

## Basic Math Functions

### Percentage

#### Formula

$$\text{Percentage (\%)} = \frac{\text{Obtained Value}}{\text{Maximum Value}} \times 100$$



### X Percentage of Y

#### Formula

$$X\% \text{ of } Y = \frac{X}{100} \times Y$$



### Percentage Difference

#### Formula

$$\% \text{ Difference} = \frac{\text{New Value} - \text{Initial Value}}{\left( \frac{\text{New Value} - \text{Initial Value}}{2} \right)} \times 100$$



### Percentage Error

## Formula

$$\% \text{ Error} = \frac{\text{Practical Value} - \text{Theoretical Value}}{\text{Theoretical Value}} \times 100$$

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## Percentage Change

### Formula

$$\% \text{ Change} = \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \times 100$$

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## Factorial

### Formula

$$n! = 1 \times 2 \times 3 \times \dots \times n$$

$n!$  → Factorial of a number

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## Fraction Simplification

## Formula

### Fraction Simplification

GCD Method

$$\text{Reduce}\left(\frac{A}{B}\right) = \left(\frac{\left(\frac{A}{\text{GCD of A \& B}}\right)}{\left(\frac{B}{\text{GCD of A \& B}}\right)}\right)$$

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## Average

### Formula

$$\text{Average} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\sum_{i=1}^n x_i \longrightarrow x_1 + x_2 + x_3 + x_4 + \dots + x_n$$

$$n \longrightarrow \text{total number of terms}$$

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## Sum of First n Numbers

## Formula

### Natural Numbers Sum & Average

$$1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$$

$$\text{Average} = \frac{(n+1)}{2}$$

$n \longrightarrow$  total number of terms

## Sum of First n Odd Numbers

### Formula

### Odd Numbers Sum & Average

$$1 + 3 + 5 + 7 + \dots + n = n^2$$

$$\text{Average} = n$$

$n \longrightarrow$  total number of terms

## Sum of First n Even Numbers

## Formula

### Even Numbers Sum & Average

$$2 + 4 + 6 + 8 \dots + n = n(n + 1)$$

$$\text{Average} = (n + 1)$$

$n \longrightarrow$  total number of terms

## Sum of Square Numbers Series

### Formula

### Square Numbers Sum & Average

$$1^2 + 2^2 + 3^2 + 4^2 \dots + n^2 = \frac{n(n + 1)(2n + 1)}{6}$$

$$\text{Average} = \frac{(n + 1)(2n + 1)}{6}$$

$n \longrightarrow$  total number of terms

## Sum of Cube Numbers Series

## Formula

### Cube Numbers Sum & Average

$$1^3 + 2^3 + 3^3 + 4^3 \dots + n^3 = \frac{n^2(n+1)^2}{4}$$

$$\text{Average} = \frac{n(n+1)^2}{4}$$

$n$   $\longrightarrow$  total number of terms

## AP - Arithmetic Progression

### Formula

$$T_n = a + (n - 1)d$$

$$\text{Sum} = \frac{n}{2} (a + T_n)$$

$T_n$   $\longrightarrow$   $n^{\text{th}}$  term of the Arithmetic Progression

$a$   $\longrightarrow$  first term of AP series or number sequence

$d$   $\longrightarrow$  difference between first & second terms

$n$   $\longrightarrow$  total count of terms

Sum  $\longrightarrow$  sum of Arithmetic Progression

## GP - Geometric Progression

## Formula

$$T_n = a r^{n-1}$$

$$\text{Sum} = \frac{a (r^n - 1)}{r - 1}$$

$T_n$   $\longrightarrow$   $n^{\text{th}}$  Term

$r$   $\longrightarrow$  Common ratio

$n$   $\longrightarrow$  Number of Terms

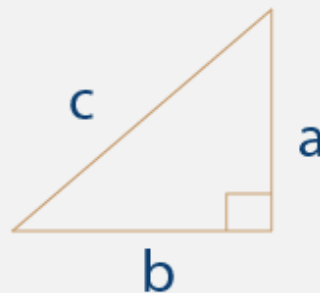
Sum  $\longrightarrow$  Sum of all Geometric Progression

## Pythagorean Theorem

### Formula

Pythagoras Theorem:

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



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

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

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

## Complex Numbers Arithmetic

### Formula

#### Complex Number Arithmetic:

$$(a + bi) + (c + di) = (a + c) + (b + d)i$$

$$(a + bi) - (c + di) = (a - c) + (b - d)i$$

$$(a + bi) \times (c + di) = (ac - bd) + (ad + bc)i$$

$$\frac{a + bi}{c + di} = \frac{ac + bd}{c^2 + d^2} + \frac{bc - ad}{c^2 + d^2} \cdot i$$

## Quadratic Equation

### Formula

#### Quadratic Equation:

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$