Chapter 20

Statistics

1. find the mean of 8,6,10,12,1,3,4,4.

Solution

Given data ,

8,6,10,12,1,3,4,4

Here , n = 8

∴ mean $(\bar{x})$

$$\sum \frac{x_i}{n} = \frac{8+6+10+12+1+3+4+4}{8}$$

$$= \frac{48}{8} = 8$$

Therefore, mean of the given data is 8

2. 5 people were asked about the time in a week they spend in doing social work in their community . they replied 10, 7, 13, 20 and 15 hrs, respectively . find the mean time in a week devoted by them for social work.

Solution

Given data,

10,7,13,20,15

Here , n = 5

∴ mean $(\bar{x})$

$$\sum \frac{x_i}{n} = \frac{10+7+13+20+15}{5}$$

$$= \frac{65}{5} = 13$$

Therefore, the mean time in a week devoted by them for social work is 8 hours.

3. the enrolment of a school during six consecutive years was as follows :

1620, 2060, 2540 , 3250, 3500,3710

Find the mean enrolment

Solution
Given data ,
1620, 2060, 2540, 3250, 3500, 3710

Here , n = 6
∴ mean $(\bar{x})$
$$\sum \frac{x_i}{n} = \frac{1620 + 2060 + 2540 + 3250 + 3500 + 3710}{5}$$

$$= \frac{16680}{6} = 2780$$

Therefore , the mean enrolment is 2780.

4. find the mean of the first twelve natural numbers.

Solution
The first twelve natural numbers are : 1,2,3,4,5,6,7,8,9,10,11,12
Here n = 12
∴ mean $(\bar{x})$
$$\sum \frac{x_i}{n} = \frac{1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12}{12}$$

$$= \frac{78}{12} = 6.5$$

Therefore, the mean of the first twelve natural numbers is 6.5

5. (i) find the mean of the first six prime numbers.
(ii) find the mean of the first seven odd prime numbers.

Solution
(i) first 6 prime numbers are 2,3,5,7,11,13
Here , n = 6
∴ mean $(\bar{x})$
$\sum \frac{x_i}{n} = \frac{2+3+5+7+11+13}{6}$

$= \frac{41}{6}$
Therefore , the mean of the first six prime numbers is $\frac{41}{6}$

(ii) first seven odd prime numbers are 3, 5, 7, 11,13,17,19
Here ,n = 7
∴ mean $(\bar{x})$
$\sum \frac{x_i}{n} = \frac{3+5+7+11+13+17+19}{7}$
$= \frac{75}{7}$
Therefore, the mean of the first six prime numbers is $\frac{75}{7}$

6. (i) the marks (out of 100) obtained by a group of students in a mathematics test are 81, 72, 90, 90 , 85, 86, 70, 93 and 71. Find the mean marks obtained by the group of students.

(ii) the mean of the age of three students vijay , rahul and rakhi is 15 years. If their ages are in the ratio 4 : 5: 6 respectively , then find their ages.

Solution

(i) the marks obtained by the groups of students are :

81, 72, 90 , 90 , 85 , 86 , 70 , 93, 71

Here , n = 9

$\therefore$ mean $(\bar{x})$

$$\sum \frac{x_i}{n} = \frac{81+ 72+ 90 + 90 + 85 + 86 + 70 + 93+71}{9}$$

$$\frac{738}{9} = 82$$

Therefore , the mean marks obtain by the group of students is 82.

(ii) given , the mean of the age of three students vijay, rahul and rakhi is 15 years.

So , n = 3

Now , the sum of ages of the 3 students = $15 \times 3 = 45$

Also given , ratio of their ages is 4 : 5: 6

Sum of ratios = 4+5+6 = 15

Hence,

Vijays's age = $\frac{45}{15} \times 4 = 12$ years

Rahul's age = $\frac{45}{15} \times 5 = 15$ years

Rakhi' s age = $\frac{45}{15} \times 6 = 18$ years

7. the mean of 5 numbers is 20 . if one number is excluded , mean of the remaining numbers becomes 23. Find the excluded number.

Solution

Given ,
The mean of 5 numbers = 20
So, the total sum of the numbers = 20 × 5 = 100
After excluding one number,
The mean of the remaining 4 numbers = 23
So , the total sum of these numbers = 23 × 4 = 92
Hence
The excluded number is = 100 – 92 = 8

8 . the mean of 25 observations is 27 . if one observation is included , the mean still remains 27 . find the includes observation.

Solution

Given,
The mean of 25 observation is 27.
So,
The total sum of all the 25 observations = 27× 25 = 675
After one observation is includes,

Now the mean of 26(25+1) numbers = 27
So,
The total sum of all the 26 observations = 27× 26 = 702

Hence,
The included observation = 702 – 675 = 27

9 . the mean of observations is 15 . if the mean of first three observations is 14 and that

Of the last three is 17 , find the third observation .

Solution

Given
The mean of 5 observation = 15
So total sum of the 5 observation = $15 \times 5 = 75$

Also given,
Mean of first 3 observations = 14
So , the sum of the 3 observations = $14 \times 3 = 42$

And the mean of last 3 observations = 17
So , the sum of last 3 observation = $17 \times 3 = 51$

Thus , the total of 3 +3 observation = 42 + 51 = 93

Hence ,
The third observation = 93 – 75 = 18.

10. the mean of 8 variant is 10.5. if seven of them are 3, 15, 7, 19, 2, 17 and 8 then find The 8^{th} variant.

Solution :
Given ,
Seven out of eight variants are : 3 , 15 , 7 , 19 , 2 , 17 and 8
Mean of 8 variants = 10.5

So the total of 8 variants = $10.5 \times 8 = 84$
Now ,

Sum of seven variants = (3+ 15+ 7 +19 +2 +17 + 8) = 71

Hence ,
The 8^{th} variant = 84 – 71 = 13 .

11. the mean weight of 8 students is 45.5 kg. Two more students having weight 41.7 kg and 53.3 kg join the group . what is the new mean weight ?

Solution
Given ,
The mean weight of 8 students = 45.5 kg
So, the total weight of 8 students = $45.5 \times 8 = 364$ kg

Weight of two more students are 41.7 kg and 53.3 kg
Now,
The total weight of 10(8+2) students = 364 + 41.7 + 53.3
= 364 + 95
= 459 kg

Hence the new mean weight of all the 10 students = $\frac{459}{10} =$ $45.9\ kg$

12. mean of 9 observations was found to be 35 . later on , it was detected that an observation 81 was misread as 18 . find the correct mean of the observations.

Solution
Given ,
Mean of 9 observation = 35
So, the sum of all 9 observations = $35 \times 9 = 315$
Now, the difference due to misread = 81 – 18 = 63
Thus, the actual sum = 315 + 63 = 378

Hence ,

The actual mean = $\frac{378}{9}$ = 42

13. a student scored the following marks in 11 questions of a question paper :
7,3,4,1,5,8,2,2,5,7,6.

Find the median marks.

Solution

Given ,

Marks scored in 11 questions of a question paper by the student are :

7,3,4,1,5,8,2,2,5,7,6

Arranging it in descending order, we have

1,2,2,3,4,5,5,6,7,7,8

Here, n = 11 which is odd

$\therefore$ median = $\frac{n+2}{2}$ th term

= $\frac{11+1}{2} = \frac{12}{2}$ =6^{th} term i.e. 5

Hence , the median mark is 5

14. In a science test given to a group of students , the marks scored by them (out of 100) are
1,39,52,48,54,62,46,52,40,96,42,40,98,60,52

Find the mean and median of this data.

Solution

On arranging the marks obtained by the students , we have

39, 40, 40, 41, 42,46, 48, 52,52,52, 54, 60 , 62, 96, 98
Here, n = 15 which is odd

$\therefore$ mean $(\bar{x})$

$$\sum \frac{x_i}{n} = \frac{39 + 40 + 40 + 41 + 42 + 46 + 48 + 52 + 52 + 52 + 54 + 60 + 62 + 96 + 98}{15}$$

$$= \frac{822}{15} = 54.8$$

And

Median = $\frac{15+1}{2}$ th term

$= \frac{16}{2} = 8^{th}$ term i.e. 52

Therefore, for the given data mean = 54.8 and median = 52 .

15. the points scored by a kabaddi team in a series of matches are as follow

17,2,5,27,15,8,14,10,48,10,7,24,8,28,18

Find the mean and the median of the points scored by the kabaddi
Team

Solution
Lets arrange the given data in descending order :
2, 5, 7,7,8,8,10,10,14,15,17,18,24,27,28, 48

Here , n = 16 when is even

$\therefore$ mean $(\bar{x})$

$$\sum \frac{x_i}{n} = \frac{2 + 5 + 7 + 7 + 8 + 8 + 10 + 10 + 14 + 15 + 17 + 18 + 24 + 27 + 28 + 48}{15}$$

$= \frac{248}{16} = 15.5$

And ,

Median $= \frac{1}{2}\left(\frac{16}{2}\right) th\ \ term + \left(\frac{16}{2} + 1\right) th\ \ term$

$= \frac{1}{2}(8th\ term + 9th\ term)$

$= \frac{1}{2}(10 + 14)$

$= \frac{1}{2} \times 24 = 12$

Therefore the mean and the median of the points scored by the kabaddi team are 15.5 and 14 respectively .

16. the following observation have been arranged in ascending order. If the medianThe data is 47.5 , find the value of x
17, 21 ,23, 29, 39 , 40 , x, 50 , 51, 54 , 59 , 67, 91, 93

Solution

Given data
17, 21 ,23, 29, 39 , 40 , x, 50 , 51, 54 , 59 , 67, 91, 93
Here , n = 14 which is even
As the given data is arranged in descending order
Median $= \frac{1}{2}\left[\frac{14}{2}\ th\ term + \frac{14}{2} + 1\ th\ term\right]$

$= \frac{1}{2}\ (7th\ term + 8th\ term)$
$= 47.5\ = \frac{1}{2}(x + 50)$

95 = x + 50
X = 95 – 50 = 45
Hence the value of x is 45.

17. the following observations have been arranged in ascending order. If the median
The data is 13 , find the value of x.
3,6,7,10, x , x +4 , 19 , 20 ,25 , 28

Solution
Given observations in ascending order,
3,6,7,10, x , x +4 , 19 , 20 ,25 , 28
Here , n = 10 which is even and median = 13
So,
Median = $\frac{1}{2}\left[\frac{10}{2}th\ term + \frac{10}{2} + 1th\ term\right]$
= $\frac{1}{2}(5th\ term + 6th\ term)$

= $\frac{1}{2}\ (x + x + 4)$

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

= x + 2

= x + 2 = 13
X = 13 -2 = 11

Hence ,the value of x is 11

18. state which of the following variables are continuous and which are discrete:

(i) marks scored (out of 50) in a test .
(ii) daily temperature of your city.
(iii) sizes of shoes
(iv) distance travelled by a man .
(v) time

Solution
(i) discrete
(ii) continuous
(iii) discrete
(iv) continuous
(v) continuous

19 . a explain the meaning of the following terms:
(i) variants
(ii) class size
(iii) class marks
(iv) class limits
(v) true class limits
(vi) frequency of a class
(vii) cumulative frequency of a class

Solution
(i) variant : a particular value of a variable is called variate.

(ii) class size : the difference between the actual upper limit and the actual lower limit of a class is called its class size.

(iii) class mark : the class mark of a class is the value midway between its actual lower limit and actual upper limit.

(iv) class limits : in the frequency table the class interval is called class limits.

(v) true class limits : in a continuous distribution , the class limits are called true or actual class limits.

(vi) frequency of a class : the number of tally marks opposite to a variant is its frequency and it is written in the next column opposite to tally marks of the variate .

(vii) cumulative frequency of a class : the sum of frequency of all previous classes and that particular class is called the cumulative frequency of the class.

20 . fill in the blanks:

(i) the number of observations in a particular class is called .....of the class.
(ii) the difference between the class marks of two consecutive classes is the .... of the class.
(iii) the range of the data 16, 19 , 23,13,11, 25,18 is ...
(iv) the mid point of the class interval is called its .....
(v) the class mark of the class 4 -9 is ....

Solution :
(i) the number of observation in a particular class is called frequency of the class

(ii) the difference between the class marks of two consecutive classes the size of the class.

(iii) the range of the date 16,19,23,13,11,25,18 is 14.

(iv) the mid point of the class interval is called its class marks .

(v) the class mark of the class 4 – 9 is 6.5 $\left[\text{class mark } = \frac{4+9}{2} = \frac{13}{2} = 6.5\right]$

21. the marks obtained (out of 50) by 40 students in a test are given below:

28, 31, 45, 03, 05, 18, 35, 46, 49, 17,10, 28, 31, 36, 40, 44, 47, 13,19, 25, 24, 31, 38 , 32 , 27 , 19 , 25, 28, 48 , 15 , 18 , 31 , 37 , 46, 06, 01, 20, 10 , 45, 02 .

(i) taking class intervals 1 – 10 , 11 – 20 ,.... , construct a tally chart and a frequency distribution table .

(ii) convert the above distribution to continuous distribution.

(iii) state the true class limits of the third class.

(iv) state the class mark of the fourth class.

Solution :

(i) A tally chart and a frequency distribution of given data is

class	tally	frequency
1-10	𝍸 ||	7
11-20	𝍸 |||	8
21-30	𝍸 ||	7
31-40	𝍸 𝍸	10
41-50	𝍸 |||	8

(ii) converting the above distribution to continuous distribution.

class	tally	frequency
0.5-10.5	𝍸 ||	7
10.5 – 20.5	𝍸 |||	8
20.5 – 30.5	𝍸 ||	7
30.5 – 40.5	𝍸 𝍸	10
40.5 – 50.5	𝍸 |||	8

(iii) the true class limits of the third class = lower limit = 20.5 and upper limit = 30.5

(iv) the class mark of the fourth class $\frac{31+40}{2} = \frac{71}{2} = 35.5$

22. the water bills (in rupees) of 32 houses in a locality are given below. Construct a frequency distribution table with a class size of 10 .

80, 48 , 52 , 78 ,103, 85, 37 , 94, 72, 73, 66, 52, 92, 85, 78, 81, 64, 60, 75, 78, 108, 63, 71, 54, 59, 75, 100, 103, 35, 89, 95, 73.

Solution

A frequency distribution with a class size of 10 is follows :

class	Tally mark	frequency
30 – 40	||	2
40 – 50	|	1
50 – 60	||||	4
60 –70	||||	4
60 – 80	𝍸 |||	9
80 – 90	𝍸|	5
90 – 100	|||	3
100 – 110	||||	4