

SHORT CUT TRICKS & TIPS ON AVERAGE

Introduction

$$\text{Average} = \left(\frac{\text{Sum of observations}}{\text{Numbers of observations}} \right).$$

An average, or more accurately an arithmetic mean is, in general terms, the sum of n different data divided by n.

For example, if a batsman scores 35, 45 and 37 runs in first, second and third innings respectively, then his

Average runs in 3 innings is equal to $\frac{35 + 45 + 37}{3} = 39$ runs.

Therefore, the two mostly used formulas in this chapter are:

$$\text{Average} = \frac{\text{Total of data}}{\text{No. of data}}$$

and,

$$\text{Total} = \text{Average} \times \text{No. of data}$$

Remember:

- If the value of each item in a group is increased/decreased by the same value x, then the average of the group also increases/decreases by x. For instance, if the income of each person in a group increases by 15, the average income of the group also increases by Rs. 15.

This is valid only when the value of each item increases/decreases by the same amount.

- If the average age of group of people is x years, then their average age after n years will be (x + n) and their average age n years ago would have been (x - n) years.

This is because with each passing year, each person's age increases by 1 and vice versa.

- If the value of each item in a group is multiplied/divided by the same

value x (where $x \neq 0$ in the case of division), then the average of the group also gets multiplied/divided by x .

- The average of a group always lies between the smallest value and the longest value in that group.

Ex. 2: The average weight of 4 men is increased by 3 kg when one of them who weighs 120 kg is replaced by another man. What is the weight of the new man?

Sol. : If the average is increased by 3kg, then the sum of weights increases by $3 \times 4 = 12$ kg. And this increase in weight is due to the extra weight included due to the inclusion of new person.

\therefore Weight of new man = $120 + 12 = 132$ kg

Ex. 3 : The average of marks obtained by 120 candidates in a certain examination is 35. If the average marks of passed candidates is 39 and that of the failed candidates is 15, what is the number of candidates who passed the examination?

Sol. : Let the number of passed candidates be x .

Then total marks = $120 \times 35 = 39x + (120 - x) \times 15$

or $4200 = 39x + 1800 - 15x$

or $24x = 2400$

$\therefore x = 100$

\therefore number of passed candidates = 100.

Ex. 4 : The average of 11 results is 50. If the average of first six results is 49 and that of last six is 52, find the sixth result.

Sol. : The total of 11 results = $11 \times 50 = 550$

The total of first 6 results = $6 \times 49 = 294$

The total of last 6 results = $6 \times 52 = 312$

The 6th result is common on both;

$$\therefore \text{Sixth result} = 294 + 312 - 500 = 56$$

Ex. 5 : The average age of 8 persons in a committee is increased by 2 years when two men aged 35 years and 45 years are substituted by two women. Find the average age of these two women.

Sol. : By the use of average formula,
the total age of two women = $2 \times 8 + (35 + 45)$
 $= 16 + 80 = 96$ years.

$$\therefore \text{average age of two women} = (96 / 2) = 48 \text{ years.}$$

$$\therefore \text{average age of two women} = 48 \text{ years.}$$

Ex. 6 : The average age of a family of 6 members is 22 years. If the age of the youngest member be 7 years, then what was the average age of the family at the birth of the youngest member?

Sol. : Total ages of all members = $6 \times 22 = 132$ years.
7 years ago, total sum of ages = $132 - (6 \times 7) = 90$ years.
But at that time there were 5 members in the family.

$$\therefore \text{Average at that time} = 90 \div 5 = 18 \text{ years.}$$

Ex. 7: A man bought 13 shirts of Rs. 50 each, 15 pants of Rs. 60 each and 12 pairs of shoes at Rs. 65 a pair. Find the average value of each article.

Sol. : By the use of average formula,

$$\text{Average} = \frac{13 \times 50 + 15 \times 60 + 12 \times 65}{13 + 15 + 12} = \text{Rs. } 58.25$$

Ex. 8 : The average score of a cricketer in two matches is 27 and in three other matches is 32. Then find the average score in all the five matches.

Sol. : By the use of average formula,

$$\text{Average in 5 matches} = \frac{2 \times 27 + 3 \times 32}{2 + 3} = \frac{54 + 96}{5} = 30.$$

Ex. 9 : The average of 11 results is 30, that of the first five is 25 and that of the last five is 28. Find the value of the 6th number.

Sol. : By the use of average formula,

$$\begin{aligned} \text{6th number} &= \text{Total of 11 results} - (\text{Total of first five results} + \text{Total of last five results}) \\ &= 11 \times 30 - (5 \times 25 + 5 \times 28) \\ &= 330 - 265 = 65 \end{aligned}$$

Note : Ex 4 and Ex 9 are different. In Ex 4 the 6th result is common to both the groups but in Ex 9 the 6th results is excluded in both the results.

Ex. 10: In a class, there are 20 boys whose average age is decreased by 2 months, when one boy aged 18 years is replaced by a new boy. Find the age of the new boy.

Sol.: This example is similar to Ex. 2. The only difference is that in Ex 2 the average increases after replacement whereas in this case the average decreases. Thus you can see the difference in average formula.

By the use of average formula,

$$\text{Age of new person} = \text{Age of removed person} - \text{No. of persons} \times \text{Decrease in average.age}$$

$$= 18 - 20 \times \frac{2}{12}$$

$$= 18 - \frac{10}{3} = \frac{44}{3} = 14\frac{2}{3} \text{ yrs} = 14 \text{ yrs } 8 \text{ months.}$$

Ex. 11: A batsman in his 17th innings makes a score of 85, and thereby increases his average by 3. What is this average after 17 innings?

Sol. : Let the average after 16th innings be x , then

$$16x + 85 = 17(x + 3) = \text{Total score after 17th innings.}$$

$$\therefore x = 85 - 51 = 34$$

$$\therefore \text{average after 17 innings} = x + 3 = 34 + 3 = 37.$$

Ex. 12: A cricketer has completed 10 innings and his average is 21.5 runs. How many runs must he make in his next innings so as to raise his average to 24?

Sol. : Total of 10 innings = $21.5 \times 10 = 215$

Suppose he needs a score of x in 11th innings; then

$$\text{average in 11 innings} = \frac{215 + x}{11} = 24$$

$$\text{or, } x = 264 - 215 = 49$$

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