Assignment No:- 1

i) define Mean, Median, Mode

* Mean :-

- The average value in the given dataset is called mean

- Mean is denoted by $\overline{x}$.

- Mean is calculated as addition of All numbers in given dataset devided by total number of observations.

Formula :-

$$\overline{x} = \sum_{i=1}^{n} x_i$$

* Median :-

- The mid-point value of the given dataset is called median

- Median is calculated as per below formula

i) if the number of ~~given~~ observations in given dataset is even

$$\text{median} = \frac{(n/2)^{th} + (n/2+1)^{th}}{2}$$

ii) if the number of obeservations in given dataset is odd

$$\frac{(n+1)^{th}}{2}$$

* Mode!-

- The value which is occurce maximum time in given dataset is called mode.

ii) Define Standerd daviation and Variance

* Standerd Daviation :-

→ - A standerd daviation is a number that describe How spread out the values are

- A low standerd daviation means that the most of the numbers are closed to the mean i.e average value.

- A high standerd deviation means that the most of the number are spread out over a wider range

- Standerd deviation is a square root of Variance

- Standerd daviation is denoted by Sigma (σ)

formula :-

Standerd daviation (σ)

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

where n = number of observations

$\bar{x}$ = mean

* Variance :- (σ^2)

- Variance is a number that indicates how spread out the values are.

- Variance is square of Standard daviation i.e if we multiply standard daviation by itself then we get variance

- if we take the square root of Variance then we found standard deviation

- following are the steps for calculating Variance

i) Find the mean ($\bar{x}$)
ii) for each value find the diffrence from mean.
iii) for each diffrence find the square value
iv) The variance is average of these square diffrences

- formula :-

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

v) Define population mean and Sample mean

* population mean :-

- Population is a collection of all items of intersect to our study. and its denoted with uppercase 'N'.
- population mean is denoted by μ.
- if we want to take a survey from some company then the total number of employee working in these company is population.

Formula:-

$$\text{Population mean } (\mu) = \frac{\sum_{i=1}^{N} x_i}{N}$$

where, N is total number of items in population

* Sample mean :-

- Sample :-

A part of the population drawn according to a rule or plan for concluding characteristics is called sample.

- The number of samples collected for study is known as sample size and it is denoted by n.
- The average of the samples is called as sample mean.
- Sample mean is denoted by $\bar{x}$.

Formula:-

$$\text{Sample mean } \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

where, n is number of items present in sample (sample size)

iv) find Mean, median, Mode, Variance and standerd deviation.

a] 7, 11, 16, 14, 11, 13, 19, 13, 13

→

* Mean $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$

$= \frac{7+11+16+14+11+13+19+13+13}{9}$

$\bar{x} = \frac{117}{9}$

$\boxed{\bar{x} = 13}$

* Median = $\frac{(n+1)^{th}}{2}$ 7, 11, 11, 13, 13, 13, 14, 16, 19

$= \frac{9+1}{2} = \frac{10}{2}$

median $= 5^{th}$

$\boxed{\text{median} = 13}$

* mode :-

In the given dataset 13 is occurce maximum so the mode is 13

$\boxed{\text{mode} = 13}$

* variance :-

(i) mean = 13

(ii) diff from mean

7 - 13 = -6

11 - 13 = -2

16 - 13 = 3

$14 - 13 = 1$

$11 - 13 = -2$

$13 - 13 = 0$

$19 - 13 = 6$

$13 - 13 = 0$

$13 - 13 = 0$

iii) Square of diffrence

$-6^2 \quad -2^2 \quad 3^2 \quad 1^2 \quad -2^2 \quad 0^2 \quad 6^2 \quad 0^2 \quad 0^2$

36, 4, 9, 1, 4, 0, 36, 0, 0

iv) average of square of diffrences

$$= \frac{36+4+9+1+4+36}{9}$$

$$= \frac{90}{9}$$

$\boxed{\text{Variance } \sigma^2 = 10}$

* Standard Daviation :-(σ)

$$\sigma = \sqrt{\text{Variance}}$$

$$\sigma = \sqrt{10}$$

$\boxed{\sigma = 3.16}$

b] 16, 15, 16, 17, 19, 12, 14, 9

$\longrightarrow$

* mean $\bar{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$

$= \dfrac{16+15+16+17+19+12+14+9}{8}$

$\boxed{\bar{x} = 14.75}$

9, 12, 14, 15, 16, 16, 17, 19

* Median $= \dfrac{(n/2)^{th} + (n/2+1)^{th}}{2}$

$= \dfrac{(8/2)^{th} + (8/2+1)^{th}}{2}$

$= \dfrac{(4)^{th} + (4+1)^{th}}{2}$

$= \dfrac{15 + 16}{2}$

$= \dfrac{31}{2}$

$\boxed{\text{median} = 15.5}$

* mode :

in the given dataset 16 occurre max so the mode is 16

$\boxed{\text{mode} = 16}$

* Variance :- (i) Mean $\bar{x}$ = 14.75

(ii) diffrences from mean

$16 - 14.75 = 1.25$
$15 - 14.75 = 0.25$
$16 - 14.75 = 1.25$
$17 - 14.75 = 2.25$
$19 - 14.75 = 4.25$
$12 - 14.75 = -2.75$
$14 - 14.75 = -0.75$
$9 - 14.75 = -5.75$

(iii) square of diffrences

$= (1.25)^2, (0.25)^2, (1.25)^2, (2.25)^2, (4.25)^2, (-2.75)^2, (-0.75)^2, (-5.75)^2$

$= 1.5625, 0.0625, 1.5625, 5.0625, 18.0625, \cancel{7.5625}\ 0.5625, 33.0625$

iv) average of square of diffrences

$$\text{Variance } (\sigma^2) = \frac{1.5625 + 0.0625 + 1.5625 + 5.0625 + 18.0625 + 7.5625 + 0.5625 + 33.0625}{8}$$

$$= \frac{\cancel{65.4375}}{\cancel{8}} = \frac{67.5}{8} = 8.4375$$

$\boxed{\sigma^2 = 8.4375}$

* Standard Daviation (σ) :-

$\sigma = \sqrt{\text{variance}}$
$\sigma = \sqrt{8.4375}$
$\boxed{\sigma = 2.90}$

c) 27, 66, 24, 81, 50, 40, 74, 81, 97

* Mean $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$

$= \frac{27+66+24+81+50+40+74+81+97}{9}$

$= \frac{540}{9}$

$\boxed{\bar{x} = 60}$

* Median $= \frac{(n+1)^{th}}{2}$

$= \frac{(10)^{th}}{2}$

$= 5^{th}$ 24, 27, 40, 50, 66, 74, 81, 81, 97

$\boxed{\text{Median} = 50}$

* Mode =

In Given Dataset 81 occurce Maximum so mode is 81

$\boxed{\text{Mode} = 81}$

* Variance :- (i) mean $\bar{x} = 60$

ii) diffrences from mean

27 - 60 = -33

66 - 60 = 6

24 - 60 = -36

81 - 60 = 21

50 - 60 = -10

40 - 60 = -20

74 - 60 = 14

81 - 60 = 21

97 - 60 = 37

iii) ~~Average~~ ~~of~~ square of diffrences

$$= (-33)^2 (6)^2 (-36)^2 (21)^2 (-10)^2 (-20)^2 (14)^2 (21)^2 (37)^2$$

$$= 1089 + 36 + 1296 + 441 + 100 + 400 + 196 + 441 + 1369$$

$$= 5368$$

iv) average of square of diffrences

$$= \frac{5368}{9}$$

$$\boxed{\text{Variance} (\sigma^2) = 596.45}$$

Standurd Daviation (σ) :

$$\sigma = \sqrt{\text{variance}}$$

$$\boxed{\sigma = 24.42}$$