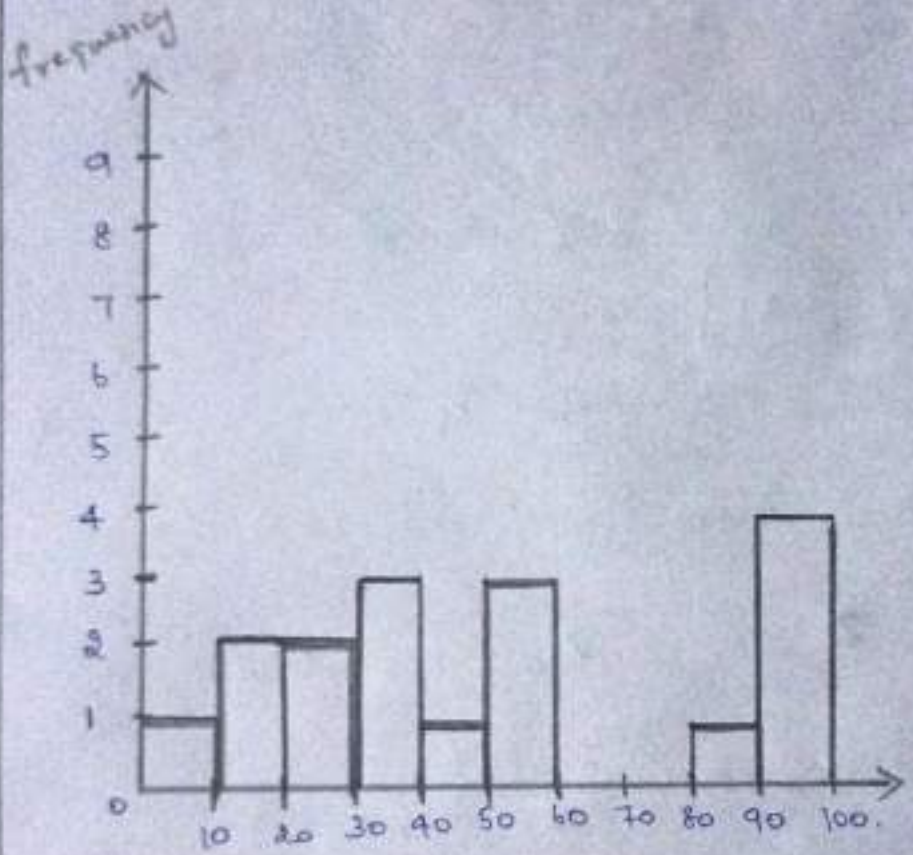
Newton Assignment - 1.

① Plot a Histogram,

10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99.



② In a Quant test of the CAT Exam, the population standard deviation is known to be 100. A sample of 25 tests taken has a mean of 520. Construct an 80% C.I about the mean.

Given:-

Population SD = 100.

Sample = 25.

Sample mean = 520.

C.I = 80%

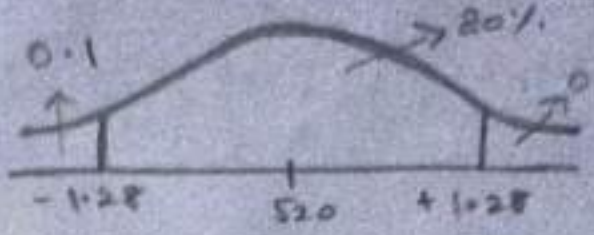
Solution:-

$\sigma = 100$

$n = 25$

$\bar{x} = 520$

C.I = 80%



Significant value: 1 - C.I.

$= 1 - 80\%$

$= 0.2$

$\boxed{\alpha = 0.2.}$

Point Estimate ± margin of Error.

$$\bar{x} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

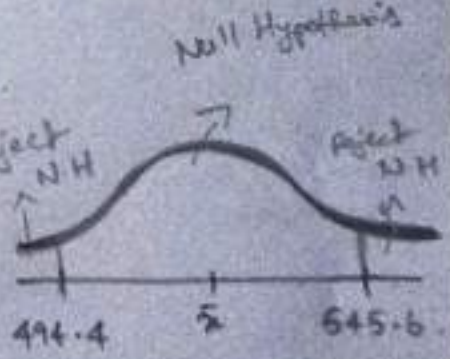
$$\Rightarrow Z_{\frac{0.2}{2}} = Z_{0.1} = 1.28$$

Lower limit: $\bar{x} - Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$.

$= 520 - 1.28 \left(\frac{100}{\sqrt{25}}\right)$

$= 520 - 1.28 (20)$.

$= 494.4$ //.



Higher limit: $\bar{x} + Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$.

$= 520 + 1.28 \left(\frac{100}{\sqrt{25}}\right)$.

$= 520 + 1.28 (20)$.

$= 545.6$ //.

(3) A car believes that the percentage of citizens in city ABC that owns a vehicle is 60% or less. A sales manager disagrees with this. He conducted a hypothesis testing survey of 250 residence & found that 170 residents responded yes to owning a vehicle.

(a) State the null and Alternate hypothesis.

(b) At a 10% significance level, is there enough evidence to support the idea that vehicle owner in ABC city is 60% (or) less.

Solution:-

Given:-

$\mu = 60\%$.

$n = 250$.

$\bar{x} = 170$.

$\alpha = 10\%$. $\quad C.I = 1 - \alpha$.

$\boxed{\alpha = 0.1}$ $\quad C.I = 1 - 0.1$

$C.I = 0.9$.

$\boxed{C.I = 90\%}$.

Step-1:-

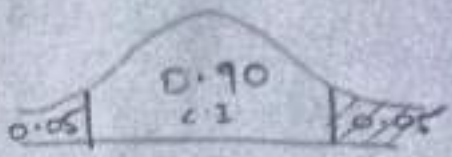
$H_0 \leq 60\%$. {null Hypothesis}.

$H_1 > 60\%$ {Alternate Hypothesis}.

$n = 250$ $\quad x = 170$

$$\hat{P} = \frac{x}{n} = \frac{170}{250} = 0.68$$

$$\boxed{\hat{P} = 0.68}$$



$\Rightarrow 0.90 + 0.05$

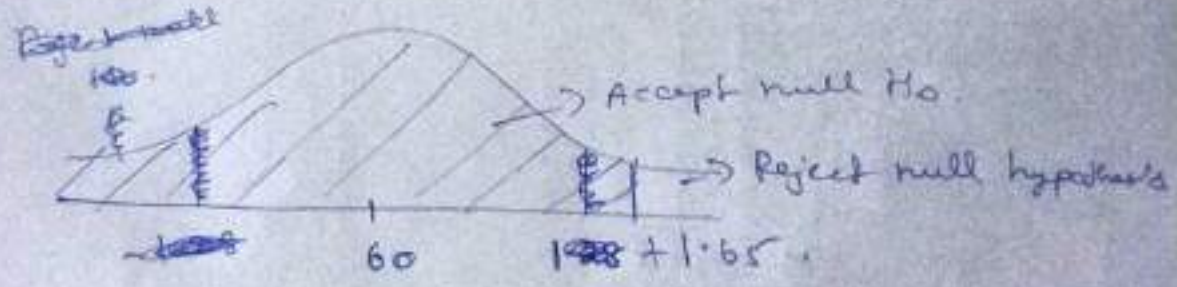
$\Rightarrow 0.95$

$\Rightarrow P_0 = 60\%$

$q_0 = 1 - P_0 = 1 - 0.6 = 0.4 = 40\%$

$\Rightarrow \alpha = 1 - C.I = 1 - 90\% = 0.1$

$\Rightarrow n > 30$ (So Z-test).



Z-test with Proportion:

$$= \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 q_0}{n}}}$$

$$= \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}}$$

$$= \frac{0.08}{\sqrt{\frac{0.24}{250}}}$$

$$= 0.08 \times \frac{\sqrt{250}}{\sqrt{0.24}} = \frac{0.08 \times 15.8}{0.489}$$

$= \frac{1.264}{0.489}$

$= 2.58$

$2.58 > 1.65$

Reject ~~Accept~~ the null hypothesis.

P Value :-

P. Value $> \alpha$

$2 = 2.58$

Accept null hypothesis.

Z-value of $2.58 = 0.99506$.

$\Rightarrow 1 - 0.99506$.

$\Rightarrow 0.00494 < 0.1$.

Reject the Null Hypothesis.

(4) What is the value of 99 percentile ?

{ 2, 2, 3, 4, 5, 5, 5, 6, 7, 8, 8, 8, 8, 8, 9, 9, 10, 11, 11, 12 }

Soln :-

$n = 20$.

Percentile = 99%.

Value : $\frac{\text{Percentile}}{100} \times (n)$.

$\frac{99}{100} \times 20 = \frac{99}{5} = 19.8$

$= 19^{th}$ Index.

(5) In Left & Right - Skewed data, what is the relationship between mean, median and mode? Draw graph to represent the same.

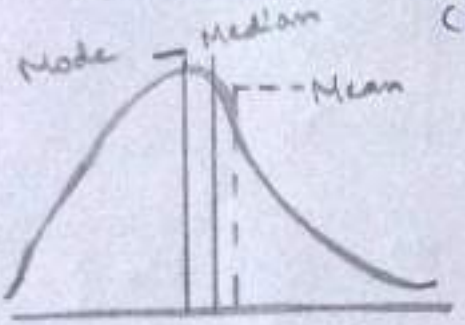
Sol:-

If the distribution of data is skewed to the left, the mean is less than the median, which is often less than the mode. If the distribution of data is skewed to the right, the mode is often less than the median, which is less than the mean.

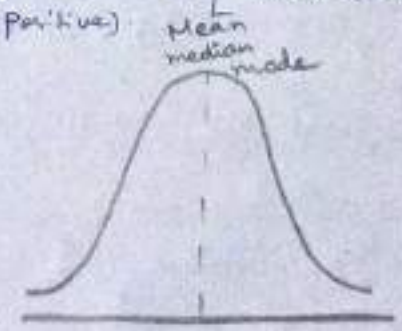
Distribution is normal [mean = mode = Median].

Distribution is left skewed (negative). [Mean < Median < Mode].

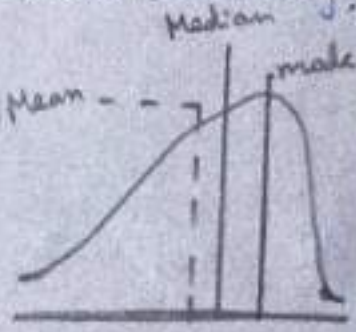
Distribution is Right skewed (Positive) [Mean > Median > Mode].



Right Skewed (positive).



Normal Distribution



Negative (left skewed)