

IX Homework-15 (STATISTICS)

- 1) Find the mode of the following marks (out of 10) obtained by 20 students :
- 4, 6, 5, 9, 3, 2, 7, 7, 6, 5, 4, 9, 10, 10, 3, 4, 7, 6, 9, 9
- 2) For what value of x , the mode of the following data is 5?
- 2, 4, 3, 5, 4, 5, 6, 4, 7, 5, $x-4$
- 3) 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.
- 4) In a mathematics test given to 15 students, the following marks (out of 100) are recorded.
- 41, 39, 48, 52, 46, 62, 54, 40, 42, 96, 52, 98, 40, 52, 60
- Find the mean, median and mode of this data.
- 5) Find the median of the following data :
- 19, 25, 59, 48, 35, 31, 30, 32, 51
- If 25 is replaced by 52 and 48 is replaced by 84, find the new median.
- 6) The mean of the following distribution is 50.
- | | | | | | |
|-----|----|--------|----|---------|----|
| x | 10 | 30 | 50 | 70 | 90 |
| f | 17 | $5a+3$ | 32 | $7a-11$ | 19 |
- Find the value of a and hence the frequencies of 30 and 70
- 7) Find the value of p , if the mean of the following distribution is 20.
- | | | | | | |
|-------|----|----|----|--------|----|
| x_i | 23 | 17 | 15 | $20+p$ | 19 |
| f_i | 6 | 3 | 2 | $5p$ | 4 |
- 8) The mean marks (out of 100) of boys and girls in an examination are 70 and 73 respectively. If the mean mark of all the student in that examination is 71, find the ratio of the number of boys to the number of girls.
- 9) The mean of 31 results is 60. If the mean of the first 16 results is 58 and that of the last 16 results is 62, find the 16th result.
- 10) The mean of 5 numbers is 18. The one number is excluded, their mean is 16, find the excluded number
- 11) If the mean of five observations $x, x+2, x+4, x+6, x+8$

- is 11, find the mean of first three observations
- 12) The mean of 16 numbers is 8. If 2 added to every number, what will be the new mean?
- 13) The mean of 10 numbers is 20. If 5 is subtracted from every number, what will be the new mean?
- 14) The mean of 6, 4, 7, p and 10 is 8, find the value of p .
- 15) If the mean of the observations $x, x+2, x+4, x+6, x+8$ is 11, then find the value of x .
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Marks	Frequency
2	1
3	2
4	3
5	2
6	3
7	3
9	4
10	2

\therefore Mode = 9, the most frequently occurring mark
i.e., 4 times

2) Since mode is 5, it is the most frequently occurring observation.

$$\begin{aligned} \text{Thus } x - 4 &= 5 \\ \Rightarrow x &= \underline{\underline{9}} \end{aligned}$$

3) $n = 10$, even

$$\text{median} = \frac{1}{2} \left[\left(\frac{n}{2} \right)^{\text{th}} + \left(\frac{n}{2} + 1 \right)^{\text{th}} \text{ observation} \right]$$

$$\Rightarrow 63 = \frac{1}{2} \left[5^{\text{th}} + 6^{\text{th}} \text{ observation} \right]$$

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

$$\Rightarrow 2x + 2 = 126$$

$$\Rightarrow 2x = 124$$

$$\therefore x = \underline{\underline{62}}$$

$$\begin{aligned} 4) \text{ mean, } \bar{x} &= \frac{\sum x_i}{n} = \frac{41 + 39 + 48 + 52 + 46 + 62 + 54 + 40 + 42 + 96 + 52 + 98 + 40 + 52 + 60}{15} \\ &= \frac{822}{15} = \underline{\underline{54.8}} \end{aligned}$$

On arranging the observations in ascending order,
39, 40, 41, 42, 46, 48, 52, 52, 52, 54, 60, 62, 96, 98
 $n = 15$, odd

$$\text{median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ observation} = \left(\frac{15+1}{2}\right)^{\text{th}} \text{ observation}$$

$$= 8^{\text{th}} \text{ observation} = \underline{\underline{52}}$$

Mode = 52, most frequently occurring observation
i.e., 3 times.

5) On arranging in ascending order,
19, 25, 30, 31, 32, 35, 48, 51, 59
 $n = 9$, odd

$$\text{median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ observation} = \left(\frac{9+1}{2}\right)^{\text{th}} \text{ observation}$$

$$= 5^{\text{th}} \text{ observation} = \underline{\underline{32}}$$

When replaced, the observations are

19, 52, 30, 31, 32, 35, 84, 51, 59

On arranging in ascending order,

19, 30, 31, 32, 35, 51, 52, 59, 84

$n = 9$, odd

$$\text{median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ observation} = 5^{\text{th}} \text{ observation}$$

$$= \underline{\underline{35}}$$

x_i	f_i	$x_i f_i$
10	17	170
30	$5a+3$	$150a+90$
50	32	1600
70	$7a-11$	$490a-770$
90	19	1710
	$60+12a$	$2800+640a$

$$\sum f_i = 60 + 12a$$

$$\sum x_i f_i = 2800 + 640a$$

$$\text{mean, } \bar{x} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\Rightarrow 50 = \frac{2800 + 640a}{60 + 12a}$$

$$\Rightarrow 3000 + 600a = 2800 + 640a$$

$$\Rightarrow -40a = -200$$

$$a = 5 //$$

Frequency of 30

$$= 5 \times 5 + 3 = 28$$

Frequency of 70

$$= 7 \times 5 - 11$$

$$= 24$$

x_i	f_i	$x_i f_i$
23	6	138
17	3	51
15	2	30
$20+p$	$5p$	$100p+5p^2$
19	4	76
	$\Sigma f_i = 15+5p$	$\Sigma x_i f_i = 295+5p^2+100p$

$$\bar{x} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \frac{295+5p^2+100p}{15+5p}$$

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

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

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

$$\therefore p^2 = 1$$

$$p = \pm 1$$

p cannot be -ve, \therefore required value of $p = 1$

8) Let the no. of boys be x and no. of girls be y .

$$\bar{x}_{\text{boys}} = 70 \quad ; \quad \bar{x}_{\text{girls}} = 73 \quad ; \quad \bar{x}_{\text{all students}} = 71$$

$$\text{Combined mean} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

$$\Rightarrow 71 = \frac{x \times 70 + y \times 73}{x + y}$$

$$\Rightarrow 71x + 71y = 70x + 73y$$

$$\Rightarrow 71x - 70x = 73y - 71y$$

$$\Rightarrow x = 2y$$

$$\therefore \frac{x}{y} = \frac{2}{1}$$

Hence the required ratio is 2:1

9) $\bar{x}_{31} = 60 \Rightarrow x_1 + x_2 + x_3 + \dots + x_{31} = 31 \times 60$

$\bar{x}_{16} = 58 \Rightarrow x_1 + x_2 + \dots + x_{16} = 16 \times 58$

$$x_{16} + x_{17} + \dots + x_{31} = 16 \times 62$$

$$\begin{aligned} \therefore 16^{\text{th}} \text{ result} &= 16 \times 62 + 16 \times 58 - 31 \times 60 \\ &= 992 + 928 - 1860 \\ &= 1920 - 1860 = \underline{\underline{60}} \end{aligned}$$

$$10) \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5} = 18$$

$$\Rightarrow x_1 + x_2 + x_3 + x_4 + x_5 = 90$$

$$\text{Given, } \frac{x_1 + x_2 + x_3 + x_4}{4} = 16$$

$$\Rightarrow x_1 + x_2 + x_3 + x_4 = 64$$

$$\therefore \text{The excluded number} = 90 - 64 = \underline{\underline{26}}$$

$$11) \bar{x} = \frac{\sum x_i}{n}$$

$$\frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} = 11$$

$$5x + 20 = 55$$

$$5x = 35$$

$$x = \underline{\underline{7}}$$

First 3 observations are 7, 9 and 11

$$\therefore \text{mean} = \frac{7+9+11}{3} = \frac{27}{3} = \underline{\underline{9}}$$

$$12) \bar{x} = \frac{\sum x_i}{n}$$

$$\Rightarrow \frac{x_1 + x_2 + \dots + x_{16}}{16} = 8$$

$$\Rightarrow x_1 + x_2 + \dots + x_{16} = 128$$

When 2 is added, $(x_1 + 2) + (x_2 + 2) + \dots + (x_{16} + 2)$

$$\Rightarrow (x_1 + x_2 + \dots + x_{16}) + (2 + 2 + \dots \text{16 times})$$

$$\Rightarrow 128 + 2 \times 16$$

$$= 128 + 32 = 160$$

$$\therefore \text{New mean} = \frac{160}{16} = \underline{\underline{10}}$$

$$13) \quad \bar{x} = \frac{\sum x_i}{n}$$

$$\Rightarrow \frac{x_1 + x_2 + \dots + x_{10}}{10} = 20$$

$$\Rightarrow x_1 + x_2 + \dots + x_{10} = 200$$

$$\begin{aligned} \text{When 5 is subtracted, } & (x_1 - 5) + (x_2 - 5) + \dots + (x_{10} - 5) \\ &= (x_1 + x_2 + \dots + x_{10}) - (5 + 5 + \dots + 5 \text{ 10 times}) \\ &= 200 - 5 \times 10 \\ &= 200 - 50 \\ &= 150 \end{aligned}$$

$$\therefore \text{New mean} = \frac{150}{10} = \underline{\underline{15}}$$

$$14) \quad \bar{x} = \frac{\sum x_i}{n}$$

$$\Rightarrow \frac{6 + 4 + 7 + p + 10}{5} = 8$$

$$\Rightarrow 27 + p = 40$$

$$\therefore p = 40 - 27 = \underline{\underline{13}}$$

$$15) \quad \bar{x} = \frac{\sum x_i}{n}$$

$$\Rightarrow \frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} = 11$$

$$\Rightarrow 5x + 20 = 55$$

$$\Rightarrow 5x = 35$$

$$\therefore x = \underline{\underline{7}}$$