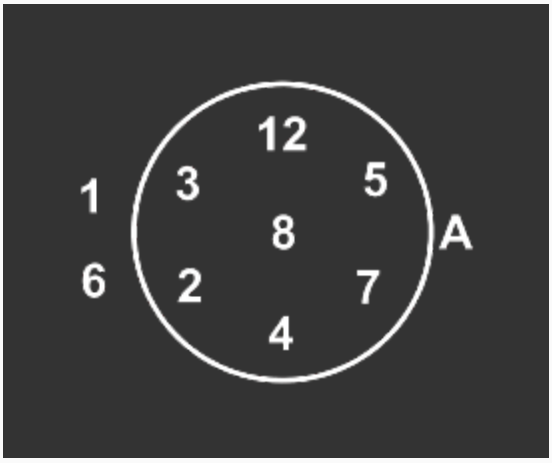
- $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$
- $a^2 - b^2 = (a + b)(a - b)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $a^4 - b^4 = (a^2 - b^2)(a^2 + b^2) = (a + b)(a + b)(a^2 + b^2)$
- $a^4 + b^4 = (a^2 + b^2)^2 - 2a^2b^2 = (a^2 + \sqrt{2}ab + b^2)(a^2 - \sqrt{2}ab + b^2)$
- $a^5 + b^5 = (a + b)(a^4 - a^3b + a^2b^2 - ab^3 + b^4)$
- $a^5 - b^5 = (a - b)(a^4 + a^3b + a^2b^2 + ab^3 + b^4)$
- $a^n - b^n = (a - b)(a^{n-1} + a^{n-2}\, b + a^{n-3}\, b^2 + \cdots + b^{n-1}n-1)$
- $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

- $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

  If $a + b + c = 0$, then the above identity reduces to $a^3 + b^3 + c^3 = 3abc$

Statistics Math Formulas

SETS :

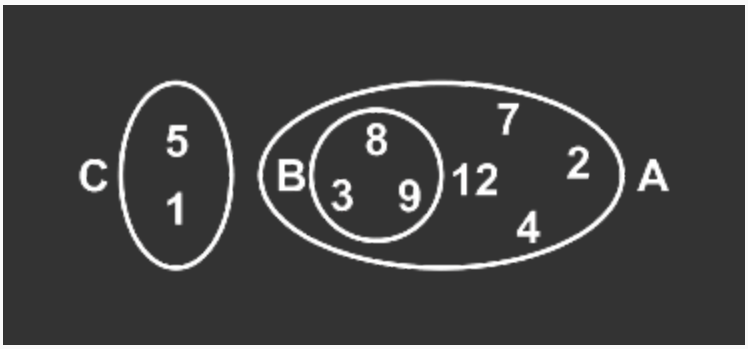


$A = \{2, 3, 4, 7, 8, 9, 12\}$

$3 \in A$

$5 \notin A$

SUBSET:



$B = \{3, 8, 9\} \Rightarrow B \subseteq A$

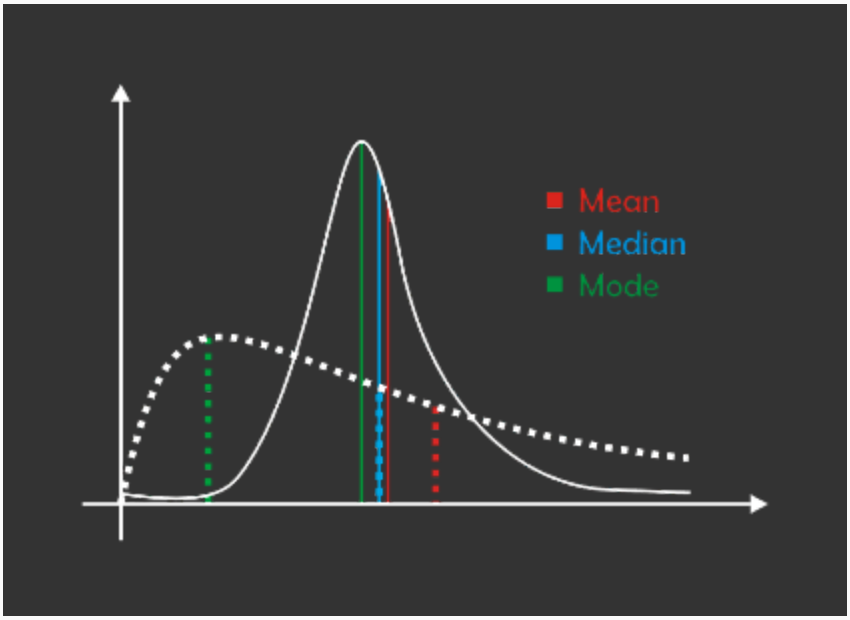
$C = \{1, 5\} \Rightarrow C \not\subset A$

STATISTICS :

MEAN : The mean value is obtained the arithmetic mean or average of a set of numbers

is expected value.

The mean value is calculated by adding up all the values, and then dividing that sum by the number of values .



Mean = Sum of all data values / Number of data values

Symbolically ,

Where (read as ” x bar”) is the mean of the set of x values, **Σ** x is the sum of all the x values, and n is the number of x values.

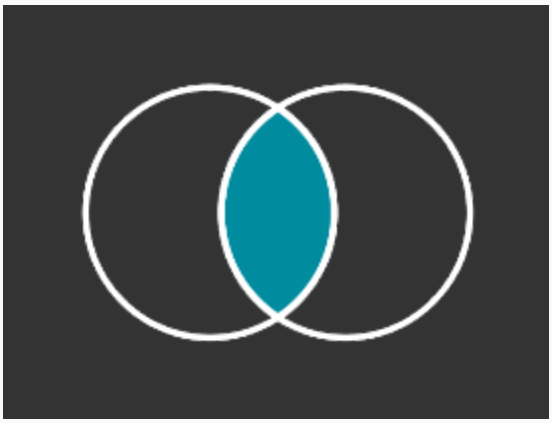
MEDIAN : The median is the middle value in a set of values. So to find the midian you need to order the numbers from largest to smallest and then you have to choose the value in the middle.

MODE : Mode is the value that the highest frequency in the data set.means values that occur most frequently and there can be more than one mode in a set.

numerical value that occurs most of the times.

$F(X_{mode}) = \max$

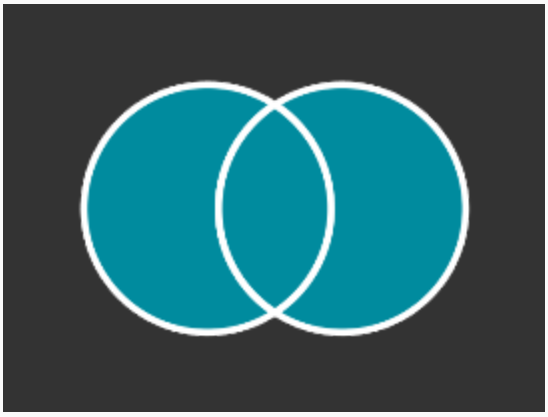
INTERSECTION :



In intersection $A \cap B$ of two sets A and B is the set that contains all elements of B also belong to A (or similarly all elements of B that also belong to A) but no other elements. The symbol intersection is inverted U.

If Set A contain element A = {1,2,3} and set B contains B = {2,3,4} and the element in having common ares 2 and 3 and this intersection area formed a new set containing 2 and 3.

UNION :



The union of two sets A and B includes all elements which are members of either A or B. If sets A and B have any elements in common then this elements which are members of both sets are only include one in the union.

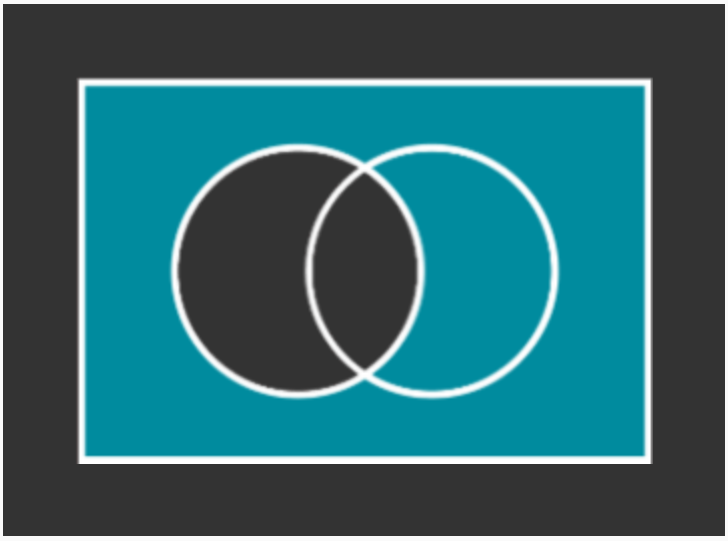
For example : If sets A contains the elements 1,2, and 3 and set B contains 2,3 and 4 the elements which are members of A or B are 1,2,3 and 4. This form a new set containing 1,2,3 and 4. when we write the union 2 and 3 are only listed once.

RELATIVE COMPLEMENT OF A IN B :

The relative complement of A in B denoted, B \ A, is the set of elements in B but not in A.

Symbolically : $B \setminus A = \{x \mid x \in B \wedge x \notin A\}$

ABSOLUTE COMPLEMENT :



In a Set theory a complement of a set A refers to things not in A.

SYMMETRIC DIFFERENCE :

Operations on sets :

$A \cup A = A$

$A \cap A = A$

$A \cup B = B \cap A$

$A \cap B = B \cap A$

$$(A \cup B) \cup C = A \cup (B \cup C)$$

$$(A \cap B) \cap C = A \cap (B \cap C)$$

$$\cup' = \varnothing$$

$$(A')' = A$$

$$A \cap \varnothing = \varnothing$$

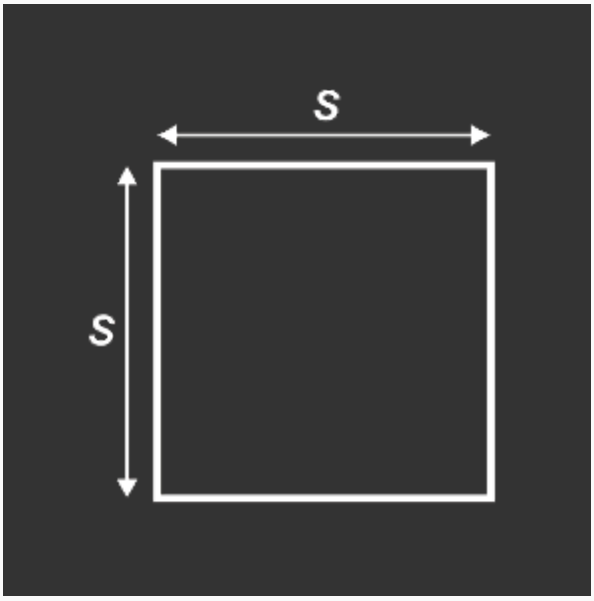
$$A \cap U = A$$

$$A \cap A' = \varnothing$$

$$(A \cup B)' = A' \cap B'$$

$$(A \cap B)' = A' \cup B'$$

Geometry Formula



P = **Perimeter**

A = **Area**

S = **Side**

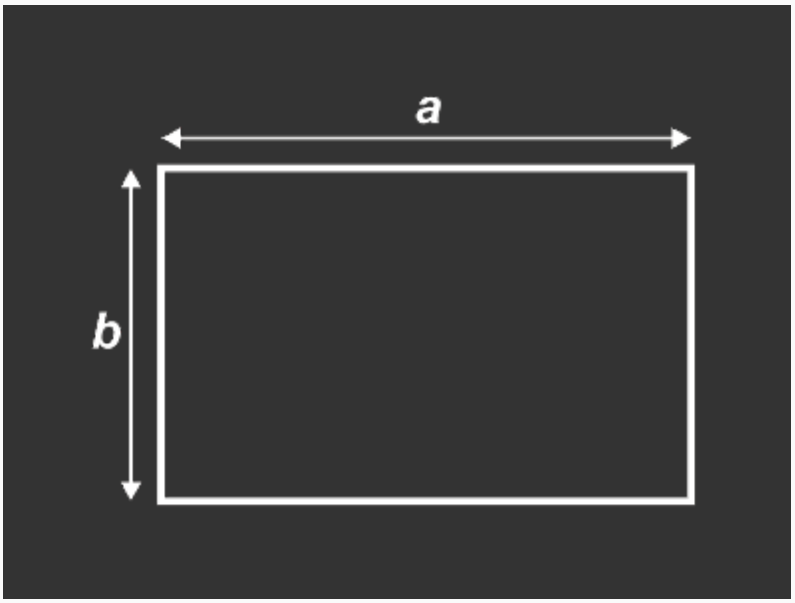
d = **diameter**

$P = 4 \times s$

$A = S^2$

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

Rectangle



P = **Perimeter**

A = **Area**

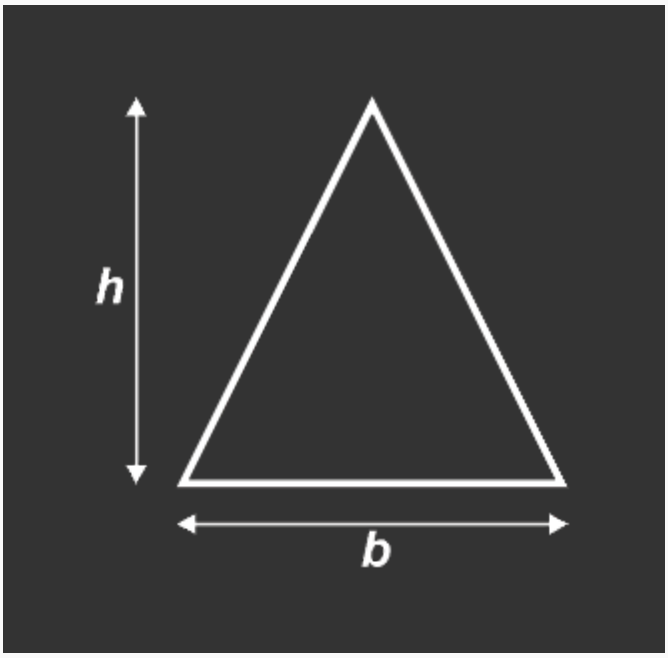
d = diameter

$P = 2 \times (a + b)$

$A = a \times b$

$d = \sqrt{a^2 + b^2}$

Triangle



P = Perimeter

A = Area

$P = a + b + c$

$A = b \times h / 2$

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

$s = a + b + c / 2 = p / 2.$

$\alpha + \beta + \gamma = 180^{o}$

Circle

P = Perimeter

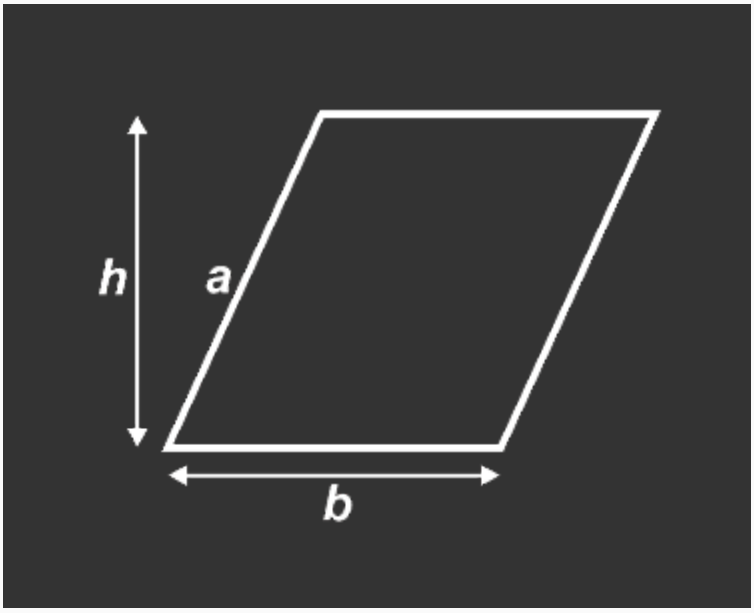
A = Area

$P = 2\pi r$

$A = \pi r^2$

$\pi = 3.14$

Parallelogram

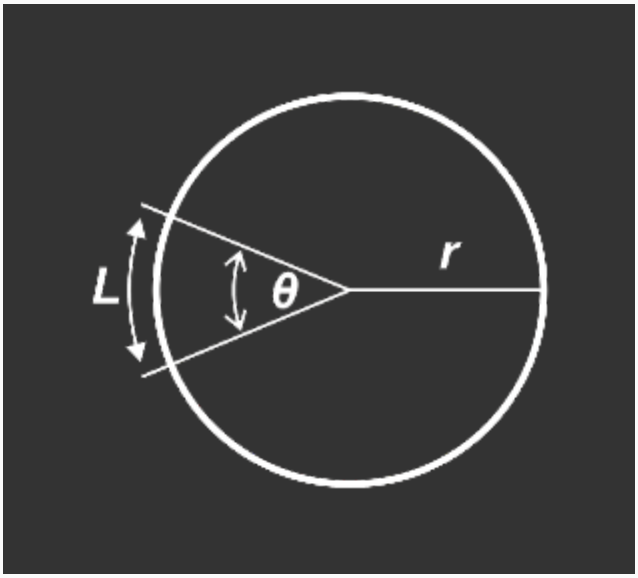


$P = (a + b) \times 2$

$P = 2a + 2b$

$A = bh = ab \sin \alpha$

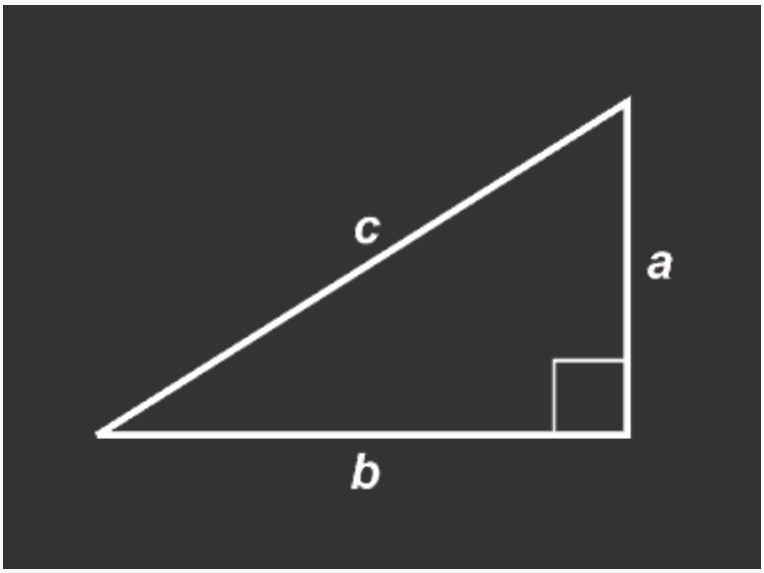
Circular Sector



$L = \pi r = \theta / 180^{0}$

$A = \pi r^{2} \theta/360^{0}$

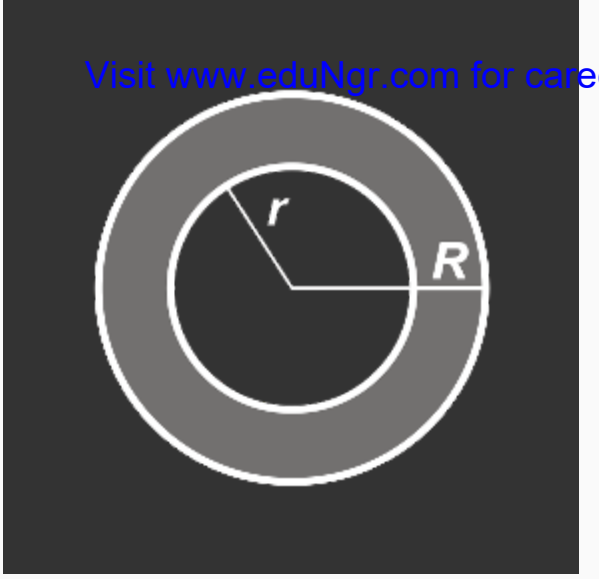
Pythagorean Theorem :



$$a^2 + b^2 = c^2$$

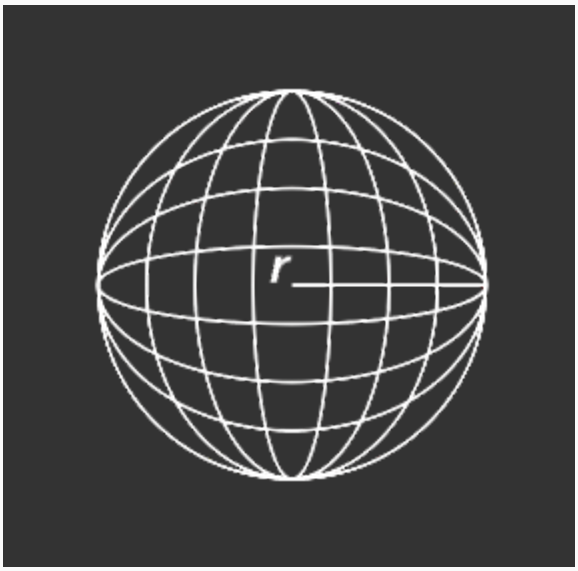
$$c = \sqrt{a^2} + \sqrt{b^2}$$

Circular Ring



$$A = \pi (R^2 - r^2)$$

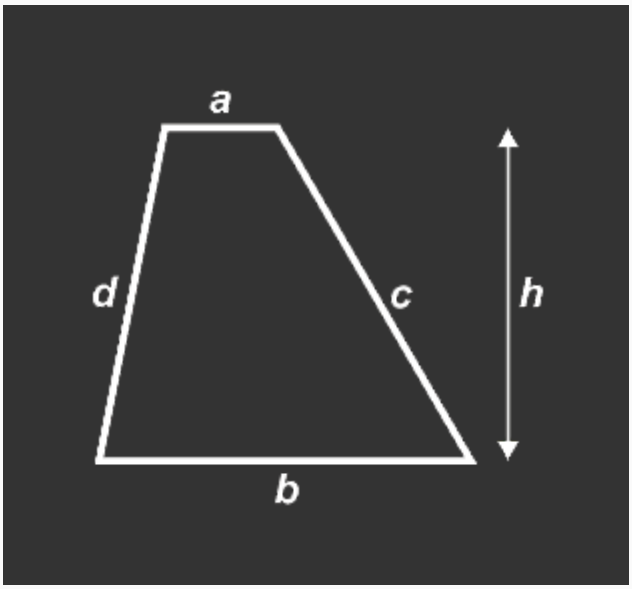
Sphere



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

$V = 4\pi r^2 / 3$

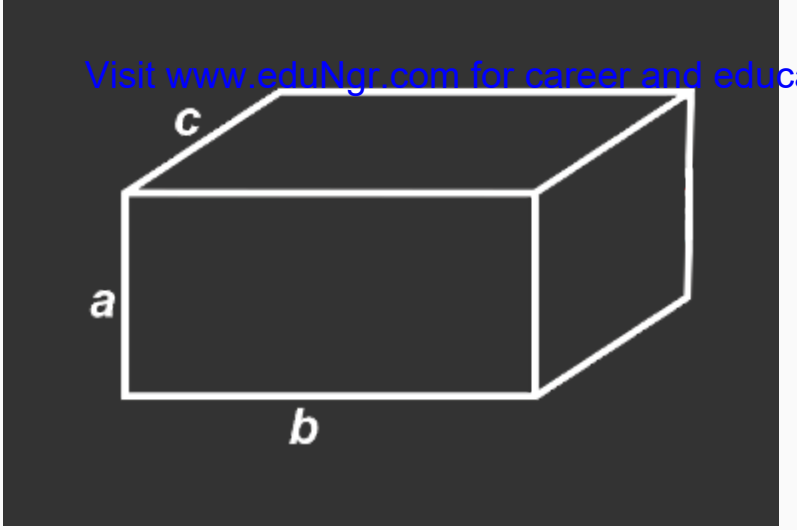
Trapezoid



$P = a + b + c + d$

$A = h \times a + b / 2$

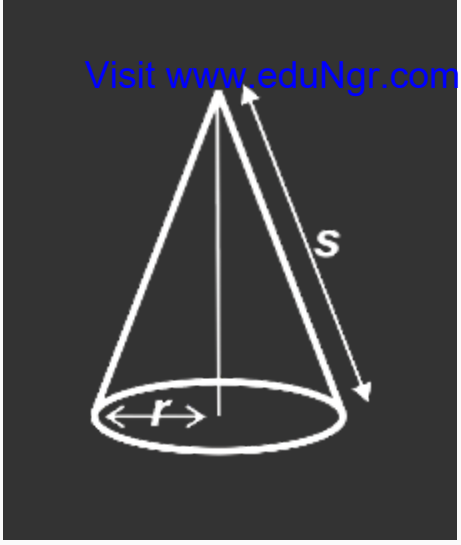
Rectangular Box



$$A = 2ab + 2ac + 2bc$$

$$V = abc$$

Right Circular Cone :

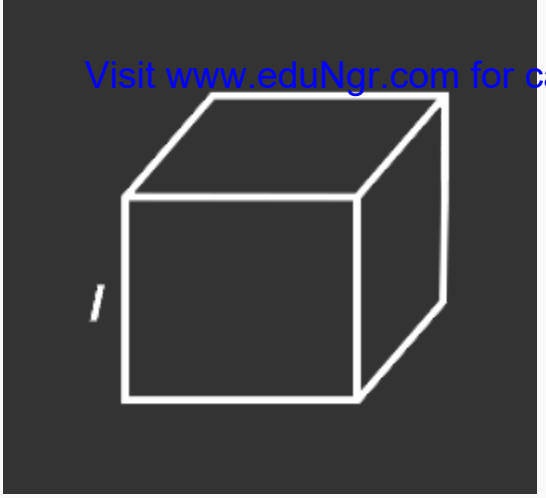


$$A = \pi r^2 + \pi rs$$

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

$$V = 1 \times \pi r^2 h / 3$$

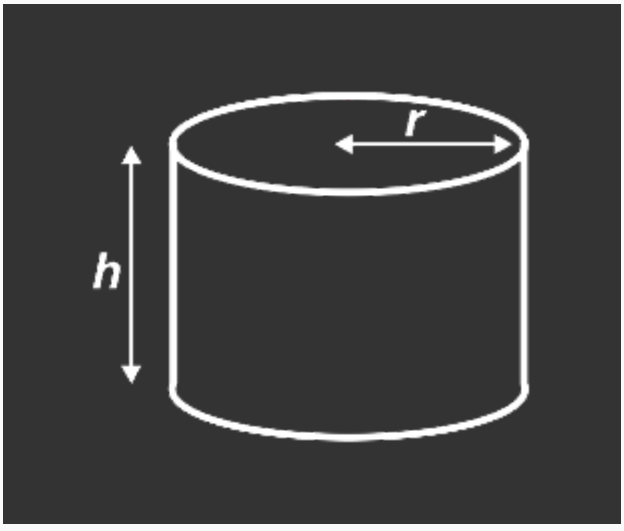
Cube



$$A = 6l^2$$

$$V = l^3$$

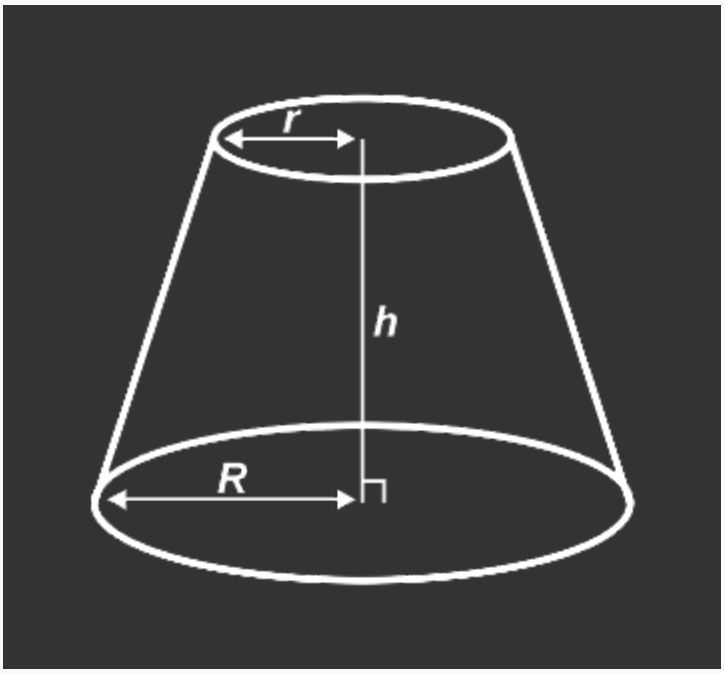
Cylinder



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

$V = \pi r^2 h$

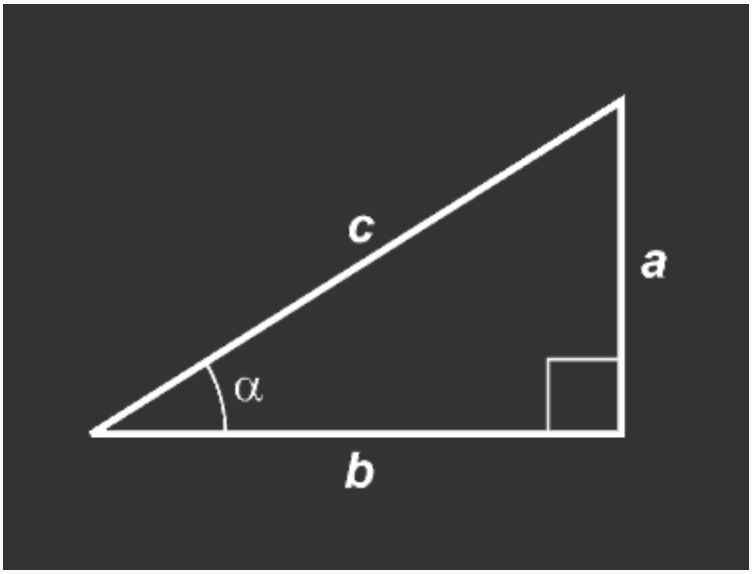
Frustum of a Cone



$$V = 1 \times \pi h (r^2 + rR + R^2) / 3$$

Trigonometry Formula

Trigonometry Function Formulas of a Right Triangle :



$\sin \alpha = a / c =$ opposite / hypotenuse

$\cos \alpha = b / c =$ adjacent / hypotenuse

$\tan \alpha = a / b =$ opposite / adjacent

$\cot \alpha = b / a =$ adjacent / opposite

$\sec \alpha = c / b$ $\text{Cosec } \alpha = c / a$

Basic Formula :

$\sin^2 \alpha + \cos^2 \alpha = 1$

$\tan \alpha \, . \, \cot \tan \alpha = 1$

$\tan \alpha = \sin \alpha / \cos \alpha = 1 / \cot \tan \alpha$

$\cot \tan \alpha = \cos \alpha / \sin \alpha = 1 / \tan \alpha$

$1 + \tan^2 \alpha = 1 / \cos^2 \alpha = \sec^2 \alpha$

$1 + \cot \tan^2 \alpha = 1 / \sin^2 \alpha = \cos \sec^2 \alpha$

Trigonometric Table

α	0^0	30^0	45^0	60^0	90^0	120^0	180^0	270^0	360^0
sin α	0	1/2	√2/2	√3/2	1	√3/2	0	-1	0
cos α	1	√3/2	√2/2	1/2	0	-1/2	-1	0	1
tan α	0	1/√3	1	√3	∞	-√3	0	∞	0
cot α	∞	√3	1	1/√3	0	-1/√3	∞	0	∞
sec α	1	2/√3	√2	2	∞	-2	-1	∞	1
cosec α	∞	2	√2	2/√3	1	2/√3	∞	-1	∞

Co-Ratios

	sin	**cos**	**tan**	**cot**
-α	-sin α	+cos α	-tan α	-cot α
$90^0 - \alpha$	+cos α	+sin α	+cot α	+tan α
$90^0 + \alpha$	+cos α	-sin α	-cot α	-tan α
$180^0 - \alpha$	+sin α	-cos α	-tan α	-cot α
$180^0 + \alpha$	-sin α	-cos α	+tan α	+cot α
$270^0 - \alpha$	-cos α	-sin α	+cot α	+tan α
$270^0 + \alpha$	-cos α	+sin α	-cot α	-tan α
$360^0k - \alpha$	-sin α	+cos α	-tan α	-cot α
$360^0k - \alpha$	+sin α	+cos α	+tan α	+cot α

Trigonometry Addition Formula:

- $\sin(A + B) = \sin A \cos B + \cos A \sin B$
- $\sin(A - B) = \sin A \cos B - \cos A \sin B$

- $\cos(A + B) = \cos A \cos B - \sin A \sin B$
- $\cos(A - B) = \cos A \cos B + \sin A \sin B$

- $\tan (A + B) = \tan A + \tan B / 1 - \tan A \tan B$
- $\tan(A - B) = \tan A - \tan B / 1 + \tan A \tan B$

- $\cot(A+B) = \cot A \cot B - 1 / \cot A + \cot B$

Product of Trigonometric Functions:

- $\sin \alpha \cos \beta = 1/2 [\sin (\alpha + \beta) + \sin(\alpha - \beta)]$
- $\cos \alpha \cos \beta = 1/2 [\sin (\alpha + \beta) + \sin(\alpha - \beta)]$
- $\cos \alpha \cos \beta = 1/2 [\cos (\alpha + \beta) + \cos(\alpha - \beta)]$
- $\sin \alpha \sin \beta = 1/2 [\cos (\alpha - \beta) + \cos(\alpha + \beta)]$

- $\tan \alpha \tan \beta = \tan \alpha + \tan \beta / \cot \tan \alpha + \cot \tan \beta = - \tan \alpha - \tan \beta / \cot \tan \alpha - \cot \tan \beta$

Trigonometric Formula with $t = \tan(x/2)$

$\sin x = 2t / 1 + t^2$

$\cos x = 1 - t^2 / 1 + t^2$

$\tan x = 2t / 1 - t^2$

$\cot x = 1 - t^2 / 2t$

Trigonometric Relation Between Functions:

	sinα	cosα	tanα	cotα
$\sin\alpha =$		$\pm\sqrt{1-\cos^2\alpha}$	$\pm\frac{\tan\alpha}{\sqrt{1+\tan^2\alpha}}$	$\pm\frac{1}{\sqrt{1+\cot\tan^2\alpha}}$
$\cos\alpha =$	$\pm\sqrt{1-\sin^2\alpha}$		$\pm\frac{1}{\sqrt{1+\tan^2\alpha}}$	$\pm\frac{\cot\tan\alpha}{\sqrt{1+\cot\tan^2\alpha}}$
$\tan\alpha =$	$\pm\frac{\sin\alpha}{\sqrt{1-\sin^2\alpha}}$	$\pm\frac{\sqrt{1-\cos^2\alpha}}{\cos\alpha}$		$\frac{1}{\cot\tan\alpha}$
$\cot\alpha =$	$\pm\frac{\sqrt{1-\sin^2\alpha}}{\sin\alpha}$	$\pm\frac{\cos\alpha}{\sqrt{1-\cos^2\alpha}}$	$\frac{1}{\tan\alpha}$	

Angle of a Plane Triangle :

- A, B, C are 3 angles of a triangle
- $\sin A + \sin B + \sin c = 4 \cos(A / 2) \cos(B/2) \cos(C/2)$
- $\cos A + \cos B + \cos C = 4 \sin(A/2) \sin(B/2) \sin(C/2) + 1$
- $\sin A + \sin B - \sin C = 4 \sin (A/2) \sin (B/2) \cos (C/2)$

Sources

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