

RD SHARMA

Solutions

Class 9 Maths

Chapter 24

Ex 24.1

Q.1: If the heights of 5 persons are 140 cm, 150 cm, 152 cm, 158 cm and 161 cm respectively. Find the mean height.

SOLUTION :

Given : the heights of 5 persons are 140 cm , 150 cm , 152 cm , 158 cm and 161 cm

$$\therefore \text{Mean Weight} = \frac{\text{sum of heights}}{\text{total no. of persons}}$$

$$= \frac{140+150+152+158+161}{5}$$

$$= \frac{761}{5} = 152.2$$

Q 2 . Find the mean of 994 , 996 , 998 , 1000 , 1002.

SOLUTION :

Given :

Numbers are 994 , 996 , 998 , 1000 , 1002.

$$\therefore \text{Mean} = \frac{\text{sum of numbers}}{\text{total numbers}}$$

$$= \frac{994+996+998+1000+1002}{5}$$

$$= \frac{4990}{5} = 998$$

Mean = 998

Q 3 . Find the mean of first five natural numbers.

SOLUTION :

The first five odd numbers are 1 , 2 , 3 , 4 , 5.

$$\therefore \text{Mean} = \frac{\text{sum of numbers}}{\text{total numbers}}$$

$$= \frac{1+2+3+4+5}{5}$$

$$= \frac{15}{5} = 3$$

Mean = 3

Q 4 . Find the mean of all factors of 10.

SOLUTION :

All factors of 6 are 1 , 2 , 5 , 10.

$$\therefore \text{Mean} = \frac{\text{sum of factors}}{\text{total factors}}$$

$$= \frac{1+2+5+10}{4} = 4.5$$

Mean = 4.5

Q 5 . Find the mean of first ten even natural numbers.

SOLUTION :

The first five even natural numbers are 2 , 4 , 6 , 8 , 10 , 12 , 14 , 16 , 18 , 20

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{2+4+6+8+10+12+14+16+18+20}{10} = 11\end{aligned}$$

Mean = 11

Q 6 . Find the mean of x , $x + 2$, $x + 4$, $x + 6$, $x + 8$.

SOLUTION :

Numbers are x , $x + 2$, $x + 4$, $x + 6$, $x + 8$.

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{x+x+2+x+4+x+6+x+8}{5} \\ &= \frac{5x+20}{5} \\ &= 5 \left(\frac{x+4}{5} \right) \\ &= x + 4\end{aligned}$$

Q 7 . Find the mean of first five multiples of 3.

SOLUTION :

First five multiples of 3 are 3 , 6 , 9 , 12 , 15.

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{3+6+9+12+15}{5} \\ &= 9\end{aligned}$$

Mean = 9

Q 8 . Following are the weights of 10 new born babies in a hospital on a particular day : 3.4 , 3 .6 , 4.2 , 4.5 , 3.9 , 4.1 , 3.8 , 4.5 , 4.4 , 3.6 (in kg). Find the mean.

SOLUTION :

The weights (in kg) of 10 new born babies are : 3.4 , 3 .6 , 4.2 , 4.5 , 3.9 , 4.1 , 3.8 , 4.5 , 4.4 , 3.6

$$\begin{aligned}\therefore \text{Mean Weight} &= \frac{\text{sum of weights}}{\text{total no. of babies}} \\ &= \frac{3.4+3.6+4.2+4.5+3.9+4.1+3.8+4.5+4.4+3.6}{10} \\ &= 4 \text{ kg}\end{aligned}$$

Q 9 . The percentage marks obtained by students of a class in mathematics are as follows: 64 , 36 , 47 , 23 , 0 , 19 , 81 , 93 , 72 , 35 , 3 , 1 .Find their mean.

SOLUTION :

The percentage marks obtained by students are 64 , 36 , 47 , 23 , 0 , 19 , 81 , 93 , 72 , 35 , 3 , 1

$$\begin{aligned} \therefore \text{Mean marks} &= \frac{\text{sum of marks}}{\text{total numbers of marks}} \\ &= \frac{64+36+47+23+0+19+81+93+72+35+3+1}{5} = 39.5 \end{aligned}$$

Mean Marks = 39.5

Q 10. The numbers of children in 10 families of a locality are 2, 4, 3, 4, 2, 3, 5, 1, 1, 5. Find the number of children per family.

SOLUTION :

The numbers of children in 10 families are : 2, 4, 3, 4, 2, 3, 5, 1, 1, 5

$$\begin{aligned} \therefore \text{Mean} &= \frac{\text{total no. children}}{\text{total families}} \\ &= \frac{2+4+3+4+2+3+5+1+1+5}{10} = 3 \end{aligned}$$

Q 11 . If M is the mean of x_1, x_2, x_3, x_4, x_5 and x_6 , Prove that

$$(x_1 - M) + (x_2 - M) + (x_3 - M) + (x_4 - M) + (x_5 - M) + (x_6 - M) = 0.$$

SOLUTION :

Let M be the mean of x_1, x_2, x_3, x_4, x_5 and x_6

$$\text{Then } M = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6}{6}$$

$$= x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 6M$$

$$\text{To Prove :- } (x_1 - M) + (x_2 - M) + (x_3 - M) + (x_4 - M) + (x_5 - M) + (x_6 - M) = 0.$$

Proof :- L . H . S

$$= (x_1 - M) + (x_2 - M) + (x_3 - M) + (x_4 - M) + (x_5 - M) + (x_6 - M)$$

$$= (x_1 + x_2 + x_3 + x_4 + x_5 + x_6) - (M + M + M + M + M + M)$$

$$= 6M - 6M$$

$$= 0$$

$$= R . H . S$$

Q 12 . Duration of sunshine(in hours) in Amritsar for first 10 days of August 1997 as reported by the Meteorological Department are given as follows : 9.6 , 5.2 , 3.5 , 1.5 , 1.6 , 2.4 , 2.6 , 8.4 , 10.3 , 10.9

1. Find the mean \bar{X}

2. Verify that $\sum_{i=1}^{10} (x_i - \bar{X}) = 0$

SOLUTION :

Duration of sunshine (in hours) for 10 days are =9.6 , 5.2 , 3.5 , 1.5 , 1.6 , 2.4 , 2.6 , 8.4 , 10.3 , 10.9

$$\text{(i) Mean } \bar{X} = \frac{\text{sum of numbers}}{\text{total numbers}}$$

$$= \frac{9.6+5.2+3.5+1.5+1.6+2.4+2.6+8.4+10.3+10.9}{10}$$

$$= \frac{56}{10} = 5.6$$

$$\begin{aligned}
\text{(ii) L.H.S} &= \sum_{i=1}^{10} (x_i - \bar{X}) \\
&= (x_1 - \bar{x}) + (x_2 - \bar{x}) + (x_3 - \bar{x}) + \dots + (x_{10} - \bar{x}) \\
&= \\
&= (9.6 - 5.6) + (5.2 - 5.6) + (3.5 - 5.6) + (1.5 - 5.6) + (1.6 - 5.6) + (2.4 - 5.6) + (2.6 - 5.6) \\
&+ (8.4 - 5.6) + (10.3 - 5.6) + (10.9 - 5.6) \\
&= 4 - 0.4 - 2.1 - 4.1 - 4 - 3.2 - 3 + 2.8 + 4.7 + 5.3 \\
&= 16.8 - 16.8 = 0 \\
&= \text{R.H.S}
\end{aligned}$$

Q 13. Explain, by taking a suitable example, how the arithmetic mean alters by (i) adding a constant k to each term, (ii) Subtracting a constant k from each term, (iii) multiplying each term by a constant k and (iv) dividing each term by non-zero constant k.

SOLUTION :

Let say numbers are 3 , 4 , 5

$$\begin{aligned}
\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\
&= \frac{3+4+5}{3} = 4
\end{aligned}$$

(i). Adding constant term k = 2 in each term.

New numbers are = 5 , 6 , 7

$$\begin{aligned}
\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\
&= \frac{5+6+7}{3} \\
&= 6 = 4 + 2
\end{aligned}$$

\therefore new mean will be 2 more than the original mean.

(ii). Subtracting constant term k = 2 in each term.

New numbers are = 1 , 2 , 3

$$\begin{aligned}
\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\
&= \frac{1+2+3}{3} \\
&= 2 = 4 - 2
\end{aligned}$$

\therefore new mean will be 2 less than the original mean.

(iii) . Multiplying by constant term k = 2 in each term.

New numbers are = 6 , 8 , 10

$$\begin{aligned}
\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\
&= \frac{6+8+10}{3} \\
&= 8 = 4 \times 2
\end{aligned}$$

∴ new mean will be 2 times of the original mean.

(iv) . Divide the constant term $k = 2$ in each term.

New numbers are = 1.5 , 2 , 2.5.

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{1.5+2+2.5}{3} \\ &= 2 = \frac{4}{2}\end{aligned}$$

∴ new mean will be half of the original mean.

Q 14. The mean of marks scored by 100 students was found to be 40. Later on, it was discovered that a score of 53 was misread as 83. Find the correct mean.

SOLUTION :

Mean marks of 100 students = 40

Sum of marks of 100 students = 100×40

= 4000

Correct value = 53

Incorrect value = 83

Correct sum = $4000 - 83 + 53 = 3970$

$$\therefore \text{correct mean} = \frac{3970}{100} = 39.7$$

Q 15 . The traffic police recorded the speed (in km/hr) of 10 motorists as 47 , 53 , 49 , 60 , 39 , 42 , 55 , 57 , 52 , 48 . Later on, an error in recording instrument was found. Find the correct average speed of the motorists if the instrument is recorded 5 km/hr less in each case.

SOLUTION :

The speed of 10 motorists are 47 , 53 , 49 , 60 , 39 , 42 , 55 , 57 , 52 , 48 .

Later on it was discovered that the instrument recorded 5 km/hr less than in each case

∴ correct values are = 52 , 58 , 54 , 65 , 44 , 47 , 60 , 62 , 57 , 53.

$$\begin{aligned}\therefore \text{correct mean} &= \frac{52+58+54+65+44+47+60+62+57+53}{10} \\ &= \frac{552}{10} = 55.2 \text{ km/hr}\end{aligned}$$

Q 16. The mean of five numbers is 27. If one number is excluded, their mean is 25. Find the excluded number.

SOLUTION :

The mean of five numbers is 27

The sum of five numbers = $5 \times 27 = 135$

If one number is excluded , the new mean is 25

∴ Sum of 4 numbers = $4 \times 25 = 100$

∴ Excluded number = $135 - 100 = 35$

Q 17. The mean weight per student in a group of 7 students is 55 kg. The individual weights of 6 of them (in kg) are 52, 54, 55, 53, 56 and 54. Find the weight of the seventh student.

SOLUTION :

The mean weight per student in a group of 7 students = 55 kg

Weight of 6 students (in kg) = 52, 54, 55, 53, 56 and 54

Let the weight of seventh student = x kg

$$\therefore \text{Mean Weight} = \frac{\text{sum of weights}}{\text{total no. of students}}$$

$$\Rightarrow 55 = \frac{52+54+55+53+56+54+x}{7}$$

$$\Rightarrow 385 = 324 + x$$

$$\Rightarrow x = 385 - 324$$

$$\Rightarrow x = 61 \text{ kg}$$

\therefore weight of seventh student = 61 kg.

Q 18. The mean weight of 8 numbers is 15. If each number is multiplied by 2, what will be the new mean?

SOLUTION :

We have ,

The mean weight of 8 numbers is 15

Then , the sum of 8 numbers = $8 \times 15 = 120$

If each number is multiplied by 2

Then , new mean = $120 \times 2 = 240$

$$\therefore \text{new mean} = \frac{240}{8} = 30.$$

Q 19. The mean of 5 numbers is 18. If one number is excluded, their mean is 16. Find the excluded number.

SOLUTION :

The mean of 5 numbers is 18

Then , the sum of 5 numbers = $5 \times 18 = 90$

If one number is excluded

Then , the mean of 4 numbers = 16

$$\therefore \text{sum of 4 numbers} = 4 \times 16 = 64$$

Excluded number = $90 - 64 = 26$.

Q 20. The mean of 200 items was 50. Later on, it was discovered that the two items were misread as 92 and 8 instead of 192 and 88. Find the correct mean.

SOLUTION :

The mean of 200 items = 50

Then the sum of 200 items = $200 \times 50 = 10,000$

Correct values = 192 and 88.

Incorrect values = 92 and 8.

$$\therefore \text{correct sum} = 10000 - 92 - 8 + 192 + 88 = 10180$$

$$\therefore \text{correct mean} = \frac{10180}{200} = \frac{101.8}{2} = 50.9 .$$

Q 21 . Find the values of n and \bar{X} in each of the following cases :

(i). $\sum_{i=1}^n (x_i - 12) = -10$ and $\sum_{i=1}^n (x_i - 3) = 62$

(ii). $\sum_{i=1}^n (x_i - 10) = 30$ and $\sum_{i=1}^n (x_i - 6) = 150$

SOLUTION :

(i). Given $\sum_{i=1}^n (x_i - 12) = -10$

$$\Rightarrow (x_1 - 12) + (x_2 - 12) + \dots + (x_n - 12) = -10$$

$$\Rightarrow (x_1 + x_2 + x_3 + x_4 + x_5 + \dots + x_n) - (12 + 12 + 12 + 12 + \dots + 12) = -10$$

$$\Rightarrow \sum x - 12n = -10 \dots \dots \dots (1)$$

And $\sum_{i=1}^n (x_i - 3) = 62$

$$\Rightarrow (x_1 - 3) + (x_2 - 3) + \dots + (x_n - 3) = 62$$

$$\Rightarrow (x_1 + x_2 + \dots + x_n) - (3 + 3 + 3 + \dots + 3) = 62$$

$$\Rightarrow \sum x - 3n = 62 \dots \dots \dots (2)$$

By subtracting equation (1) from equation(2) , we get

$$\sum x - 3n - \sum x + 12n = 62 + 10$$

$$\Rightarrow 9n = 72$$

$$\Rightarrow n = \frac{72}{9} = 8$$

Put value of n in equation (1)

$$\sum x - 12 \times 8 = -10$$

$$\Rightarrow \sum x - 96 = -10$$

$$\Rightarrow \sum x = 96 - 10 = 86$$

$$\therefore \bar{X} = \frac{\sum x}{n} = \frac{86}{8} = 10.75$$

(ii). Given $\sum_{i=1}^n (x_i - 10) = 30$

$$(x_1 - 10) + (x_2 - 10) + \dots + (x_n - 10) = 30$$

$$\Rightarrow (x_1 + x_2 + x_3 + x_4 + x_5 + \dots + x_n) - (10 + 10 + 10 + 10 + \dots + 10) = 30$$

$$\Rightarrow \sum x - 10n = 30 \dots \dots \dots (1)$$

And $\sum_{i=1}^n (x_i - 6) = 150$

$$\Rightarrow (x_1 - 6) + (x_2 - 6) + \dots + (x_n - 6) = 150$$

$$\Rightarrow (x_1 + x_2 + \dots + x_n) - (6 + 6 + 6 + \dots + 6) = 150$$

$$\Rightarrow \sum x - 6n = 150 \dots \dots \dots (2)$$

By subtracting equation (1) from equation(2) , we get

$$\sum x - 6n - \sum x + 10n = 150 - 30$$

$$\Rightarrow 4n = 120$$

$$\Rightarrow n = \frac{120}{4} = 30$$

Put value of n in equation (1)

$$\sum x - 10 \times 30 = 30$$

$$\Rightarrow \sum x - 300 = 30$$

$$\Rightarrow \sum x = 30 + 300 = 330$$

$$\therefore \bar{x} = \frac{\sum x}{n} = \frac{330}{30} = 11.$$

Q 22 . The sum of the deviations of a set of n values $x_1, x_2, x_3, \dots, x_n$ measured from 15 and -3 are -90 and 54 respectively . Find the value of n and mean .

SOLUTION :

Given :

$$\sum_n^{i=1} (x_i - 15) = -90$$

$$\Rightarrow (x_1 - 15) + (x_2 - 15) + \dots \dots \dots + (x_n - 15) = -90$$

$$\Rightarrow (x_1 + x_2 + \dots \dots + x_n) - (15 + 15 + 15 + \dots \dots \dots + 15) = -90$$

$$\Rightarrow \sum x - 15n = -90 \dots \dots \dots (1)$$

And $\sum_n^{i=1} (x_i + 3) = 54$

$$\Rightarrow (x_1 + 3) + (x_2 + 3) + \dots \dots \dots + (x_n + 3) = 54$$

$$\Rightarrow (x_1 + x_2 + \dots \dots + x_n) + (3 + 3 + 3 + \dots \dots \dots + 3) = 54$$

$$\Rightarrow \sum x + 3n = 54 \dots \dots \dots (2)$$

By subtracting equation (1) from equation(2) , we get

$$\sum x + 3n - \sum x + 15n = 54 + 90$$

$$\Rightarrow 18n = 144$$

$$\Rightarrow n = \frac{144}{18} = 8$$

Put value of n in equation(1)

$$\sum x - 15 \times 8 = -90$$

$$\sum x - 120 = -90$$

$$\sum x = 120 - 90 = 30$$

$$\therefore \bar{X} = \frac{\sum x}{n} = \frac{30}{8} = 3.75.$$

Q 23 . Find the sum of the deviations of the variate values 3 , 4 , 6 , 7 , 8 , 14 from their mean.

SOLUTION :

Values 3 , 4 , 6 , 7 , 8 , 14

$$\therefore \text{Mean} = \frac{\text{sum of numbers}}{\text{total numbers}}$$

$$\therefore \text{Mean} = \frac{3+4+6+7+8+14}{6}$$

$$\therefore \text{Mean} = \frac{42}{6}$$

$$=7$$

\therefore Sum of deviation of values from their mean

$$= (3 - 7) + (4 - 7) + (6 - 7) + (7 - 7) + (8 - 7) + (14 - 7)$$

$$= -4 - 3 - 1 + 0 + 1 + 7$$

$$= -8 + 8 = 0$$

Q 24 . If \bar{X} is the mean of the ten natural numbers $x_1, x_2, x_3, \dots, x_{10}$ show that $(x_1 - \bar{X}) + (x_2 - \bar{X}) + \dots + (x_{10} - \bar{X}) = 0$

SOLUTION :

$$\text{We have, } \bar{X} = \frac{x_1+x_2+\dots+x_{10}}{10}$$

$$\Rightarrow x_1 + x_2 + \dots + x_{10} = 10\bar{X} \dots \dots \dots (1)$$

$$\text{Now, } (x_1 - \bar{X}) + (x_2 - \bar{X}) + \dots + (x_{10} - \bar{X})$$

$$= (x_1 + x_2 + \dots + x_{10}) - (\bar{X} + \bar{X} + \bar{X} + \text{upto } 10 \text{ terms})$$

$$= 10\bar{X} - 10\bar{X} \quad \quad \quad [\text{By equation (i)}]$$

$$\therefore (x_1 - \bar{X}) + (x_2 - \bar{X}) + \dots + (x_{10} - \bar{X}) = 0$$