Exercise 23.1

Q1) Ashish studies for 4 hours, 5 hours and 3 hours on three consecutive days. How many hours does he study daily on an average?

Solution:

Average number of study hours = (4 + 5 + 3) ÷ 3

= 12 ÷ 3

= 4 hours

Thus, Ashish studies for 4 hours on an average.

Q2) A cricketer scores the following runs in 8 innings: 58, 76, 40, 35, 48, 45, 0, 100.

Find the mean score.

Solution:

We have:

The mean score = (58 + 76 + 40 + 35 + 48 + 45 + 0 + 100) ÷ 8

= 402 ÷ 8

= 50.25 runs.

Q3) The marks (out of 100) obtained by a group of students in science test are 85, 76, 90, 84, 39, 48, 56, 95, 81 and 75. Find the

(i) highest and the lowest marks obtained by the students.

(ii) range of marks obtained.

(iii) mean marks obtained by the group.

Solution:

In order to find the highest and lowest marks, let us arrange the marks in ascending order as follows:

39, 48, 56, 75, 76, 81, 84, 85, 90, 95

(i) Clearly, the highest mark is 95 and the lowest is 39.

(ii) The range of the marks obtained is: (95 – 39) = 56.

(iii) We have:

Mean marks = Sum of the marks ÷ Total number of students

=> Mean marks = (39 + 48 + 56 + 75 + 76 + 81 + 84 + 85 + 90 + 95) ÷ 10

= 729 ÷ 10

= 72.9.

Hence, the mean mark of the students is 72.9.

Q4) The enrolment of a school during six consecutive years was as follows:

1555, 1670, 1750, 2019, 2540, 2820

Find the mean enrollment of the school for this period.

Solution:

The mean enrolment = Sum of the enrolments in each year ÷ Total number of years

The mean enrolment = (1555 + 1670 + 1750 + 2019 + 2540 + 2820) ÷ 6

= 12354 ÷ 6

= 2059.

Thus, the mean enrolment of the school for the given period is 2059.

Q5) The rainfall (in mm) in a city on 7 days of a certain week was recorded as follows:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Rainfall (in mm)	0.0	12.2	2.1	0.0	20.5	5.3	1.0

(i) Find the range of the rainfall from the above data.

(ii) Find the mean rainfall for the week.

(iii) On how many days was the rainfall less than the mean rainfall.

Solution:

(i) The range of the rainfall = Maximum rainfall − Minimum rainfall

= 20.5 − 0.0

= 20.5 mm.

(ii) The mean rainfall = (0.0 + 12.2 + 2.1 + 0.0 + 20.5 + 5.3 + 1.0) ÷ 7

= 41.1 ÷ 7

= 5.87 mm.

(iii) Clearly, there are 5 days (Mon, Wed, Thu, Sat and Sun), when the rainfall was less than the mean, i.e., 5.87 mm.

Q6) If the heights of 5 persons are 140 cm, 150 cm, 152 cm, 158 cm and 161 cm respectively, find the mean height.

Solution:

The mean height = Sum of the heights ÷ Total number of persons

= (140 + 150 + 152 + 158 + 161) ÷ 5

= 761 ÷ 5

= 152.2 cm.

Q7) Find the mean of 994, 996, 998, 1002 and 1000.

Solution:

Mean = Sum of the observations ÷ Total number of observations

Mean = (994 + 996 + 998 + 1002 + 1000) ÷ 5

= 4990 ÷ 5

= 998.

Q8) Find the mean of first five natural numbers.

Solution:

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

Let $\overline{X}$ denote their arithmetic mean. Then,

$\overline{X}$ = (1 + 2 + 3 + 4 + 5) ÷ 5

= 15 ÷ 5

= 3.

Q9) Find the mean of all factors of 10.

Solution:

The factors of 10 are 1, 2, 5 and 10.

Let $\overline{X}$ denote their arithmetic mean. Then,

$\overline{X}$ = (1 + 2 + 5 + 10) ÷ 4

= 18 ÷ 4

= 4.5.

Q10) Find the mean of first 10 even natural numbers.

Solution:

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

Let $\overline{X}$ denote their arithmetic mean. Then,

$\overline{X}$ = (2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20) ÷ 10

= 110 ÷ 10

= 11.

Q11) Find the mean of x, x + 2, x + 4, x + 6, x + 8

Solution:

Mean = Sum of observations ÷ Number of observations

=> Mean = (x + x + 2 + x + 4 + x + 6 + x + 8) ÷ 5

=> Mean = (5x + 20) ÷ 5

=> Mean = $\frac{5(x+4)}{5}$

=> Mean = x + 4

Q12) Find the mean of first five multiples of 3.

Solution:

The first five multiples of 3 are 3, 6, 9, 12 and 15.

Let $\overline{X}$ denote their arithmetic mean. Then,

$\overline{X}$ = (3 + 6 + 9 + 12 + 15) ÷ 5

= 45 ÷ 5

= 9.

Q13) Following are the weights (in kg) 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 Find the mean $\overline{X}$.

Solution:

We have:

$\overline{X} = \frac{Sum\ of\ observations}{Number\ of\ observations}$

=> $\overline{X} = \frac{3.4+3.6+4.2+4.5+3.9+4.1+3.8+4.5+4.4+3.6}{10}$

=> $\overline{X} = \frac{40}{10}$

=> $\overline{X}$ = 4 kg.

Q14) *The percentage of marks obtained by students of a class in mathematics are:*

64, 36, 47, 23, 0, 19, 81, 93, 72, 35, 3, 1 Find their mean.

Solution:

We have:

Mean = $\dfrac{Sum\ of\ the\ marks\ obtained}{Total\ number\ of\ students}$

=> Mean = $\dfrac{64+36+47+23+0+19+81+93+72+35+3+1}{12}$

=> Mean = $\dfrac{474}{12}$ = 39.5 %.

Q15) *The numbers of children in 10 families of a locality are:*

2, 4, 3, 4, 2, 3, 5, 1, 1, 5 Find the mean number of children per family.

Solution:

The mean number of children per family = $\dfrac{Sum\ of\ the\ total\ number\ of\ children}{Total\ number\ of\ families}$

Mean = $\dfrac{2+4+3+4+2+3+5+1+1+5}{10}$

= $\dfrac{30}{10}$

= 3.

Thus, on an average there are 3 children per family in the locality.

Q16) *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:

We have:

n = The number of observations = 100, Mean = 40

Mean = $\dfrac{Sum\ of\ the\ observations}{Total\ number\ of\ observations}$

=> 40 = $\dfrac{Sum\ of\ the\ observations}{100}$

=> Sum of the observations = 40 x 100

Thus, the incorrect sum of the observations = 40 x 100 = 4000.

Now,

The correct sum of the observations = Incorrect sum of the observations − Incorrect observation + Correct observation

=> The correct sum of the observations = 4000 − 83 + 53

=> The correct sum of the observations = 4000 − 30 = 3970

$$\therefore Correct\ mean = \frac{Correct\ sum\ of\ the\ observations}{Number\ of\ observations} = \frac{3970}{100} = 39.7$$

Q17) *The mean of five numbers is 27. If one number is excluded, their mean is 25. Find the excluded number.*

Solution:

We have:

Mean = $\frac{sum\ of\ the\ five\ numbers}{5} = 27$

So, sum of the five numbers = 5 x 27 = 135.

Now,

The mean of four numbers = $\frac{sum\ of\ the\ four\ numbers}{4} = 25$

So, sum of the four numbers = 4 x 25 = 100.

Therefore, the excluded number = Sum of the five number − Sum of the four numbers

=> The excluded number = 135 − 100 = 35.

Q18) *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:

We have:

Mean = $\dfrac{\text{sum of the weights of the students}}{\text{Number of students}}$

Let the weight of the seventh student be x kg.

Mean = $\dfrac{52+54+55+53+56+54+x}{7}$

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

=> 385 = 324 + x

=> x = 385 − 324

=> x = 61 kg.

Thus, the weight of the seventh student is 61 kg.

Q19) The mean weight of 8 numbers is 15 kg. If each number is multiplied by 2, what will be the new mean?

Solution:

Let $x_1, x_2, x_3 \ldots x_8$ be the eight numbers whose mean is 15 kg. Then,

$15 = \dfrac{x_1+x_2+x_3+\ldots+x_8}{8}$

$x_1 + x_2 + x_3 + \ldots + x_8 = 15 \times 8$
$=> x_1 + x_2 + x_3 + \ldots + x_8 = 120.$

Let the new numbers be $2x_1, 2x_2, 2x_3 \ldots 2x_8$. Let M be the arithmetic mean of the new numbers.

Then,

M = $\dfrac{2x_1+2x_2+2x_3+\ldots+2x_8}{8}$

=> M = $\dfrac{2(x_1+x_2+x_3+\ldots+x_8)}{8}$

=> M = $\dfrac{2\times 120}{8}$

=> M = 30

Q20) The mean of 5 numbers is 18. If one number is excluded, their mean is 16. Find the excluded number.

Solution:

Let x_1, x_2, x_3, x_4 and x_5 be five numbers whose mean is 18. Then,

18 = Sum of five numbers ÷ 5

∴ Sum of five numbers = 18 x 5 = 90

Now, if one number is excluded, then their mean is 16.

So,

16 = Sum of four numbers ÷ 4

∴ Sum of four numbers = 16 x 4 = 64.

The excluded number = Sum of five observations − Sum of four observations

∴ The excluded number = 90 − 64

∴ The excluded number = 26.

Q21) 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:

n = Number of observations = 200

$$\text{Mean} = \frac{Sum\ of\ the\ observations}{Number\ of\ observations}$$

$$=> 50 = \frac{Sum\ of\ the\ observations}{200}$$

=> Sum of the observations = 50 x 200 = 10,000.

Thus, the incorrect sum of the observations = 50 x 200

Now,

The correct sum of the observations = Incorrect sum of the observations − Incorrect observations + Correct observations

=> Correct sum of the observations = 10,000 − (92 + 8) + (192 + 88)

=> Correct sum of the observations = 10,000 − 100 + 280

=> Correct sum of the observations = 9900 + 280

=> Correct sum of the observations = 10,180.

∴ Correct Mean = $\frac{Correct\ sum\ of\ the\ observations}{Number\ of\ observations} = \frac{10180}{200}$ = 50.9

Q22) *The mean of 5 numbers is 27. If one more number is included, then the mean is 25. Find the included number.*

Solution:

We have:

Mean = Sum of five numbers ÷ 5

=> Sum of the five numbers = 27 x 5 = 135.

Now, New mean = 25

25 = Sum of six numbers ÷ 6

=> Sum of the six numbers = 25 x 6 = 150.

The included number = Sum of the six numbers − Sum of the five numbers

=> The included number = 150 − 135

=> The included number = 15.

Q23) *The mean of 75 numbers is 35. If each number is multiplied by 4, find the new mean.*

Solution:

Let $x_1, x_2, x_3 \ldots x_{75}$ be 75 numbers with their mean equal to 35. Then,

=> $35 = \dfrac{x_1 + x_2 + x_3 + \ldots + x_{75}}{75}$

$x_1 + x_2 + x_3 + \ldots + x_{75} = 35 \times 75$
=> $x_1 + x_2 + x_3 + \ldots + x_{75} = 2625$

The new numbers are $4x_1, 4x_2, 4x_3 \ldots 4x_{75}$. Let M be the arithmetic mean of the new numbers. Then,

M = $\dfrac{4x_1 + 4x_2 + 4x_3 + \ldots + 4x_{75}}{75}$

=> M = $\dfrac{4(x_1 + x_2 + x_3 + \ldots + x_{75})}{75}$

=> M = $\dfrac{4 \times 2625}{75}$

=> M = 140.

Exercise 23.2

Q1) A die was thrown 20 times and the following scores were recorded:

5, 2, 1, 3, 4, 4, 5, 6, 2, 2, 4, 5, 5, 6, 2, 2, 4, 5, 5, 1

Prepare the frequency table of the scores on the upper face of the die and find the mean score.

Solution:

The frequency table for the given data is as follows:

x:	1	2	3	4	5	6
f:	2	5	1	4	6	2

In order to compute the arithmetic mean, we prepare the following table:

Computation of Arithmetic Mean

Scores (x_i)	Frequency (f_i)	$x_i f_i$
1	2	2
2	5	10
3	1	3
4	4	16
5	6	30
6	2	12
Total	$\sum f_i = 20$	$\sum f_i x_i = 73$

We have, $\sum f_i = 20$ and $\sum f_i x_i = 73$

$\therefore$ Mean score $= \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{73}{20} = 3.65.$

Q2) *The daily wages (in Rs) of 15 workers in a factory are given below:*

200, 180, 150, 150, 130, 180, 180, 200, 150, 130, 180, 180, 200, 150, 180

Prepare the frequency table and find the mean wage.

Solution:

The frequency table for the given data is as follows:

Wages (x_i):	130	150	180	200
Number of workers (f_i):	2	4	6	3

In order to compute the mean wage, we prepare the following table:

Mean wages of the workers

x_i	f_i	$x_i f_i$
130	2	260
150	4	600
180	6	1080
200	3	600
Total	$\sum f_i = N = 15$	$\sum f_i x_i = 2540$

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{2540}{15} = 169.33.$

Q3) *The following table shows the weights (in kg) of 15 workers in a factory:*

Weight (in kg):	60	63	66	72	75
Numbers of workers:	4	5	3	1	2

Calculate the mean weight.

Solution:

Calculation of Mean

x_i	f_i	$x_i f_i$
60	4	240
63	5	315
66	3	198
72	1	72
75	2	150
Total	$\sum f_i = 15$	$\sum f_i x_i = 975$

$\therefore$ Mean Weight = $\dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{975}{15} = 65$ kg.

Q4) The ages (in years) of 50 students of a class in a school are given below:

Age (in years): 14 15 16 17 18

Numbers of students: 15 14 10 8 3

Find the mean age.

Solution:

Calculation of Mean

x_i	f_i	$x_i f_i$
14	15	210
15	14	210
16	10	160
17	8	136
18	3	54
Total	$\sum f_i = 50$	$\sum f_i x_i = 770$

∴ Mean Weight $= \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{770}{50} = 15.4$ yrs.

Q5) Calculate the mean for the following distribution:

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

Solution:

Calculation of Mean

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

∴ Mean $= \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{281}{40} = 7.025$.

Q6) Find the mean of the following data:

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

Solution:

Calculation of Mean

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

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{2650}{106} = 25.$

Q7) 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:

Calculation of Mean

x_i	f_i	$x_i f_i$
10	3	30
15	10	150
p	25	25p
25	7	175
35	5	175
Total	$\sum f_i = 50$	$\sum f_i x_i = 530 + 25p$

We have:

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

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

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

$\Rightarrow 25p = 1030 - 530$

$\Rightarrow p = \dfrac{500}{25}$

$\Rightarrow p = 20$

Q8) If the mean of the following data is 15, find p.

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

Solution:

Calculation of Mean

x_i	f_i	$x_i f_i$
5	6	30
10	p	10p
15	6	90
20	10	200
25	5	125
Total	$\sum f_i = 27 + p$	$\sum f_i x_i = 445 + 10p$

We have:

$\sum f_i = 27 + p$, $\sum f_i x_i = 445 + 10p$

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

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

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

$\Rightarrow 5p = 445 - 405$

$\Rightarrow p = \dfrac{40}{5}$

$\Rightarrow p = 8$.

Q9) 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:

Calculation of Mean

x_i	f_i	$x_i f_i$
8	12	96
12	16	192
15	20	300
p	24	24p
20	16	320
25	8	200
30	4	120
Total	$\sum f_i = N = 100$	$\sum f_i x_i = 1228 + 24p$

We have:

$\sum f_i = 100, \sum f_i x_i = 1228 + 24p$

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

$=> 16.6 = \dfrac{1228 + 24p}{100}$

$=> 1228 + 24p = 16.6 \times 100$

$=> 24p = 1660 - 1228$

$=> p = \dfrac{432}{24}$

$=> p = 18.$

Q10) 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:

Calculation of Mean

x_i	f_i	$x_i f_i$
5	2	10
8	5	40
10	8	80
12	22	264
p	7	7p
20	4	80
25	2	50
Total	$\sum f_i = N = 50$	$\sum f_i x_i = 524 + 7p$

We have:

$\sum f_i = 50, \sum f_i x_i = 524 + 7p$

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

=> $12.58 = \dfrac{524 + 7p}{50}$

=> $524 + 7p = 12.58 \times 50$

=> $7p = 629 - 524$

=> $p = \dfrac{105}{7}$

=> p = 15.

Q11) 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:

Calculation of Mean

x_i	f_i	$x_i f_i$
3	6	10
5	8	40
7	15	80
9	p	264
11	8	7p
13	4	80
Total	$\sum f_i = 41 + p$	$\sum f_i x_i = 303 + 9p$

We have:

$\sum f_i = 41 + p,\ \sum f_i x_i = 303 + 9p$

$\therefore$ Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

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

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

$\Rightarrow 1.32p = 314.88 - 303$

$\Rightarrow p = \dfrac{11.88}{1.32}$

$\Rightarrow p = 9.$

Q12) 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:

Calculation of Mean

x_i	f_i	$x_i f_i$
15	2	30
17	3	51
19	4	76
20 + p	5p	(20 + p) 5p
23	6	138
Total	$\sum f_i$ = 15 + 5p	$\sum f_i x_i$ = 295 + (20+p) 5p

We have:

$\sum f_i$ = 15 + 5p, $\sum f_i x_i$ = 295 + (20+p) 5p

$\therefore$ Mean = $\dfrac{\sum f_i x_i}{\sum f_i}$

=> 20 = $\dfrac{(295+(20+p)5p)}{15+5p}$

=> 295 + 100p + 5p^2 = 300 + 100p

=> 5p^2 = 300 − 295

=> 5p^2 = 5

=> p^2 = 1

=> p = 1.

Find the median of the following data (1-8)

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

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 10 (Even).

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1$ th observation

=> Median = $\frac{Value\ of\ 5^{th}\ observation + Value\ of\ 6^{th}\ observation}{2}$

=> Median = $\frac{45+54}{2}$ = 49.5

Hence, the median of the given data is 49.5.

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

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 10 (Even)

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1$ th observation

=> Median = $\frac{Value\ of\ 5^{th}\ observation + Value\ of\ 6^{th}\ observation}{2}$

=> Median = $\frac{94+100}{2}$ = 97

Hence, the median of the given data is 97.

Q3) *31, 38, 27, 28, 36, 25, 35, 40*

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 8 (Even).

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1^{th}$ observation

=> Median = $\frac{Value\ of\ 4^{th}\ observation + Value\ of\ 5^{th}\ observation}{2}$

=> Median = $\frac{31+35}{2}$ = 33

Hence, the median of the given data is 33.

Q4) *15, 6, 16, 8, 22, 21, 9, 18, 25*

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 9 (Odd).

=> Median = Value of $\frac{n+1}{2}th$ observation i.e., value of 5th observation = 16

Hence, the median of the given data is 16.

Q5) *41, 43,127, 99, 71, 92, 71, 58, 57*

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 9 (Odd).

∴ Median = Value of $\frac{9+1}{2}th$ observation i.e., the 5th observation = 71.

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

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 10 (Even).

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1$ th observation

=> Median = $\frac{Value\ of\ 5^{th}\ observation + Value\ of\ 6^{th}\ observation}{2}$

=> Median = $\frac{26+29}{2}$ = 27.5

Hence, the median of the given data is 27.5.

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

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 8 (Even).

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1$ th observation

=> Median = $\frac{Value\ of\ 4^{th}\ observation + Value\ of\ 5^{th}\ observation}{2}$

=> Median = $\frac{8+12}{2}$ = 10

Hence, the median of the given data is 10.

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

Solution:

Arranging the data in ascending order, we have:

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

Here, the number of observations, n = 10 (Even).

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2}+1^{th}$ observation

=> Median = $\frac{Value\ of\ 5^{th}\ observation+Value\ of\ 6^{th}\ observation}{2}$

=> Median = $\frac{67+69}{2}$ = 68

Hence, the median of the given data is 68.

Q9) Numbers 50, 42, 35, 2x +10, 2x − 8, 12, 11, 8, 6 are written in descending order and their median is 25, find x.

Solution:

Here, the number of observations n is 9. Since n is odd, the median is the $\frac{n+1}{2}th$ observation, i.e., the 5th observation.

As the numbers are arranged in the descending order, we therefore observe from the last.

Median = 5th observation.

=> 25 = 2x − 8

=> 2x = 25 + 8

=> 2x = 33

=> x = $\frac{33}{2}$

=> x = 16.5

Hence, x = 16.5.

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:

Arranging the given data in ascending order, we have:

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

Here, the number of observations n is 11 (odd).

Since the number of observations is odd, therefore,

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 6th observation = 58.

Hence, median = 58.

If 92 is replaced by 99 and 41 by 43, then the new observations arranged in ascending order are:

33, 35, 43, 46, 55, 58, 64, 77, 87, 90, 99

∴ New median = Value of the 6th observation = 58.

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:

Arranging the given data in ascending order, we have:

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

Here, the number of observations, n, is 9(odd).

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 5th observation = 61.

Hence, the median = 61.

If 58 is replaced by 85, then the new observations arranged in ascending order are:

41, 43, 57, 61, 71, 85, 92, 99, 12

New median = Value of the 5th observation = 71.

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:

Arranging the given data in ascending order, we have:

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

Here, the number of observations n is 15(odd).

Since the number of observations is odd, therefore,

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 8th observation = 35.

Hence, median = 35 kg.

If 44 kg is replaced by 46 kg and 27 kg by 25 kg, then the new observations arranged in ascending order are:

25, 28, 29, 30, 31, 32, 34, 35, 36, 37, 41, 42, 43, 45, 46

∴ New median = Value of the 8th observation = 35 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:

Here, the number of observations n is 10. Since n is even,

=> Median = $\frac{n}{2}th$ observation + $\frac{n}{2} + 1$ th observation

=> Median = $\frac{Value\ of\ 5^{th}\ observation + Value\ of\ 6^{th}\ observation}{2}$

=> 63 = $\frac{x+(x+2)}{2}$

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

=> 63 = $\frac{2(x+1)}{2}$

=> 63 = x + 1 => x = 63 − 1 => x = 62.

Q1) Find the mode and median of the data: 13, 16, 12, 14, 19, 12, 14, 13, 14

By using the empirical relation also find the mean.

Solution:

Arranging the data in ascending order such that same numbers are put together, we get:

12, 12, 13, 13, 14, 14, 14, 16, 19

Here, n = 9.

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 5th observation = 14.

Here, 14 occurs the maximum number of times, i.e., three times. Therefore, 14 is the mode of the data.

Now,

Mode = 3 Median − 2 Mean

=> 14 = 3 x 14 − 2 Mean

=> 2 Mean = 42 − 14 = 28

=> Mean = 28 ÷ 2 = 14.

Q2) Find the median and mode of the data: 35, 32, 35, 42, 38, 32, 34

Solution:

Arranging the data in ascending order such that same numbers are put together, we get:

32, 32, 34, 35, 35, 38, 42

Here, n = 7

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 4th observation = 35.

Here, 32 and 35, both occur twice. Therefore, 32 and 35 are the two modes.

Q3) Find the mode of the data: 2, 6, 5, 3, 0, 3, 4, 3, 2, 4, 5, 2, 4

Solution:

Arranging the data in ascending order such that same values are put together, we get:

0, 2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 6

Here, 2, 3 and 4 occur three times each. Therefore, 2, 3 and 4 are the three modes.

Q4) The runs scored in a cricket match by 11 players are as follows:

6, 15, 120, 50, 100, 80, 10, 15, 8, 10, 10

Find the mean, mode and median of this data.

Solution:

Arranging the data in ascending order such that same values are put together, we get:

6, 8, 10, 10, 15, 15, 50, 80, 100, 120

Here, n = 11

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 6th observation = 15.

Here, 10 occur three times. Therefore, 10 is the mode of the given data.

Now,

Mode = 3 Median − 2 Mean

=> 10 = 3 x 15 − 2 Mean

=> 2 Mean = 45 − 10 = 35

=> Mean = 35 ÷ 2 = 17.5

Q5) Find the mode of the following data:

12, 14, 16, 12, 14, 14, 16, 14, 10, 14, 18, 14

Solution:

Arranging the data in ascending order such that same values are put together, we get:

10, 12, 12, 14, 14, 14, 14, 14, 14, 16, 18

Here, clearly, 14 occurs the most number of times.

Therefore, 14 is the mode of the given data.

Q6) Heights of 25 children (in cm) in a school are as given below:

168, 165, 163, 160, 163, 161, 162, 164, 163, 162, 164, 163, 160, 163, 163, 164, 163, 160, 165, 163, 162

What is the mode of heights?

Also, find the mean and median.

Solution:

Arranging the data in tabular form, we get:

Height of Children (cm)	Tally Bars	Frequency
160	III	3
161	I	1
162	IIII	4
163	IIII IIII	10
164	III	3
165	III	3
168	I	1
Total		25

Here, n = 25

Median = Value of $\frac{n+1}{2} th$ observation = Value of the 13th observation = 163 cm.

Here, clearly, 163 cm occurs the most number of times. Therefore, the mode of the given data is 163 cm.

Mode = 3 Median − 2 Mean

=> 163 = 3 x 163 − 2 Mean

=> 2 Mean = 326

=> Mean = 163 cm.

Q7) The scores in mathematics test (out of 25) of 15 students are as follows:

19, 25, 23, 20, 9, 20, 15, 10, 5, 16, 25, 20, 24, 12, 20

Find the mode and median of this data. Are they same?

Solution:

Arranging the data in ascending order such that same values are put together, we get:

5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 25

Here, n = 15

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 8th observation = 20.

Here, clearly, 20 occurs most number of times, i.e., 4 times. Therefore, the mode of the given data is 20.

Yes, the median and mode of the given data are the same.

Q8) Calculate the mean and median for the following data:

Marks: 10   11   12   13   14   16   19   20

Number of students: 3   5   4   5   2   3   2   1

Using empirical formula, find its mode.

Solution:

Calculation of Mean

Marks (x_i)	10	11	12	13	14	16	19	20	Total
Number of Students (f_i)	3	5	4	5	2	3	2	1	$\sum f_i = 25$
$f_i x_i$	30	55	48	65	28	48	38	20	$\sum f_i x_i = 332$

Mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{332}{25} = 13.28$

Here, n = 25, which is an odd number. Therefore,

Median = Value of $\frac{n+1}{2}th$ observation = Value of the 13th observation = 13.

Now,

Mode = 3Median − 2 Mean

=> Mode = 3 (13) − 2 (13.28)

=> Mode = 39 − 26.56

=> Mode = 12.44.

Q9) The following table shows the weights of 12 persons.

Weight (in kg):	48	50	52	54	58
Number of persons:	4	3	2	2	1

Find the median and mean weights. Using empirical relation, calculate its mode.

Solution:

Weight (x_i)	48	50	52	54	58	Total
Number of Persons (f_i)	4	3	2	2	1	$\sum f_i = 12$
$f_i x_i$	192	150	104	108	58	$\sum f_i x_i = 612$

Mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{612}{12}$ = 51 kg.

Here, n = 12

Median = $\frac{n}{2} th$ observation + $\frac{n}{2} + 1^{th}$ observation

=> Median = $\frac{Value\ of\ 6^{th}\ observation + Value\ of\ 7^{th}\ observation}{2}$

=> Median = $\frac{50 + 50}{2}$ = 50 kg.

Now,

Mode = 3 Median − 2 Mean

=> Mode = 3 x 50 − 2 x 51

=> Mode = 150 − 102

=> Mode = 48 kg.

Thus, Mean = 51 kg, Median = 50 kg and Mode = 48 kg.