Average

Average $= \frac{Sum\ of\ magnitude\ of\ all\ Quantities}{Number\ of\ Quantities}$

Average of n numbers $= \frac{X1+X2+X3+X4+X5,.....Xn}{n}$

Important Properties (महत्वपूर्ण गुण)

- **In a set of numbers, average** always lies above the **lowest number** of the set and below the **highest number** of the set.
- If all the number of a given set are equal, then the average will also be the same as the equal number.
- If zero is one of the numbers in a given set, then zero should also be included while calculating the average.
- If each quantity of the set is increased by a certain value 'a' then average of the set will also be increased by 'a'

Some Important Results:

1. For Consecutive Natural Numbers

- Average of first n natural numbers: $\frac{n+1}{2}$
- Average of squares of first n natural numbers: $\frac{(n+1)(2n+1)}{6}$
- Average of cubes of first n natural numbers: $\frac{[n(n+1)^2]}{4}$

2. For Consecutive Even Numbers

- Average of first n even numbers: n+1
- Average of squares of first n even numbers: $\frac{2(n+1)(2n+1)}{3}$
- Average of cubes of first n even numbers: $2n(n+1)^2$

3. For Consecutive Odd Numbers:

- Average of first n odd numbers: n
- Average of squares of first n odd numbers: $\frac{(2n+1)(2n-1)}{3}$
- Average of cubes of first n odd numbers: $n(2n^2-1)$

Average Speed:

- If a person travels from P to Q at a speed of x km/h and returns from Q to P at a speed of y km/h, the average speed for the entire journey is:

$$\text{Average speed} = \frac{2xy}{x+y}$$

Or

Average speed = Total distance / Total time taken

- If a distance is traveled with three different speeds: a km/h, b km/h, and c km/h, the average speed for the total journey is:

$$\text{Average speed} = \frac{3abc}{ab+bc+ca}$$

When Data is Misread:

- If the average of n numbers is m, but later it was found that a number 'a' was misread as 'b', the correct average will be:

$$Correct\ Average = m + \frac{a-b}{n}$$

- If the average of n numbers is m, but later it was found that two numbers 'a' and 'b' were misread as 'p' and 'q', the correct average will be:

$$Correct\ Average\ =\ m\ +\frac{[(a\ +\ b)-\ (p\ +\ q)]}{n}$$

Concept of Age:

- If in the group of N persons, a new person replaces a person of age T years, so that the average age increases by t years:

The age of the new person is: T + N * t

- If the average age decreases by t years after the entry of a new person:

The age of the new person is: T - N * t

- If the average age of a group of N students is T years, and n students join, causing the average age of the group to increase by t years, then:

The average age of the new students is: $T\ +\ [\left(\frac{N}{n}\right)\ +\ 1]\ *t$

Important Concept

- If in any series having common difference "d" and Average "k", "x" numbers are added in forward or backward, then

  New Avg. = k ± $(\frac{xd}{2})$
- In series of even or odd having Avg. "k", when we add "x" no. in forward or backward, Then

  New Avg. = k ± x
- In series of natural no. having Avg. "k", when we add "x" no. in forward or backward, Then

  New Avg. = k ± $(\frac{x}{2})$
- If the average of n_1 observations is a_1, the average of n_2 observations is a_2 and so on, then:

  Average of all the observations = $\frac{n^1a^1+n^2a^2+\ldots}{n^1+n^2+\ldots}$.
- If the average of n observations is a but the average becomes b when one observation is eliminated, then value of eliminated observation = n(a − b) + b.
- If the average of n observations is a but the average becomes b when a new observation is added, then value of added observation = n(b − a) + b.
- If the average of n students in a class is a, where average of passed students is x and average of failed students is y, then:

  Number of students passed = $\frac{n(a-y)}{x-y}$.
- Bowling Average = $\frac{Total\ runs\ given}{Total\ wickets\ taken}$
- Batting Average = $\frac{Total\ runs\ scored}{Total\ number\ of\ innings\ played}$
- Total runs = Bowling average × Wickets

Or

Total average = $\frac{Bowling\ Average\ (1)\times Wicket\ (1)+\ Bowling\ Average\ (2)\times Wicket\ (2)}{Wicket\ (1)+\ Wicket\ (2)}$