

### Measures Of Central Tendency Exercise 24.1

RD Sharma Solutions Class 9 Chapter 24 Exercise 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.

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{994+996+998+1000+1002}{5} \\ &= \frac{4990}{5} = 998\end{aligned}$$

Mean = 998

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

**SOLUTION :**

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

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{1+2+3+4+5}{5} \\ &= \frac{15}{5} = 3\end{aligned}$$

Mean = 3

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

**SOLUTION :**

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

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{sum of factors}}{\text{total factors}} \\ &= \frac{1+2+5+10}{4} = 4.5\end{aligned}$$

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

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

$$= 4 \text{ kg}$$

**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

$$\begin{aligned}\therefore \text{Mean marks} &= \frac{\text{sum of marks}}{\text{total numbers of marks}} \\ &= \frac{64+36+47+23+0+19+81+93+72+35+3+1}{12} = 39.5\end{aligned}$$

$$\text{Mean Marks} = 39.5$$

**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

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

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

$$= 6M - 6M$$

$$= 0$$

$$= \text{R . H . S}$$

**Q 12 . Duration of sunshine(in hours) in Amritsar for first 10 days of August 1997 as reported by the Meterological 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  $\bar{X}$**

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

**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

$$\begin{aligned}\text{(i) Mean } \bar{X} &= \frac{\text{sum of numbers}}{\text{total numbers}} \\ &= \frac{9.6+5.2+3.5+1.5+1.6+2.4+2.6+8.4+10.3+10.9}{10}\end{aligned}$$

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

$$\text{(ii) L.H.S} = \sum_{i=1}^{10} (x_i - \bar{X})$$

$$= (x_1 - \bar{x}) + (x_2 - \bar{x}) + (x_3 - \bar{x}) + \dots + (x_{10} - \bar{x})$$

$$=$$

$$\begin{aligned}& (9.6 - 5.6) + (5.2 - 5.6) + (3.5 - 5.6) + (1.5 - 5.6) + (1.6 - 5.6) + (2.4 - 5.6) + (2.6 - 5.6) \\ & + (8.4 - 5.6) + (10.3 - 5.6) + (10.9 - 5.6)\end{aligned}$$

$$= 4 - 0.4 - 2.1 - 4.1 - 4 - 3.2 - 3 + 2.8 + 4.7 + 5.3$$

$$= 16.8 - 16.8 = 0$$

$$= \text{R.H.S}$$

**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

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

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

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

New numbers are = 5 , 6 , 7

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

$$= \frac{5+6+7}{3}$$

$$= 6 = 4 + 2$$

$\therefore$  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

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

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

$$= 2 = 4 - 2$$

$\therefore$  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

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

$$= \frac{6+8+10}{3}$$

$$= 8 = 4 \times 2$$

$\therefore$  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.

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

$$= \frac{1.5+2+2.5}{3}$$

$$= 2 = \frac{4}{2}$$

$\therefore$  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 =  $100 \times 40$

$$= 4000$$

Correct value = 53

Incorrect value = 83

$$\text{Correct sum} = 4000 - 83 + 53 = 3970$$

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

**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

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

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

$$\Rightarrow 385 = 324 + x$$

$$\Rightarrow x = 385 - 324$$

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

∴ 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

∴ 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.

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

$\therefore$  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 :

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

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

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

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

$$\text{And } \sum_{n=1}^{i=1} (x_i + 3) = 54$$

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

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

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

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 :**

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

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

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

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

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

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

### Measures Of Central Tendency Exercise 24. 2

RD Sharma Solutions Class 9 Chapter 24 Exercise 24.2

Q 1 . Calculate the mean for the following distribution :

x :	5	6	7	8	9
f :	4	8	14	11	3

SOLUTION :

x	f	fx



5	4	20
6	8	48
7	14	98
8	11	88
9	3	27
N=40		$\sum fx = 281$

$$\therefore \text{Mean } \bar{x} = \frac{\sum fx}{N}$$

$$= \frac{281}{40} = 7.025.$$

Q 2 . Find the mean of the following data :

x :	19	21	23	25	27	29	31
f :	13	15	16	18	16	15	13

SOLUTION :

x	f	fx
19	13	247
21	15	315
23	16	368
25	18	450
27	16	432
29	15	435
31	13	403
N=106		$\sum fx = 2650$

$$\therefore \text{Mean } \bar{x} = \frac{\sum fx}{N}$$

$$= \frac{2650}{106} = 25.$$

Q 3 . The mean of the following data is 20.6 .Find the value of p.

x :	10	15	p	25	35
f :	3	10	25	7	5

SOLUTION :

x	f	fx
10	3	30
15	10	150
P	25	25p
25	7	175
35	5	175
N = 50		$\sum fx = 25p + 530$

It is given that ,

Mean = 20.6

$$\Rightarrow \frac{\sum fx}{N} = 20.6$$

$$\Rightarrow \frac{25p+530}{50} = 20.6$$

$$\Rightarrow 25p + 530 = 20.6 \times 50$$

$$\Rightarrow 25p = 1030 - 530$$

$$\Rightarrow 25p = 500$$

$$\Rightarrow p = \frac{500}{25} = 20$$

$$\Rightarrow p = 20$$

$$\therefore p = 20.$$

Q 4 . If the mean of the following data is 15 , find p.

x :	5	10	15	20	25
f :	6	p	6	10	5

SOLUTION :

x	f	fx
5	6	30
10	P	10p
15	6	90
20	10	200
25	5	125
N=p+27		$\sum fx = 10p + 445$

It is given that ,

Mean = 15

$$\Rightarrow \frac{\sum fx}{N} = 15$$

$$\Rightarrow \frac{10p+445}{p+27} = 15$$

$$\Rightarrow 10p + 445 = 15 \times (p + 27)$$

$$\Rightarrow 10p + 445 = 15p + 405$$

$$\Rightarrow 15p - 10p = 445 - 405$$

$$\Rightarrow 5p = 40$$

$$\Rightarrow p = \frac{40}{5} = 8$$

$$\Rightarrow p = 8$$

$$\therefore p = 8.$$

Q 5 . Find the value of p for the following distribution whose mean is 16.6.

x :	8	12	15	p	20	25	30
f :	12	16	20	24	16	8	4

SOLUTION :

x	f	fx
8	12	96
12	16	192
15	20	300
P	24	24p
20	16	320
25	8	200
30	4	120
N=100		$\sum fx = 24p + 1228$

It is given that ,

Mean = 16.6

$$\Rightarrow \frac{\sum fx}{N} = 16.6$$

$$\Rightarrow \frac{24p+1228}{100} = 16.6$$

$$\Rightarrow 24p + 1228 = 1660$$

$$\Rightarrow 24p = 1660 - 1228$$

$$\Rightarrow 24p = 432$$

$$\Rightarrow p = \frac{432}{24} = 18$$

$$\Rightarrow p = 18$$

$$\therefore p = 18.$$

Q 6 . Find the missing value of p for the following distribution whose mean is 12.58 .

x :	5	8	10	12	p	20	25
f :	2	5	8	22	7	4	2

SOLUTION :

x	f	fx
5	2	10
8	5	40
10	8	80
12	22	264
P	7	7p
20	4	80
25	2	50
N = 50		$\sum fx = 7p + 524$

It is given that ,

$$\text{Mean} = 12.58$$

$$\Rightarrow \frac{\sum fx}{N} = 12.58$$

$$\Rightarrow \frac{7p+524}{50} = 12.58$$

$$\Rightarrow 7p + 524 = 629$$

$$\Rightarrow 7p = 629 - 524$$

$$\Rightarrow 7p = 105$$

$$\Rightarrow p = \frac{105}{7} = 15$$

$$\Rightarrow p = 15$$

$$\therefore p = 18.$$

Q 7 . Find the missing frequency (p) for the following distribution whose mean is 7.68 .

x :	3	5	7	9	11	13
f :	6	8	15	p	8	4

SOLUTION :

x	f	fx
3	6	18
5	8	40
7	15	105
9	P	9p
11	8	88
13	4	52
N=p+41		$\sum fx = 9p + 303$

It is given that ,

$$\text{Mean} = 7.68$$

$$\Rightarrow \frac{\sum fx}{N} = 7.68$$

$$\Rightarrow \frac{9p+303}{p+41} = 7.68$$

$$\Rightarrow 9p + 303 = 7.68p + 314.88$$

$$\Rightarrow 9p - 7.68p = 314.88 - 303$$

$$\Rightarrow 1.32p = 11.88$$

$$\Rightarrow p = \frac{11.88}{1.32} = 9$$

$$\Rightarrow p = 9$$

$$\therefore p = 9.$$

Q 8 . Find the value of p , if the mean of the following distribution is 20 .

x :	15	17	19	20+p	23
f :	2	3	4	5p	6

SOLUTION :

x	f	fx
15	2	30
17	3	51
19	4	76
20+p	5p	100p+ 5p <sup>2</sup>
23	6	138
	N=5p+15	fx= 5p <sup>2</sup> + 100p + 295

It is given that ,

$$\text{Mean} = 20$$

$$\Rightarrow \frac{\sum fx}{N} = 20$$

$$\Rightarrow \frac{5p^2 + 100p + 295}{5p + 15} = 20$$

$$\Rightarrow 5p^2 + 100p + 295 = 20(5p + 15)$$

$$\Rightarrow 5p^2 + 100p + 295 = 100p + 300$$

$$\Rightarrow 5p^2 = 300 - 295$$

$$\Rightarrow 5p^2 = 5$$

$$\Rightarrow p^2 = 1$$

$$\Rightarrow p = \pm 1$$

Frequency can't be negative.

Hence, value of p is 1.

Q 9 . Find the mean of the following distribution :

x :	10	12	20	25	35
f :	3	10	15	7	5

SOLUTION :

x	f	fx
10	3	30
12	10	120
20	15	300
25	7	175
35	5	175
	N=40	$\sum fx = 800$

$$\therefore \text{Mean } \bar{x} = \frac{\sum fx}{N}$$

$$= \frac{800}{40} = 20.$$

Q 10. Candidates of four schools appear in a mathematics test. The data were as follows :

Schools	No. Of Candidates	Average Score

I	60	75
II	48	80
III	Not Available	55
IV	40	50

If the average score of the candidates of all four schools is 66 , Find the number of candidates that appeared from school III .

SOLUTION :

Schools	No. Of Candidates	Average Score
I	60	75
II	48	80
III	x	55
IV	40	50

Given the average score of all schools =66

$$\Rightarrow \frac{N_1\bar{x}_1 + N_2\bar{x}_2 + N_3\bar{x}_3 + N_4\bar{x}_4}{N_1 + N_2 + N_3 + N_4} = 66$$

$$\Rightarrow \frac{60 \times 75 + 48 \times 80 + x \times 55 + 40 \times 50}{60 + 48 + x + 40} = 66$$

$$\Rightarrow \frac{4500 + 3840 + 55x + 2000}{148 + x} = 66$$

$$\Rightarrow \frac{10340 + 55x}{148 + x} = 66$$

$$\Rightarrow 10340 + 55x = 66x + 9768$$

$$\Rightarrow 10340 - 9768 = 66x - 55x$$

$$\Rightarrow 11x = 572$$

$$\Rightarrow x = \frac{572}{11} = 52$$

∴ No. of candidates appeared from school III = 52.

Q 11 . Five coins were simultaneously tossed 1000 times and at each, toss the number of heads was observed. The number of tosses during which 0 , 1 , 2 , 3 , 4 and 5 heads were obtained are shown in the table below. Find the mean number of heads per toss.

No . of heads per toss	No.of tosses
0	38
1	144
2	342
3	287
4	164
5	25
Total	1000

SOLUTION :

No . of heads per toss(x)	No.of tosses(f)	fx
0	38	0
1	144	144
2	342	684
3	287	861
4	164	656
5	25	125
	N=1000	$\sum fx = 2470$

$$\therefore \text{Mean number of heads per toss} = \frac{\sum fx}{N}$$

$$= \frac{2470}{1000}$$

$$= 2.47$$

Q 12 . Find the missing frequencies in the following frequency distribution if it is known that the mean of the distribution is 50.

x :	10	30		50	70	90
f :	17	$f_1$	32	$f_2$	19	

Total=120

SOLUTION :

x	f	fx
10	17	170
30	$f_1$	$30f_1$
50	32	1600
70	$f_2$	$70f_2$
90	19	1710
	N=120	$\sum fx = 3480 + 30f_1 + 70f_2$

It is given that

Mean = 50

$$\Rightarrow \frac{\sum fx}{N} = 50$$

$$\Rightarrow \frac{3480 + 30f_1 + 70f_2}{N} = 50$$

$$\Rightarrow 3480 + 30f_1 + 70f_2 = 50 \times 120$$

$$\Rightarrow 30f_1 + 70f_2 = 6000 - 3480$$

$$\Rightarrow 10(3f_1 + 7f_2) = 10(252)$$

$$\Rightarrow 3f_1 + 7f_2 = 252 \dots \dots (1) \quad [\because \text{Divide by } 10]$$

And N = 120

$$\Rightarrow 17 + f_1 + 32 + f_2 + 19 = 120$$

$$\Rightarrow 68 + f_1 + f_2 = 120$$

$$\Rightarrow f_1 + f_2 = 120 - 68$$

$$\Rightarrow f_1 + f_2 = 52$$

Multiply with 3 on both sides

$$\Rightarrow 3f_1 + 3f_2 = 156 \dots \dots (2)$$

Subtracting equation (2) from equation (1)

$$\Rightarrow 3f_1 + 7f_2 - 3f_1 - 3f_2 = 252 - 156$$

$$\Rightarrow 4f_2 = 96$$

$$\Rightarrow f_2 = \frac{96}{4} = 24$$

Put the value of  $f_2$  in equation (1)

$$\Rightarrow 3f_1 + 7 \times 24 = 252$$

$$\Rightarrow 3f_1 = 252 - 168$$

$$\Rightarrow f_1 = \frac{84}{3} = 28$$

$$\Rightarrow f_1 = 28$$

### Measures Of Central Tendency Exercise 24.3

RD Sharma Solutions Class 9 Chapter 24 Exercise 24.3

Find the median of the following data :

Q1 . 83 , 37 , 70 , 29 , 45 , 63 , 41 , 70 , 34 , 54

SOLUTION :

Numbers are 83 , 37 , 70 , 29 , 45 , 63 , 41 , 70 , 34 , 54

Arranging the numbers in ascending order

29 , 34 , 37 , 41 , 45 , 54 , 63 , 70 , 70 , 83

n = 10(even)

$$\begin{aligned}\therefore \text{median} &= \frac{\frac{n}{2} \text{th value} + \left(\frac{n}{2} + 1\right) \text{th value}}{2} \\&= \frac{\frac{10}{2} \text{th value} + \left(\frac{10}{2} + 1\right) \text{th value}}{2} \\&= \frac{5 \text{th value} + 6 \text{th value}}{2} \\&= \frac{45 + 54}{2} \\&= \frac{99}{2} = 49.5\end{aligned}$$

Q2 . 133 , 73 , 89 , 108 , 94 , 104 , 94 , 85 , 100 , 120

SOLUTION :

Numbers are 133 , 73 , 89 , 108 , 94 , 104 , 94 , 85 , 100 , 120

Arranging the numbers in ascending order

73 , 85 , 89 , 94 , 94 , 100 , 104 , 108 , 120 , 133

n = 10(even)

$$\begin{aligned}\therefore \text{median} &= \frac{\frac{n}{2} \text{th value} + \left(\frac{n}{2} + 1\right) \text{th value}}{2} \\&= \frac{\frac{10}{2} \text{th value} + \left(\frac{10}{2} + 1\right) \text{th value}}{2} \\&= \frac{5 \text{th value} + 6 \text{th value}}{2} \\&= \frac{94 + 100}{2} \\&= \frac{194}{2} = 97\end{aligned}$$

Q3 . 31 , 38 , 27 , 28 , 36 , 25 , 35 , 40

SOLUTION :

Numbers are 31 , 38 , 27 , 28 , 36 , 25 , 35 , 40

Arranging the numbers in ascending order

25 , 27 , 28 , 31 , 35 , 36 , 38 , 40

n = 8(even)

$$\begin{aligned}\therefore \text{median} &= \frac{\frac{n}{2} \text{th value} + \left(\frac{n}{2} + 1\right) \text{th value}}{2} \\&= \frac{\frac{8}{2} \text{th value} + \left(\frac{8}{2} + 1\right) \text{th value}}{2} \\&= \frac{4 \text{th value} + 5 \text{th value}}{2} \\&= \frac{31 + 35}{2} \\&= \frac{66}{2} = 33\end{aligned}$$

Q4 . 15 , 6 , 16 , 8 , 22 , 21 , 9 , 18 , 25

SOLUTION :

Numbers are 15 , 6 , 16 , 8 , 22 , 21 , 9 , 18 , 25

Arranging the numbers in ascending order

6 , 8 , 9 , 15 , 16 , 21 , 22 , 25

n = 9 (odd)

$$\begin{aligned}\therefore \text{Median} &= \left(\frac{n+1}{2}\right) \text{th value} \\&= \left(\frac{9+1}{2}\right) \text{th value} \\&= 5 \text{th value} = 16\end{aligned}$$

Q5 . 41 , 43 , 127 , 99 , 71 , 92 , 71 , 58 , 57

SOLUTION :

Numbers are 41 , 43 , 127 , 99 , 71 , 92 , 71 , 58 , 57

Arranging the numbers in ascending order



41, 43, 57, 58, 71, 71, 92, 99, 127

$n = 9$  (odd)

$$\therefore \text{Median} = \left( \frac{n+1}{2} \right) \text{th value}$$

$$= \left( \frac{9+1}{2} \right) \text{th value}$$

$$= 5\text{th value} = 71$$

Q6. 25, 34, 31, 23, 22, 26, 35, 29, 20, 32

SOLUTION :

Numbers are 25, 34, 31, 23, 22, 26, 35, 29, 20, 32

Arranging the numbers in ascending order

20, 22, 23, 25, 26, 29, 31, 32, 34, 35

$n = 10$  (even)

$$\therefore \text{median} = \frac{\frac{n}{2} \text{th value} + \left( \frac{n}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{\frac{10}{2} \text{th value} + \left( \frac{10}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{5\text{th value} + 6\text{th value}}{2}$$

$$= \frac{26 + 29}{2}$$

$$= \frac{55}{2} = 27.5$$

Q7. 12, 17, 3, 14, 5, 8, 7, 15

SOLUTION :

Numbers are 12, 17, 3, 14, 5, 8, 7, 15

Arranging the numbers in ascending order

3, 5, 7, 8, 12, 14, 15, 17

$n = 8$  (even)

$$\therefore \text{median} = \frac{\frac{n}{2} \text{th value} + \left( \frac{n}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{\frac{8}{2} \text{th value} + \left( \frac{8}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{4\text{th value} + 5\text{th value}}{2}$$

$$= \frac{8 + 12}{2}$$

$$= \frac{20}{2} = 10$$

Q8. 92, 35, 67, 85, 72, 81, 56, 51, 42, 69

SOLUTION :

Numbers are 92, 35, 67, 85, 72, 81, 56, 51, 42, 69

Arranging the numbers in ascending order

35, 42, 51, 56, 67, 69, 72, 81, 85, 92

$n = 10$  (even)

$$\therefore \text{median} = \frac{\frac{n}{2} \text{th value} + \left( \frac{n}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{\frac{10}{2} \text{th value} + \left( \frac{10}{2} + 1 \right) \text{th value}}{2}$$

$$= \frac{5\text{th value} + 6\text{th value}}{2}$$

$$= \frac{67 + 69}{2}$$

$$= \frac{136}{2} = 68$$

Q9. Numbers 50, 42, 35,  $2x + 10$ ,  $2x - 8$ , 12, 11, 8 are written in descending order and their median is 25, find  $x$ .

SOLUTION :

Given the number of observation,  $n = 8$

$$\begin{aligned}
 \therefore \text{median} &= \frac{\frac{n}{2} \text{th value} + \left(\frac{n}{2} + 1\right) \text{th value}}{2} \\
 &= \frac{\frac{8}{2} \text{th value} + \left(\frac{8}{2} + 1\right) \text{th value}}{2} \\
 &= \frac{4 \text{th value} + 5 \text{th value}}{2} \\
 &= \frac{2x + 10 + 2x - 8}{2} \\
 &= 2x + 1
 \end{aligned}$$

Given median = 25

$$\therefore 2x + 1 = 25$$

$$\Rightarrow 2x = 24$$

$$\Rightarrow x = 12$$

Q10 . Find the median of the following observations : 46 , 64 , 87 , 41 , 58 , 77 , 35 , 90 , 55 , 92 , 33 .If 92 is replaced by 99 and 41 by 43 in the above data, find the new median?

SOLUTION :

Given the numbers are 46 , 64 , 87 , 41 , 58 , 77 , 35 , 90 , 55 , 92 , 33

Arranging the numbers in ascending order

33 , 35 , 41 , 46 , 55 , 58 , 64 , 77 , 87 , 90 , 92

n = 11 (odd)

$$\begin{aligned}
 \therefore \text{Median} &= \left(\frac{n+1}{2}\right) \text{th value} \\
 &= \left(\frac{11+1}{2}\right) \text{th value} \\
 &= 6 \text{th value} = 58
 \end{aligned}$$

If 92 is replaced by 99 and 41 by 43

Then the new values are : 33 , 35 , 43 , 46 , 55 , 58 , 64 , 77 , 87 , 90 , 99

n = 11 (odd)

$$\begin{aligned}
 \therefore \text{NewMedian} &= \left(\frac{n+1}{2}\right) \text{th value} \\
 &= \left(\frac{11+1}{2}\right) \text{th value} \\
 &= 6 \text{th value} = 58
 \end{aligned}$$

Q11 . Find the median of the following data : 41 , 43 , 127 , 99 , 61 , 92 , 71 , 58 , 57 .If 58 is replaced by 85 , what will be the new median ?

SOLUTION :

Given the numbers are 41 , 43 , 127 , 99 , 61 , 92 , 71 , 58 , 57

Arranging the numbers in ascending order

41 , 43 , 57 , 58 , 61 , 71 , 92 , 99 , 127

n = 9 (odd)

$$\begin{aligned}
 \therefore \text{NewMedian} &= \left(\frac{n+1}{2}\right) \text{th value} \\
 &= \left(\frac{9+1}{2}\right) \text{th value} \\
 &= 5 \text{th value} = 61
 \end{aligned}$$

If 58 is replaced by 85

Then the new values be in order are : 41 , 43 , 57 , 61 , 71 , 85 , 92 , 99 , 127

$$\begin{aligned}
 \therefore \text{NewMedian} &= \left(\frac{n+1}{2}\right) \text{th value} \\
 &= \left(\frac{9+1}{2}\right) \text{th value} \\
 &= 5 \text{th value} = 71
 \end{aligned}$$

Q12 . The weights (in kg ) of 15 students are : 31 , 35 , 27 , 29 , 32 , 43 , 37 , 41 , 34 , 28 , 36 , 44 , 45 , 42 , 30. Find the median . If the weight 44 kg is replaced by 46 kg and 27 kg by 25 kg , find the new median .

SOLUTION :

Given the numbers are 31, 35, 27, 29, 32, 43, 37, 41, 34, 28, 36, 44, 45, 42, 30

Arranging the numbers in ascending order

27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 41, 42, 43, 44, 45.

$n = 15$  (odd)

$$\therefore \text{NewMedian} = \left( \frac{n+1}{2} \right) \text{th value}$$

$$= \left( \frac{15+1}{2} \right) \text{th value}$$

$$= 8\text{th value} = 35 \text{ kg}$$

If the weight 44 kg is replaced by 46 kg and 27 kg is replaced by 25 kg

Then the new values be in order are : 25, 28, 29, 30, 31, 32, 34, 35, 36, 37, 41, 42, 43, 45, 46

$$\therefore \text{NewMedian} = \left( \frac{n+1}{2} \right) \text{th value}$$

$$= \left( \frac{15+1}{2} \right) \text{th value}$$

$$= 8\text{th value} = 35 \text{ kg}$$

Q13 . The following observations have been arranged in ascending order. If the median of the data is 63, find the value of  $x$  : 29, 32, 48, 50,  $x$ ,  $x + 2$ , 72, 78, 84, 95.

SOLUTION :

Total number of observations in the given data is 10 (even number) . So median of this data will be mean of  $\frac{10}{2}$  i.e., 5<sup>th</sup> observation and  $\frac{10}{2} + 1$  i.e., 6<sup>th</sup> observation.

$$\text{So, median of data} = \frac{5\text{th observation} + 6\text{th observation}}{2}$$

$$\Rightarrow 63 = \frac{x + x + 2}{2}$$

$$\Rightarrow 63 = \frac{2x + 2}{2}$$

$$\Rightarrow 63 = x + 1$$

$$\Rightarrow x = 62$$

### Measures Of Central Tendency Exercise 24.4

RD Sharma Solutions Class 9 Chapter 24 Exercise 24.4

**Q 1 . Find out the mode of the following marks obtained by 15 students in a class :**

**Marks : 4 , 6 , 5 , 7 , 9 , 8 , 10 , 4 , 7 , 6 , 5 , 9 , 8 , 7 , 7.**

**SOLUTION :**

Marks	4	5	6	7	8	9	10
No.of Students	2	2	2	4	2	2	1

Since maximum frequency corresponds to the value 7 then mode = 7 marks.

**Q 2 . Find out the mode from the following data :**

**125 , 175 , 225 , 125 , 225 , 175 , 325 , 125 , 375 , 225 , 125**

**SOLUTION :**

Values	125	175	225	325	375
Frequency	4	2	3	1	1

Since maximum frequency 4 corresponds to the value 125 then mode = 125

**Q 3 . Find the mode for the following series :**

**7.5 , 7.3 , 7.2 , 7.2 , 7.4 , 7.7 , 7.7 , 7.5 , 7.3 , 7.2 , 7.6 , 7.2**

**SOLUTION :**

Values	7.2	7.3	7.4	7.5	7.6	7.7
Frequency	4	2	1	2	1	2

Since maximum frequency 4 corresponds to the value 7.2 then mode = 7.2

**Q 4 . Find the mode of the following data in each case :**

**(i) . 14 , 25 , 14 , 28 , 18 , 17 , 18 , 14 , 23 , 22 , 14 , 18**

**SOLUTION :**

Arranging the numbers in ascending order:

14 , 14 , 14 , 14 , 17 , 18 , 18 , 18 , 22 , 23 , 25 , 28

Here the observation 14 is having the highest frequency i . e , 4 in given data, so mode = 14.

**(ii) . 7 , 9 , 12 , 13 , 7 , 12 , 15 , 7 , 12 , 7 , 25 , 18 , 7**

**SOLUTION :**

Values	7	9	12	13	15	18	25
Frequency	5	1	3	1	1	1	1

Since maximum frequency 5 corresponds to the value 7 then mode = 7

**Q 5 . The demand of different shirt sizes, as obtained by a survey, is given below :**

Size:	38	39	40	41	42	43	44	Total
No. of persons(wearing it)	26	39	20	15	13	7	5	125

**Find the modal shirt sizes, as observed from the survey.**

**SOLUTION :**

Size:	38	39	40	41	42	43	44	Total
No. of persons(wearing it)	26	39	20	15	13	7	5	125

Since, maximum frequency 39 corresponds to the value 39 then mode = 39