Chapter 5

Statistics

Ex 5.1

Question 1.
Fill in the blanks.

1. The mean of first ten natural numbers is _____
2. If the average selling price of 15 books is ₹ 235, then the total selling price is _____
3. The average of the marks 2, 9, 5, 4, 4, 8, 10 is _____
4. The average of integers between -10 to 10 is _____

Answers:

1. 5.5
2. 3,525
3. 6
4. 0

Question 2.
Ages of 15 students in 8th standard is 13, 12, 13, 14, 12, 13, 13, 14, 12, 13, 13, 14, 13, 12, 14.
Find the mean age of the students.

Solution:

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

$$= \frac{13+12+13+14+12+13+13+14+12+13+13+14+13+12+14}{15}$$

$$= \frac{195}{15} = 13$$

= 19515 = 13
Mean age of the students = 13

Question 3.
The marks of 14 students in a science test out of 50 are given below. 34, 23, 10, 45, 44, 47, 35, 37, 41, 30, 28, 32, 45, 39 Find
(i) the mean mark.

(ii) the maximum mark obtained.
(iii) the minimum mark obtained.

Solution:

$$\text{Mean marks} = \frac{\text{Sum of all marks}}{\text{Total number of marks}}$$

$$= \frac{34+23+10+45+44+47+35+37+41+30+28+32+45+39}{14}$$

$$= \frac{490}{14}$$

Mean marks = 35
(ii) Maximum mark obtained = 47
(iii) Minimum mark obtained = 10

Question 4.
The mean height of 11 students in a group is 150 cm. The heights of the students are 154 cm, 145 cm, Y cm, Y + 4 cm, 160 cm, 151 cm, 149 cm, 149 cm, 150 cm, 144 cm and 140 cm. Find the value of Y and the heights of two students.

Solution:

$$\text{Mean Height} = \frac{\text{Sum of heights of all students}}{\text{Number of students}}$$

$$150 = \frac{154+145+Y+(Y+4)+160+151+149+149+150+144+140}{11}$$

$150 = 1342+Y+Y+411$
$150 = 1346+2Y11$
$150 \times 11 = 1346 + 2Y$
$1650 = 1346 + 2Y$
$2Y = 1650 - 1346 = 304$
$Y = 3042 = 152$
Height of two students are Y and Y + 4
$\Rightarrow$ 152 and 152 + 4
$\Rightarrow$ 152 cm and 156 cm

Question 5.
The mean of runs scored by a cricket team in the last 10 innings is 276. If the scores are 235, 400, 351, x, 100, 315, 410,165, 260, 284, then find the runs scored in the fourth innings.
Solution:
Let the runs scored in the fourth innings be x.

$$\text{Mean runs scored} = \frac{\text{Total runs of all innings}}{\text{number of innings}}$$

$$276 = \frac{235+400+351+x+100+315+410+165+260+284}{10}$$

$$276 = \frac{2520+x}{10}$$

$276 \times 10 = 2520 + x$
$2760 = 2520 + x$
$x = 2760 - 2520 = 240$
∴ Number of runs scored in the fourth innings = 240

Question 6.
Find the mean of the following data. 5.1, 4.8, 4.3, 4.5, 5.1, 4.7, 4.5, 5.2, 5.4, 5.8, 4.3, 5.6,

Solution:

$$\text{Mean} = \frac{\text{Sum of all numbers}}{\text{Number of values}}$$

$$\frac{5.1+4.8+4.3+4.5+5.1+4.7+4.5+5.2+5.4+5.8+4.3+5.6+5.2+5.5}{14}$$

$$= \frac{70.0}{14} = 5$$

Mean = 5

Question 7.
Arithmetic mean of 10 observations was found to be 22. If one more observation 44 was to be added to the data, what would be the new mean?

Solution:
Arithmetic mean of 10 observation is 22.

$$\text{Arithmetic mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$22 = \frac{\text{sum of 10 observations}}{10}$$

$$\text{Sum of 10 observations} = 22 \times 10 = 220$$

Now if new number is added, then

$$\text{Mean of 11 observations} = \frac{\text{Sum of 10 observation} + 44}{11}$$

$= 220+4411 = 26411 = 24$
New mean = 24

Objective Type Questions

Question 1.
_____ is a representative value of the entire data.
(i) Mean
(ii) range
(iii) minimum value
(iv) maximum value

Answer:
(i) Mean

Question 2.
The mean of first fifteen even numbers is _____
(i) 4
(ii) 16
(iii) 5
(iv) 10

Answer:
(ii) 16

Hint:

$$\frac{2+4+6+....+30}{15} = \frac{2[1+2+3+....15]}{15} = 2 \times \frac{120}{15} = 16$$

Question 3.
The average of two numbers are 20. One number is 24, another number is _____
(i) 16
(ii) 26
(iii) 20
(iv) 40

Ans:
(i) 16

Hint:
$x+y2 = 20$
$x + y = 40$
$24 + y = 40$
$y = 40 - 24 = 16$

Question 4.
The mean of the data 12, x, 28 is 18. Find the value of x.
(i) 18
(ii) 16
(iii) 14
(iv) 22

Answer:
(iii) 14

Hint:
$12+x+283 = 18$
$x + 40 = 54$
$x = 14$

Ex 5.2

Question 1.
Find the mode of the following data. 2, 4, 5, 2, 6, 7, 2, 7, 5,4, 8, 6, 10, 3, 2, 4, 2.

Solution:
Arranging the given data in ascending order 2, 2, 2, 2, 2, 3, 4, 4, 4, 5, 5, 6, 6, 7, 7, 8, 10.
Here the number 2 occurs 5 times which is the maximum
∴ Mode of this data is 2.

Question 2.
The number of points scored by a Kabaddi team in 20 matches are
36, 35, 27, 28, 29, 31, 32, 31, 35, 38, 38, 31, 28, 31, 34, 33, 34, 31, 30, 29.
Find the mode of the points scored by the team.

Solution:
Arranging the given data in ascending order
27, 28, 28, 29, 29, 30, 31, 31, 31, 31, 31, 32, 33, 34, 34, 35, 35, 36, 38, 38.
Here the number 31 occurs 5 times which is the maximum.
∴ Mode of this data is 31.

Question 3.
The ages (in years) of 11 cricket players are given below.
25, 36, 39,38 40, 36, 25, 25, 38, o 26,36. Find the mode of the ages.

Solution:
Arranging the ages is ascending order: 25, 25, 25, 26, 36, 36, 36, 36, 38, 38, 39,

40.
The ages (in years) of 11 cricket players are given below. 25, 36, 39,38 40, 36, 25, 25, 38, o 26,36. Find the mode of the ages.
Arranging the ages is ascending order: 25, 25, 25, 26, 36, 36, 36, 36, 38, 38, 39, 40.
25 and 36 occurs maximum number of times.
∴ Mode is 25 and 36.

Question 4.
Find the mode of the following data.
12, 14, 12, 16, 15, 13, 14, 18, 19, 12, 14, 15, 16, 15, 16, 16, 15, 17, 13, 16, 16, 15, 15, 13, 15, 17, 15, 14, 15, 13, 15, 14.

Solution:
Tabulating the given data

Data	Tally marks	Frequency
12	|||	3
13	||||	4
14	𝍸	5
15	𝍸 𝍸	10
16	𝍸 |	6
17	||	2
18	|	1
19	|	1
	Total	**32**

The highest frequency is 10 which corresponds to the value 15.
Hence mode of this data is 15.

Objective Type Questions

Question 1.
The colors used by the six students for drawing is blue, orange, yellow, white, green and blue then the mode is _____
(i) blue
(ii) green
(iii) white
(iv) yellow
Answer:
(i) blue

Question 2.
Find the mode of data 3, 6, 9, 12, 15.
(i) 1
(ii) 2
(iii) 3
(iv) No mode

Answer:
(iv) No mode

Question 3.
Find the modes of the data 2, 1, 1, 3, 4, 5, 2.
(1) 1 and 5
(2) 2 and 3
(3) 2 and 1
(4) 1 and 4

Answer:
(3) 2 and 1

Ex 5.3

Question 1.
Fill in the blanks.

(i) The median of the data 12, 14, 23, 25, 34, 11, 42, 45, 32, 22, 44 is _____
(ii) The median of first ten even natural numbers is _____

Answers:
(i) 25
(ii) 11

Question 2.
Find the median of the given data: 35, 25, 34, 36, 45, 18, 28.

Solution:
Arranging the given data in ascending order 18, 25, 28, 34, 35, 36, 45.
Here the number of observations n = 7, which is odd.

$$\therefore \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{term} = \left(\frac{7+1}{2}\right)^{th} \text{term}$$

$$= \left(\frac{8}{2}\right)^{th} \text{term} = 4^{\text{th}} \text{ term}$$

Hence Median = 34

Question 3.
The weekly sale of motor bikes in a showroom for the past 14 weeks given below.
10, 6, 8, 3, 5, 6, 4, 7, 12, 13, 16, 10, 4, 7.
Find the median of the data.

Solution:
Arranging the given data in ascending order 3, 4, 4, 5, 6, 6, 7, 7, 8, 10, 10, 12, 13, 16.
Here number of data n = 14, which is even

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

$$= \frac{1}{2}\left\{\left(\frac{14}{2}\right)^{th} \text{term} + \left(\frac{14}{2}+1\right)^{th} \text{term}\right\}$$

$$= \frac{1}{2}\{7^{\text{th}} \text{ term} + 8^{\text{th}} \text{ term}\}$$

$$= \frac{1}{2}\{7+7\} = \frac{1}{2}(14) = 7$$

∴ Median = 7

Question 4.
Find the median of the 10 observations 36, 33, 45, 28, 39, 45, 54, 23, 56, 25. If another observation 35 is added to the above data, what would be the new median?

Solution:
Arranging the given 10 observations in ascending order 23, 25, 28, 33, 36, 39, 45, 45, 54, 56.
Here number of data n = 10, which is even

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

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

$$= \frac{1}{2}\{5^{th}\text{ term} + 6^{th}\text{ term}\} = \frac{1}{2}\{36+39\}$$

$$= \frac{1}{2}(75) = 37.5$$

∴ Median = 37.5
If 35 is added to the above data then it will be the 5th term then number of data n = 11, odd
∴ Median = $(n+12)^{th}$ term = $(11+12)^{th}$ term
= $(122)^{th}$ term = 6th term
New median = 36

Objective Type Questions

Question 1.
If the median of a, 2a, 4a, 6a, 9a is 8, then find the value of a is
(i) 8
(ii) 6
(iii) 2
(iv) 10

Answer:
(iii) 2

Hint:

Hint : $a, 2a, 4a, 6a, 9a$

$$\text{Median} = 4a = 8$$
$$a = 2$$

Median = 4a = 8
a = 2

Question 2.
The median of the data 24, 29, 34, 38, 35 and 30, is _____
(i) 29
(ii) 30
(iii) 34
(iv) 32

Answer:
(iv) 32

Hint:
~~24~~ , ~~29~~ , 30, 34, ~~35~~ , ~~38~~

$$\text{Median} = \frac{30+34}{2} = \frac{64}{2} = 32$$

Median = 30+342
= 642
= 32

Question 3.
The median first 6 odd natural numbers is
(i) 6
(ii) 7
(iii) 8
(iv) 14

Answer:
(i) 6

Hint:
~~1~~ , ~~3~~ , 5, 7, ~~9~~ , ~~11~~

$$\text{Median} = \frac{5+7}{2} = \frac{12}{2} = 6$$

Median = 5+7/2
= 12/2
= 6

Ex 5.4

Miscellaneous Practice problems

Question 1.
Arithmetic mean of 15 observations was calculated as 85. In doing so an observation was wrongly taken as 73 for 28. What would be correct mean?

Solution:

$$\text{Arithmetic mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$85 = \frac{\text{Sum of 15 observation}}{15}$$

$85 \times 15 =$ sum of 15 observations
$1275 =$ sum of 15 observations
Wrong observation $= 73$
Correct observation $= 28$

$$\therefore \text{Correct Mean} = \frac{\text{Sum} - \text{Wrong value} + \text{Correct value}}{\text{Number of obervation}}$$

$$= \frac{1275 - 73 + 28}{15} = \frac{1202 + 28}{15} = \frac{1230}{15} = 82$$

Correct mean $= 82$

Question 2.
The median of 25,16,15,10, 8, 30.

Solution:
Arranging is ascending order : 8, 10, 15, 16, 25, 30
Here n = 6, even

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

$$= \frac{1}{2}\left\{\left(\frac{6}{2}\right)^{th} \text{term} + \left(\frac{6}{2}+1\right)^{th} \text{term}\right\}$$

$$= \frac{1}{2}\{3^{rd} \text{ term} + 4^{th} \text{ term}\} = \frac{1}{2}\{15 + 16\} = \frac{1}{2}(31) = 15.5$$

$\therefore$ Median $= 15.5$

Question 3.
Find the mode of 2, 5, 5, 1, 3, 2, 2, 1, 3, 5, 3.

Solution:
Arranging the data in ascending order: 1, 1, 2, 2, 2, 3, 3, 3, 5, 5, 5
Here 2, 3 and 5 occurs 3 times each.
Which is the maximum number of times.
$\therefore$ Mode is 2, 3 and 5.

Question 4.
The marks scored by the students in social test out of 20 marks are as follows.
12, 10, 8, 18, 14, 16. Find the mean and the median?

Solution:
Arranging the given data in ascending order: 8, 10, 12, 14, 16, 18.

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

$$= \frac{8+10+12+14+16+18}{6} = \frac{78}{6}$$

$$\text{Mean} = 13$$

There are n = 6 observations, which is even

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

$$= \frac{1}{2}\left\{\left(\frac{6}{2}\right)^{th} \text{term} + \left(\frac{6}{2}+1\right)^{th} \text{term}\right\}$$

$$= \frac{1}{2}\{3^{th} \text{ term} + 4^{th} \text{ term}\}$$

$$= \frac{1}{2}\{8 + 18\} = \frac{1}{2}(26) = 13$$

Question 5.
The number of goals scored by a football team is given below.
Find the mode and median for the data of 2 ,3, 2, 4, 6, 1, 3, 2, 4, 1, 6.

Solution:
Arranging the given data in ascending order: 1, 1, 2, 2, 2, 3, 3, 4, 4, 6, 6
Clearly 2 occurs at the maximum of 3 times and so mode = 2
Here number of data of data n = 11, odd.
∴ Median = $(n+12)^{th}$ term
= $(11+12)^{th}$
term = $(122)^{th}$ term
= 6^{th} term
Median = 3

Question 6.
Find the mean and mode of 6, 11, 13, 12, 4, 2.

Answer:
Arranging is ascending order : 2, 4, 6, 11, 12, 13

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

$$= \frac{2+4+6+11+12+13}{6}$$

$$\text{Mean} = \frac{48}{6} = 8$$

Mean = 486 = 8
All observation occurs only once and so there is no mode for this date.

Challenge Problems

Question 1.
The average marks of six students is 8. One more student mark is added and the mean is still 8. Find the student mark that has been added.

Solution:

$$\text{Average} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$8 = \frac{\text{Sum of observation}}{6}$$

Sum of observation = 6 × 8 = 48
If one more mark is added then number of observations = 6 + 1 = 7
Let the number be x
Still average = 8
∴ 8 = 48+x7
48 + x = 7 × 8
48 + x = 56
48 + x = 56 – 48
x = 8
∴ The number that is added = 8

Question 2.
Calculate the mean, mode and median for the following data: 22, 15, 10, 10, 24, 21.

Solution:
Arranging in ascending order: 10, 10, 15, 21, 22, 24

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

$$= \frac{10+10+15+21+22+24}{6}$$

$$= \frac{102}{6} = 17$$

Here n = 6, even

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

$$= \frac{1}{2}\left\{\left(\frac{6}{2}\right)^{th} \text{term} + \left(\frac{6}{2}+1\right)^{th} \text{term}\right\}$$

$$= \frac{1}{2}\{3^{\text{th}} \text{ term} + 4^{\text{th}} \text{ term}\} = \frac{1}{2}\{15+21\}$$

$$= \frac{1}{2}(36)$$

∴ Median = 18

Clearly the data 10 occurs maximum number of times and so 10 is the mode.

∴ Mode = 10

Question 3.

Find the median of the given data: 14, -3, 0, -2, -8, 13, -1, 7.

Solution:

Arranging the data is ascending order: -8, -3, -2, -1, 0, 7, 13, 14

Here number of data n = 8, even

∴ Median

$$= \frac{1}{2}\left\{\left(\frac{n}{2}\right)^{th} \text{term} + \left(\frac{n}{2}+1\right)^{th} \text{term}\right\}$$

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

$$= \frac{1}{2}\{4^{\text{th}} \text{ term} + 5^{\text{th}} \text{ term}\}$$

$$= \frac{1}{2}\{-1+0\} = \frac{1}{2}(-1) = -0.5$$

∴ Median = – 0.5

Question 4.

Find the mean of first 10 prime numbers and first 10 composite numbers.

Solution:

First 10 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

$$\text{Mean} = \frac{\text{Sum of all data}}{\text{number of data}}$$

$$= \frac{2+3+5+7+11+13+17+19+23+29}{10}$$

$$= \frac{129}{10}$$

Mean = 12.9

Mean of first 10 prime numbers = 12.9

First 10 composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18

$$\text{Mean} = \frac{4+6+8+9+10+12+14+15+16+18}{10}$$

$$= \frac{112}{10}$$

$$= 11.2$$

Mean of first 10 composite numbers = 11.2