



## **Average - Important Formulas**

### **Basic Averages Formulas:**

- Mathematically, it is defined as the ratio of summation of all the numbers to the number of units present in the list.

$$\text{Average} = \left( \frac{x_1 + x_2 + x_3 + x_4 + \dots + x_n}{n} \right)$$

OR

$$\text{Average} = \left( \frac{\text{Sum of Numbers}}{\text{Number of Units}} \right)$$

### **Average Speed and Velocity Formula:**

- Average Speed:** It can be defined as total distance travelled by a body in definite interval of time. Average speed is calculated using the below formula

$$\text{Average Speed} = \text{Total Distance} / \text{Total Time}$$

**CASE 1 :** When one travels at speed 'a' for half the time and speed 'b' for other half of the time. Then, average speed is the arithmetic mean of the two speeds.

$$\text{Average Speed} = \left( \frac{a + b}{2} \right)$$

**CASE 2 :** When one travels at speed 'a' for half of the distance and speed 'b' for other half of the distance. Then, average speed is the harmonic mean of the two speeds.

$$\text{Average Speed} = \left( \frac{2ab}{a+b} \right)$$

**CASE 3:** When one travels at speed a for one-third of the distance, at speed b for another one-third of the distance and speed c for rest of the one-third of the distance

$$\text{Average Speed} = \left( \frac{3abc}{ab+bc+ca} \right)$$

- **Average Velocity :** It can be defined as total displacement divided by total time.

We calculate Average Velocity using the below formula :

$$\text{Average Velocity} = \left( \frac{\text{Displacement}}{\text{Total Time}} \right)$$

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### **Formula of Averages Related to Numbers:**

- **Average of 'n' consecutive Natural Numbers**

$$\left( \frac{n+1}{2} \right)$$

- **Average of the square of consecutive n natural numbers**

$$\left( \frac{(n+1)(2n+1)}{6} \right)$$

- **Average of cubes of consecutive n natural numbers**

$$\left( \frac{n(n+1)^2}{4} \right)$$

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- **Average of n consecutive even numbers =  $(n+1)$**
- **Average of consecutive even numbers till n**

$$\left( \frac{n}{2} + 1 \right)$$

- **Average of n consecutive odd numbers = n**
- **Average of consecutive odd numbers till n**

$$\left( \frac{n+1}{2} \right)$$

- **Sum of 1st n even consecutive natural numbers is  $n(n+1)$**
- **Sum of 1st n odd consecutive natural numbers is  $n^2$**