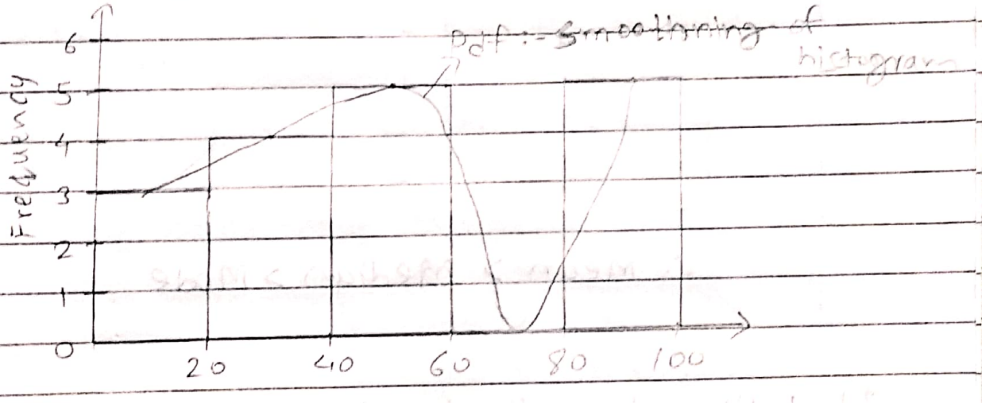
Statistic Assignments

Q.1) Plot a histogram.
10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99

(0-100) bins = 5

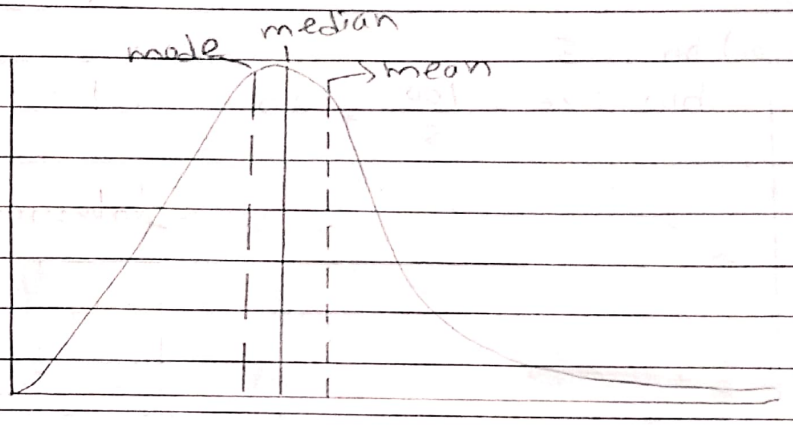
bin size = $\frac{100}{5} = 20$



Q.2) In left & right skewed data, what is the relationship between mean, median & mode?
Draw the graph to represent the same.

⇒ (1) Right skewed distribution.
→ A distribution is right skewed if it has a 'tail' on the right side of the distribution.
→ Right skewed distribution also called 'positively skewed distributions.'
→ In Right skewed distribution the 'mean' is greater than the 'median' & the median is greater than the 'mode'.

→ Ex of right skewed distribution
ⓐ Wealth distribution.
ⓑ Tickets sold per movie.



∴ Mean > Median > Mode

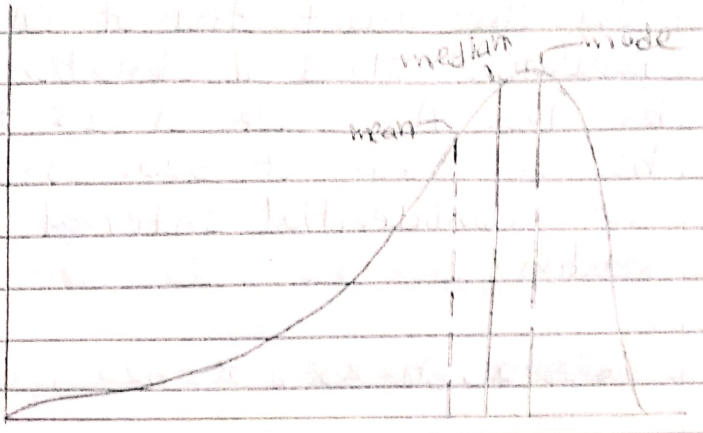
② Left skewed distribution

→ A distribution is left skewed if it has a 'tail' on the left side of the distribution.

→ Left skewed distribution is also called 'Negatively skewed distribution'.

→ In Left skewed distribution the 'mean' is less than the median & the 'median' is less than the 'mode'.

→ Ex of Left skewed distribution
ⓐ Record of Long jumps at a competition
ⓑ Retirement Age.



∴ Mean < Median < Mode
ie. Mode > Median > Mean

Q. 3) What is the value of the 99 percentile?

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

n = 20

Ascending order :- ~~22~~ 2, 2, 3, 4, 5, 5, 5, 6, 7, 8, 8, 8, 8, 8, 9, 9, 10, 11, 11, 12.

$$P(x) = \frac{x}{100} \times (n+1)$$

$$P(99) = \frac{99}{100} \times (20+1)$$

$$P(99) = \frac{99}{100} \times 21$$

$$\boxed{P(99) = 20.79} \rightarrow \text{Index position}$$

∴ 20th position is ie. 99th percentile is 12
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Q.4. In the Quant test of 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% Confidential Interval about the mean?

Ans ⇒)

$\sigma = 100$, $n = 25$, $\bar{x} = 520$, C.I. $= 0.8$

Point Estimate $\pm$ Margin of Error

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

So, $\alpha = 1 - C.I.$

$\alpha = 1 - 0.8$

S.V. $\boxed{\alpha = 0.2}$

So, $Z_{\alpha/2} = \frac{0.2}{2} = 0.1$

$1 - 0.1 = 0.9$

Z-score of $0.9 = 1.29$

$\boxed{Z_{\alpha/2} = 1.29}$

Lower fence = Point Estimate − Margin of Error

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

$$= 520 - 1.29 \times \frac{100}{\sqrt{25}}$$

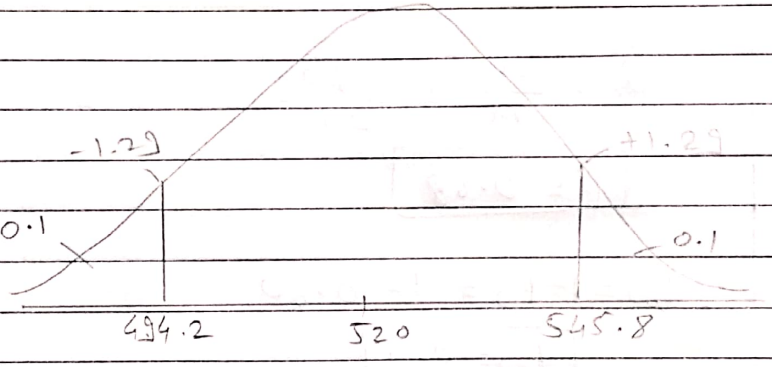
$\boxed{\text{Lower Fence} = 494.2}$

Higher fence = Point Esimate + margin of Error

$$= \bar{x} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$= 520 + 1.29 \times \frac{100}{\sqrt{25}}$$

Higher fence = 545.8



Q.5 A car company beleives 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 surveijing 250 residents & 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.

Ans ⇒ $\mu = P_0 = 60$, $n = 250$, $x = 170$

(a) Null hypothesis :- $H_0 : P_0 = 60$

Alternate hypothesis : $H_1 : P_0 \neq 60$

$$\hat{p} = \frac{x}{n} = \frac{170}{250}$$

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

$$q_0 = 1 - P_0 = 1 - 0.60$$

$$\boxed{q_0 = 0.4}$$

(b) $\alpha = 0.10$, C.I. $= 0.90$

$$\frac{\alpha}{2} = \frac{0.10}{2} = 0.05$$

$$1 - 0.05 = 0.95$$

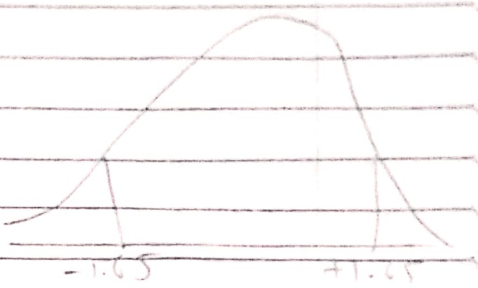
Z-score of 0.95 is 1.65

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

$$= \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}}$$

$Z = 2.58$

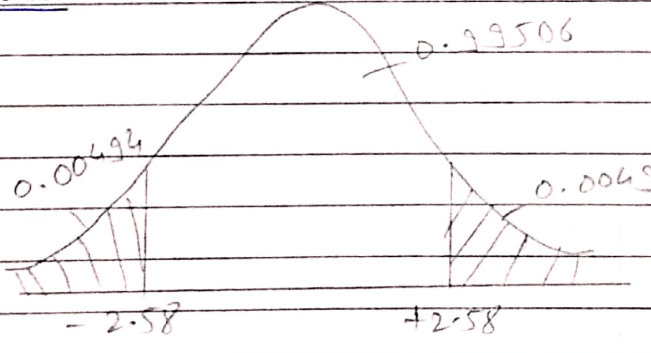
$\therefore 2.58 > 1.65$



∴ Reject the null hypothesis.

∴ There is not enough evidence at 10% significance level to support the idea that vehicle owner in ABC city is 60% or less.

P-value



$\therefore 1 - 0.99506$

$= 0.00494$

P-value $= 0.00494 + 0.00494$

P-value $= 0.00988$ & $\alpha = 0.10$

$\therefore 0.00988 < 0.10$

∴ We reject the null hypothesis.