Statistics Assignment:

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Q.1: Plot a histogram,

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

Soln:

First we sort the numbers in ascending order.

Now,

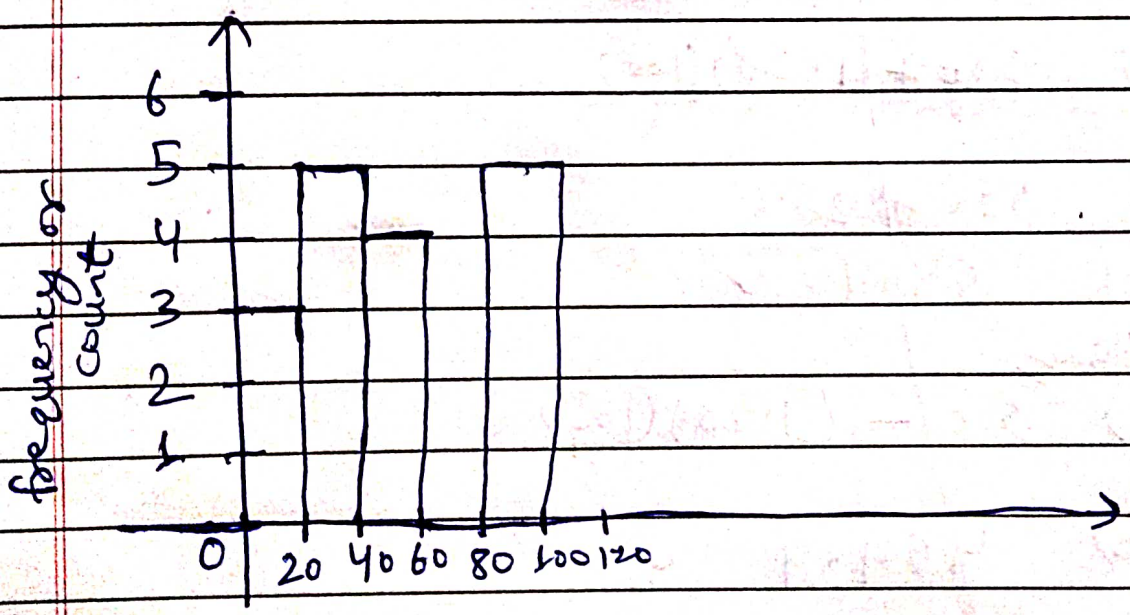
We decide bins and bins size.

Here, we take

bins = 5

bins size = 20

$\left[(0-100) \quad \frac{100}{5} = 20\right]$



Q: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.

Soln

Given:- $n = 25$, $\sigma = 100$, C.I = 80%,
$\alpha = 0.2$, $\bar{x} = 520$

Null Hypothesis, $H_0 = \mu = 520$
Alternate Hypothesis $H_1 = \mu \neq 520$

Now,

By point estimate ± margin of error.

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

$$\Rightarrow 520 + z_{0.1} \left(\frac{100}{\sqrt{25}}\right)$$

$$\Rightarrow 520 + (1.28)\left(\frac{100}{5}\right) \quad [\text{from z table}]$$

$$\Rightarrow 545.6$$

Again:-

$$520 - (1.28)\left(\frac{100}{5}\right)$$

$$\Rightarrow 494.4$$

80% C.I

494.4 ⟷ 545.6

Therefore,

We Accept the Null hypothesis since the value lies between 494.4 to 545.6

Q3. A car company 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 surveying 250 residents & found that 170 residents responded yes to owning a vehicle.

(a) State the null & 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.

Soln

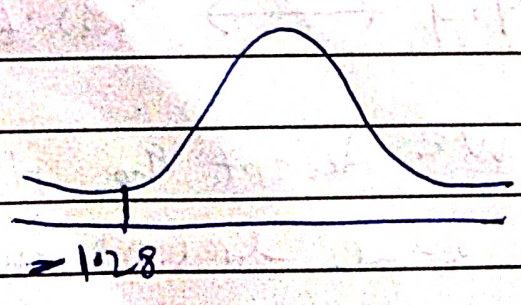
$n = 250$, $x = 170$

Null hypothesis, $H_0 : P_0 \geq 60\%$

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

$$q_0 = 1 - P_0 = 1 - 0.6 = 0.4$$

$$\alpha = 0.1$$



$$Z \text{ test} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

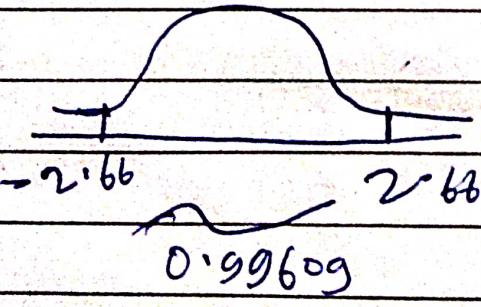
$$Z = \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{200}}}$$

$$Z = \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{200}}}$$

$$= \frac{0.08}{0.0346} = 2.66$$

$2.66 > -1.28$ Accept the null hypothesis.

Now, by P-value method.



$1 - 0.99609 = 0.00391$

P value $= 0.00391 + 0.00391$

$= 0.00782$

Q.4. 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

Soln

$$\text{Value} = \frac{\text{Percentile}}{100} \times (n+1)$$

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

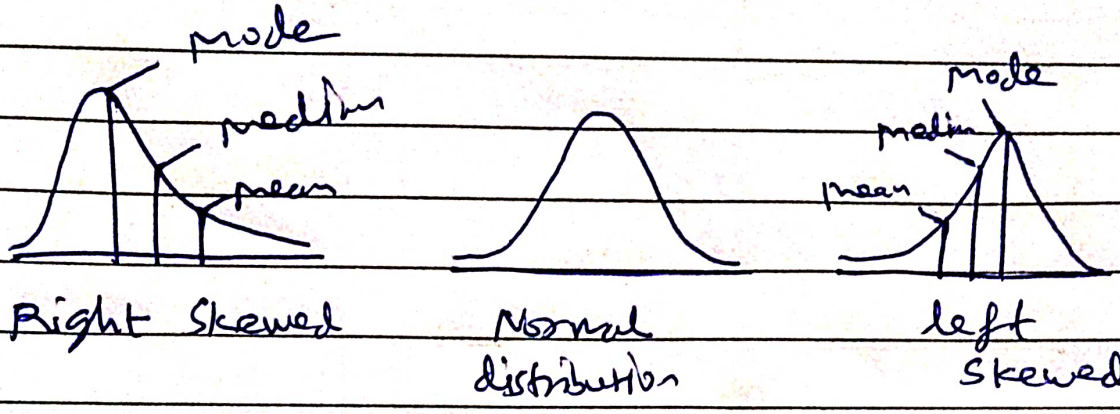
$$= \frac{99}{100} \times 21$$

$$= 20.79$$

$\therefore$ Value $\simeq$ 12 Ans

Q.5. In left & right skewed data, what is the relationship between mean, median & mode?
Draw the graph to represent the same.

Sol



Right Skewed | Normal distribution | left Skewed

For left Skewed:-

mean < median < mode

For right Skewed:-

mode < Median < mean