

## ISE 1, Component 2: Tutorial

Problem 1: A group of students took a math test, & the scores are as follows: 85, 90, 88, 92, 78, 95, 90. Calculate the mean, median, & mode of the scores.

Sol<sup>n</sup>:

Given,  $S = \{85, 90, 88, 92, 78, 95, 90\}$

For mean,  $\text{mean} = \frac{\text{Sum of values}}{\text{Number of values}}$

$$\text{mean} = \frac{85 + 90 + 88 + 92 + 78 + 95 + 90}{7}$$

$$= \frac{618}{7} = 88.28$$

For median,

Number of observations = 7 (odd)

'n' is odd hence,

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

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

Median = 4th term

Median is 4th term

Arranging the scores in ascending order,  $\{78, 85, 88, \underline{90}, 90, 92, 95\}$   
4th term is 90.

$\therefore$  Median = 90.

For mode,

Arranging the scores in ascending order,  $\{78, 85, 88, \underline{90}, \underline{90}, 92, 95\}$

Mode = Highest Frequency Term.

Mode = 90



Problem 2 : The monthly incomes (in dollars) of a sample of 8 employees in a company are : \$4000, \$4500, \$3800, \$4200, \$4800, \$4000, \$3600, \$4500. Calculate the mean, median, & mode.

Sol<sup>n</sup>: Given,

$$S = \{4000, 4500, 3800, 4200, 4800, 4000, 3600, 4500\}$$

For mean,

mean = Sum of all values / Number of values

$$= \frac{4000 + 4500 + 3800 + 4200 + 4800 + 4000 + 3600 + 4500}{8}$$

$$= \frac{33400}{8} = 4175$$

For median,

Arranging sequence in ascending order,

$$\{3600, 3800, 4000, 4000, 4200, 4500, 4500, 4800\}$$

Number of observations = 8 (even)

'n' is even hence,

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

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

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

$$= \frac{4^{\text{th}} \text{ term} + 5^{\text{th}} \text{ term}}{2} = \frac{4000 + 4200}{2}$$

$$= \frac{8200}{2}$$

$$\text{Median} = 4100$$

For Mode,

Arranging sequence in ascending order,



{3600, 3800, 4000, 4000, 4200, 4500, 4500, 4800}

Mode = Highest Frequency Term.

Mode = 4000 and 4500.

Problem 3: The weights (in kg) of a sample of 10 apples are: 150, 140, 155, 160, 145, 150, 152, 148, 155, 158. Calculate the mean, median, & mode.

sol<sup>n</sup>: Given,

$$S = \{150, 140, 155, 160, 145, 150, 152, 148, 155, 158\}$$

For mean,

Mean = Sum of all values / Number of values

$$\text{Mean} = \frac{150 + 140 + 155 + 160 + 145 + 150 + 152 + 148 + 155 + 158}{10}$$

$$= \frac{1513}{10} = 151.3$$

For median,

Arranging sequence in ascending order,

{140, 145, 148, 150, 150, 152, 155, 155, 158, 160}

Number of observations = 10 (even)

'n' is even hence,

$$\begin{aligned} \text{Median} &= \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ term} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ term}}{2} \\ &= \frac{\left(\frac{10}{2}\right)^{\text{th}} \text{ term} + \left(\frac{10}{2} + 1\right)^{\text{th}} \text{ term}}{2} \end{aligned}$$

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

$$= \frac{145 + 150}{2} = 147.5$$



For mode,

Arranging sequence in ascending order,

{140, 145, 148, 150, 150, 152, 155, 155, 158, 160}

Mode = Highest Frequency Term

Mode = 150 & 155

Problem 4: For a set of exam scores, the mean is 75 & the median is 80. What does this suggest about the distribution of scores?

Sol<sup>n</sup>: Given,

The mean of the set of exam scores is 75.

The median of the set of exam scores is 80.

Since, the median is greater than the mean, the distribution of scores must be skewed to the left.

Problem 5: Calculate the range of the following dataset: 15, 22, 18, 25, 30, 12, 28.

Sol<sup>n</sup>: Given,  $S = \{15, 22, 18, 25, 30, 12, 28\}$

Arranging sequence in ascending order,

{12, 15, 18, 22, 25, 28, 30}

Lowest number = 12, Highest number = 30.

Range = Highest number - Lowest number  
= 30 - 12

Range = 18

$\therefore$  Range of the given dataset is 18.

Problem 6: The monthly rents (in dollars) for a sample of apartments are: \$1200, \$1400, \$1300, \$1250, \$1500. Calculate the variance & standard deviation of the rents.

Sol<sup>n</sup>: Given,

$S = \{1200, 1400, 1300, 1250, 1500\}$



$$\text{Variance} = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

$x_i$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
1200	-130	16900
1400	70	4900
1300	-30	900
1250	-80	6400
1500	170	28900
$\sum x_i = 6650$		$\sum (x_i - \bar{x})^2 = 58000$

$$\text{Mean} = \frac{\sum x_i}{n} = \frac{6650}{5} = 1330$$

$$\begin{aligned} \text{Variance} &= \frac{16900 + 4900 + 900 + 6400 + 28900}{5} \\ &= \frac{58000}{5} \\ &= 11600 \end{aligned}$$

$$\text{Standard deviation} = \sqrt{\text{Variance}} = \sqrt{11600} = 107.70$$

$\therefore$  Variance of the rents is \$11600 & the standard deviation is \$107.70.

Problem 7.: The heights (in cm) of a sample of 12 students are : 160, 165, 158, 170, 155, 162, 168, 175, 160, 172, 165, 180. Calculate the variance & standard deviation.



sol<sup>n</sup>:

$x_i$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
160	-5.83	33.9889
165	-0.83	0.6889
158	-7.83	61.3089
170	4.17	17.3889
155	-10.83	117.2889
162	-3.83	14.6689
168	2.17	4.7089
175	9.17	84.0889
160	-5.83	33.9889
172	6.17	38.0689
165	-0.83	0.6889
180	14.17	200.7889
$\Sigma x_i = 1990$		$\Sigma (x_i - \bar{x})^2 = 607.6668$

$$\text{Mean} = \bar{x} = \frac{\Sigma x_i}{n} = \frac{1990}{12} = 165.83$$

$$\text{Variance} = \frac{\Sigma (x_i - \bar{x})^2}{n} = \frac{607.6668}{12} = 50.6389$$

$$\text{Standard deviation} = \sqrt{\text{Variance}} = \sqrt{50.6389} = 7.1161$$

$\therefore$  Variance of the heights is 50.6389 cm & standard deviation is 7.1161 cm.

Problem 8: For a set of data, the interquartile range (IQR) is 12. If the lower quartile is 20, what is the upper quartile?

sol<sup>n</sup>:

Given,

$$\text{Interquartile range (IQR)} = 12$$

$$\text{lower quartile} = 20$$



Upper quartile - lower quartile = Interquartile range

$$\begin{aligned}\text{Upper quartile} &= \text{Interquartile range} + \text{lower quartile} \\ &= 12 + 20\end{aligned}$$

$$\text{Upper quartile} = 32$$

$\therefore$  Upper quartile is 32.