AVERAGE FORMULAS AND EXAMPLES

1) Basic Average Formula

Formula:

Average = Sum of quantities / Number of quantities

Example:

The marks of five students are 20, 25, 30, 35, 40. Find the average.

Average = (20 + 25 + 30 + 35 + 40) / 5 = 150 / 5 = 30

Derived Formulas:

Sum of quantities = Average × Number of quantities

Example: If the average is 30 and there are 5 students:

Sum of quantities = 30 × 5 = 150

Number of quantities = Sum of quantities / Average

Example: If the sum is 150 and the average is 30:

Number of quantities = 150 / 30 = 5

2) Combined Average of Two Groups

Formula:

Combined Average = (n1 × X + n2 × Y) / (n1 + n2)

Example:

Group 1 has 4 students with an average of 50, and Group 2 has 6 students with an average of 70. Find the combined average.

Combined Average = (4 × 50 + 6 × 70) / (4 + 6) = (200 + 420) / 10 = 620 / 10 = 62

3) Average of Remaining Quantities

Formula:

Average of Remaining Quantities = (n1 × X - n2 × Y) / (n1 - n2)

Example:

A group of 10 students has an average of 60. Out of these, 4 students have an average of 50. Find the average of the remaining students.

Average of Remaining Quantities = (10 × 60 - 4 × 50) / (10 - 4) = (600 - 200) / 6 = 400 / 6 = 66.67

4) Replacement of a Quantity

Formula:

Q = P + n × (Y - X)

Example:

The average of 5 quantities is 30. One quantity of value 25 is replaced with a new quantity Q, and the new average becomes 32. Find Q.

Q = 25 + 5 × (32 - 30) = 25 + 5 × 2 = 25 + 10 = 35

5) Removal or Addition of a Quantity

(a) Removed Quantity:

Formula:

Removed Quantity = n × (X - Y) + Y

Example:

The average of 6 numbers is 40. After removing one number, the new average is 38. Find the removed number.

Removed Quantity = 6 × (40 - 38) + 38 = 6 × 2 + 38 = 12 + 38 = 50

(b) Added Quantity:

Formula:

New Quantity = n × (Y - X) + Y

Example:

The average of 6 numbers is 40. After adding one number, the new average is 42. Find the added number.

New Quantity = 6 × (42 - 40) + 42 = 6 × 2 + 42 = 12 + 42 = 54

6) Averages of Special Numbers

(a) Natural Numbers:

Average of first n natural numbers = (n + 1) / 2

Example:

Find the average of the first 10 natural numbers.

Average = (10 + 1) / 2 = 11 / 2 = 5.5

(b) Squares of Natural Numbers:

Average of squares of first n natural numbers = [n(n + 1)(2n + 1)] / (6n)

Example:

Find the average of squares of the first 3 natural numbers.

Average = [3(3 + 1)(2 × 3 + 1)] / (6 × 3) = (3 × 4 × 7) / 18 = 84 / 18 = 4.67

(c) Even Numbers:

Average of first n even numbers = n + 1

Example:

Find the average of the first 5 even numbers.

Average = 5 + 1 = 6

7) Multiplication of Average

Formula:

New Average = Initial Average × Y

Example:

The average of 4 numbers is 5. Each number is multiplied by 3. Find the new average.

New Average = 5 × 3 = 15

8) Age of a New Person in a Group

Formula:

Age of New Person = New Average + (Number of People Initially × Increase in Average)

Example:

The average age of 5 boys is 12. A new boy joins, increasing the average to 13. Find the age of the new boy.

Age of New Boy = 13 + 5 × (13 - 12) = 13 + 5 × 1 = 13 + 5 = 18

9) Passed and Failed Candidates

Passed Candidates:

Formula:

Number of Passed Candidates = (Total Average - Average of Failed Students) / Difference Between Passed and Failed Averages

Example:

The average marks of 50 students are 40. The average marks of 30 passed students are 50, and the average marks of failed students are 20. Find the number of failed students.

Number of Failed Students = 50 - 30 = 20