

EXERCISE

1/ For the following discrete data set find:

(i) The Mean (ii) Mode (iii) The Median

(iv) Variance (v) Standard Deviation

(vi) lower Quartile (vii) Interquartile Range.

$$S = \{ 3, 2, 3, 4, 2, 2, 5 \}$$

2/ For the following frequency distribution

find (i) The Mean (ii) The Mode

(iii) Standard Deviation.

x	1	2	3	4
f	6	4	5	2

3/ For the following Grouped frequency diagram

find (i) The Mean (ii) Modal Class (iii) Variance.

(iv) SD.

overtime hours	f
1 - 3	5
4 - 6	2
7 - 9	3
10 - 12	4

- 4/ The results from an experiment relating two variables x and y are as follows.

x	1	2	3	4	5
y	1.2	2.8	4.9	6.8	9.4

Calculate (i) The least Squares Regression line for y on x .

(ii) Pearson's product moment Correlation for this data.

- 5/ 2 Competitors rank eight photographs in a Competition as follows:

Photograph	A	B	C	D	E	F	G	H
1st Competitor	2	5	3	6	1	4	7	8
2nd Competitor	4	3	2	6	1	8	5	7

Calculate the Spearman's Coefficient of rank Correlation for this data.

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

Solutions

$$1) S = \{3, 2, 3, 4, 2, 2, 5\}$$

In order: -

$$S = \{2, 2, 2, 3, 3, 4, 5\}$$

Median.

$$\text{Median value} = 3 = \frac{1}{2} (7+1)^{\text{th}} \text{ value}$$

$$\begin{aligned} Q_1 &= \frac{1}{4} (7+1)^{\text{th}} \text{ value} \\ &= \frac{1}{4} 18^{\text{th}} \text{ value} \\ &= 2^{\text{nd}} \text{ value} \\ &= 2. \end{aligned}$$

$$\begin{aligned} Q_3 &= \frac{3}{4} (7+1)^{\text{th}} \text{ value} \\ &= \frac{3}{4} \times 8^{\text{th}} \text{ value} \\ &= 6^{\text{th}} \text{ value} \\ &= 4 \end{aligned}$$

$$\begin{aligned} IQR &= Q_3 - Q_1 \\ &= 4 - 2 \\ &= 2. \end{aligned}$$

1 Mean $\bar{x} = \frac{1}{n} \sum_1^1 x$

$$\bar{x} = \frac{1}{7} (2+2+2+3+3+4+5)$$

$$= \frac{1}{7} (21)$$

$$= \underline{3}$$

Modal value = 2 (occurs most often)

$$\text{Variance } \sigma^2 = \frac{1}{n} \sum_1^1 x^2 - (\bar{x})^2$$

$$\begin{aligned} \sum_1^1 x^2 &= 2^2 + 2^2 + 2^2 + 3^2 + 3^2 + 4^2 + 5^2 \\ &= 4 + 4 + 4 + 9 + 9 + 16 + 25 \\ &= 71 \end{aligned}$$

$$\begin{aligned} \sigma^2 &= \frac{1}{7} (71) - (3)^2 \\ &= 10.1429 - 9 \\ &= \underline{1.1429} \end{aligned}$$

$$\begin{aligned} \sigma &= \sqrt{1.1429} \\ &= \underline{1.069} \end{aligned}$$

2

x	f	$f \times x$	x^2	$f \times x^2$
1	6	6	1	6
2	4	8	4	16
3	5	15	9	45
4	2	8	16	32
$\sum f = 17$		$\sum fx = 37$	$\sum fx^2 = 99$	

$$(i) \quad \bar{x} = \frac{\sum fx}{\sum f}$$

$$\bar{x} = \frac{37}{17}$$

$$\bar{x} = 2.1765$$

(ii) Mode $\Rightarrow x = 1$ occurs most often 6 times.

$$\sigma^2 = \frac{\sum fx^2}{\sum f} - (\bar{x})^2$$

$$= \frac{99}{17} - (2.1765)^2$$

$$= 1.0864 \text{ (4 d.p.)}$$

$$\Rightarrow \sigma = \sqrt{1.0864} = 1.0423$$

3 Overtime Hours	f	Mid-pt x	f x x	x ²	f x x ²
1 - 3	5	2	10	4	20
4 - 6	2	5	10	25	50
7 - 9	3	8	24	64	192
10 - 12	4	11	44	121	484
$\sum f = 14$		$\sum fx = 88$		$\sum fx^2 = 746$	

$$\text{Mean } \bar{x} = \frac{\sum fx}{\sum f} = \frac{88}{14} = 6.29 \text{ hrs.}$$

Modal Class = 1 - 3 hrs.

$$\begin{aligned} \sigma^2 &= \frac{\sum fx^2}{\sum f} - (\bar{x})^2 \\ &= \frac{746}{14} - (6.29)^2 \\ &= 13.7216 \end{aligned}$$

$$\begin{aligned} \sigma &= \sqrt{13.7216} \\ &= 3.70 \text{ hrs.} \end{aligned}$$