

iNeuron

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Statistics Assignment

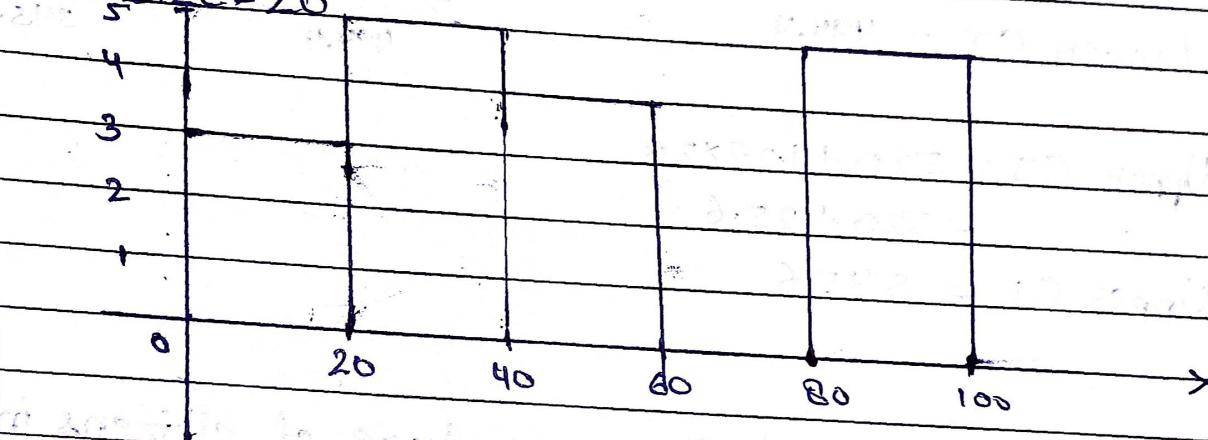
Q1

Plot a histogram,

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

bins = 5

bin size = 20



Q2

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% CI about the mean.

Sol:

Given

$$\sigma = 100$$

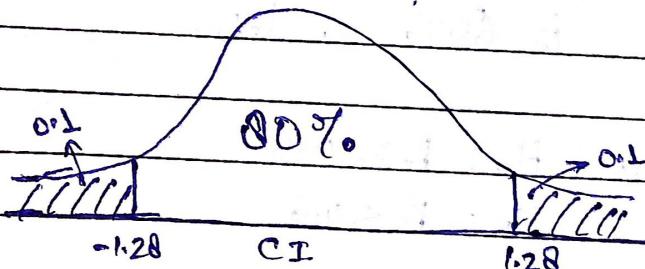
$$n = 25$$

$$\bar{x} = 520$$

$$\alpha \Rightarrow CI = 80\% = 0.8$$

$$\alpha = 0.2$$

$$CI = \bar{x} \pm$$



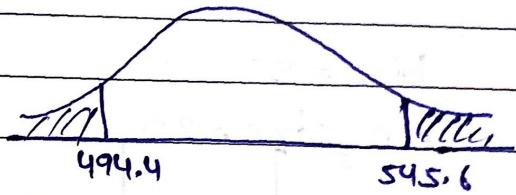
Confidence Interval = Point Estimate + Margin of Error * Parameter
OR

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

$$CI = 520 \pm Z_{0.05} \times \frac{100}{\sqrt{5}} = 520 \pm 1.28 \times 20$$

$$\text{Lower CI} = 520 - 1.28 \times 20 \\ = 520 - 25.6$$

$$\text{Lower CI} = 494.4$$



$$\text{Upper CI} = 520 + 1.28 \times 20 \\ = 520 + 25.6$$

$$\text{Upper CI} = 545.6$$

Q3

A car believes that the percentage of citizens in city ABC that owns a vehicle is 60% or less. A sales manager disagree with this. He conducted a hypothesis testing surveying 250 residents and found that 170 residents responded yes to owning a vehicle.

- State the null and alternate hypothesis.
- At a 10% significance level, is there enough evidence to support the idea the vehicle owner in ABC city is 60% or less.

$$H_0: p \geq 0.6$$

$$H_A: p < 0.6$$

b. Given

$$n = 250$$

$$x = 170$$

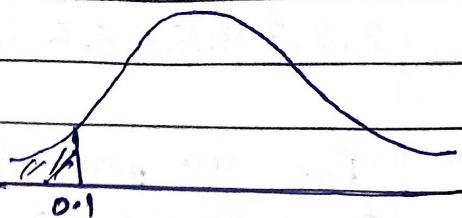
$$\alpha = 10\% = 0.1$$

$$CI = 0.9$$

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

$$P_0 = 60\% = 0.6$$

$$Q_0 = 1 - P_0 = 1 - 0.6 = 0.4$$



$$Z_{0.1} = -2.32$$

- Calculate the Z-test under H_0 .

$$Z_{\text{test}} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 Q_0}{n}}}$$

$$= \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}} = \frac{0.08}{\sqrt{\frac{0.24}{250}}} = \frac{0.08}{\sqrt{0.0096}} = \frac{0.08}{0.098} = 0.81$$

$$Z_{\text{test}} = \frac{0.08 \times 15.81}{0.49}$$

$$Z_{\text{test}} = 2.6$$

$$Z_{\text{test}} (2.6) > Z_{0.1} (-2.32)$$

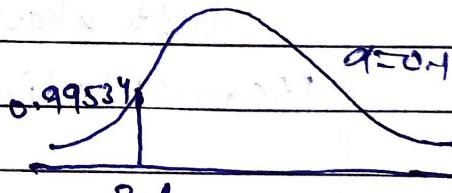
We accept the null hypothesis.

- Now, estimate the p-value

P-value is 0.99534 which is greater than α .

i.e. $p\text{-value} > \alpha$

So, we accept the null hypothesis.



- Conclusion:-
Percentage of residents in city ABC that owns a vehicle is more than or equal to 60%.

Q4

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

Sol'

For 99 percentile

$$P_{99} = \frac{Q}{100} \times (n+1)$$

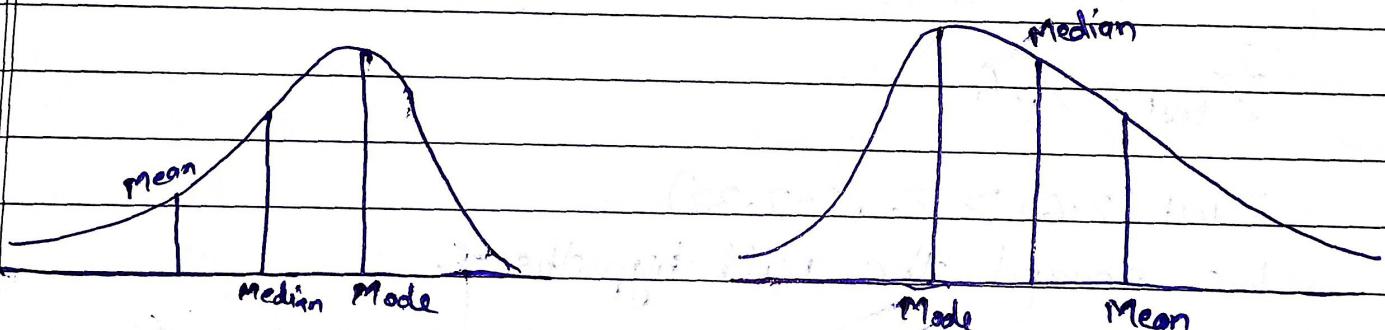
$$P_{99} = \frac{99}{100} \times (20+1)$$

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

P_{99} = 20.79 th element

$$P_{99} = 12.$$

Q5. In left and right-skewed data, what is the relationship between mean, median & mode. Draw the graph to represent the same.



Left skewed (-ve)

Mean < Median < Mode

Right skewed (+ve)

Mode < Median < Mean

$$\text{Mode} = 3\text{Median} - 2\text{Mean}.$$