Statistics Assignment 1

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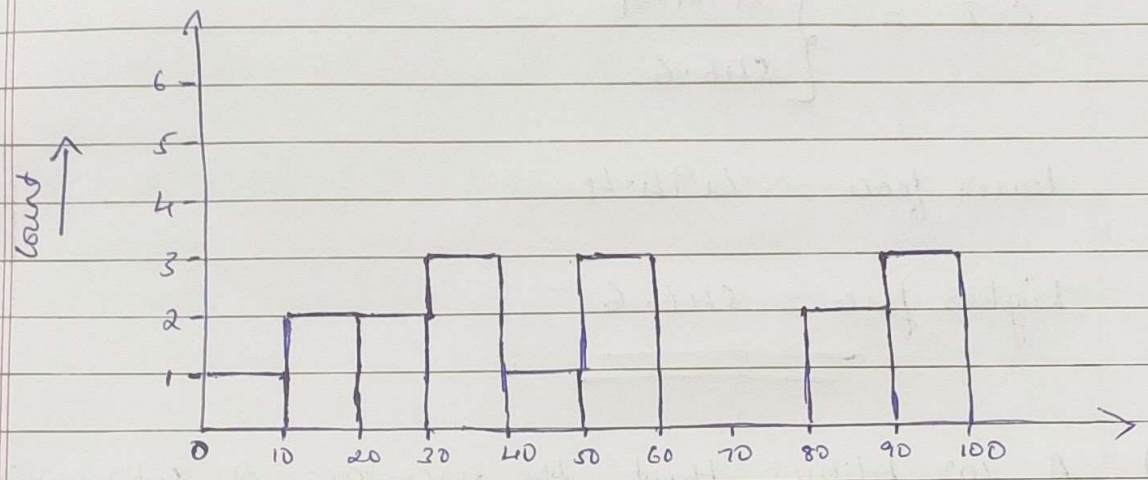
Q1) Plot a histogram,
10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99

Ans)



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.

Ans $\sigma = 100$, $n = 25$, $\bar{x} = 520$, $CI = 80\%$.

$\alpha = 1 - C.I = 1 - 0.8 = \underline{0.2}$.

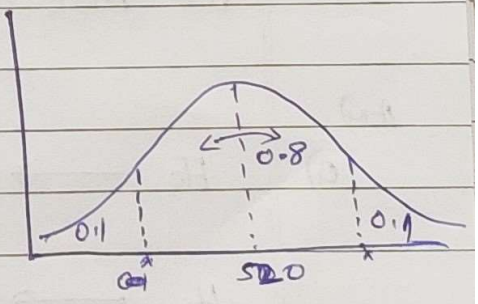
$C.I$ = Point Estimate $\pm$ margin error

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

$= 520 \pm Z_{0.2/2} * \frac{100}{\sqrt{25}}$

$= 520 \pm Z_{0.1} * \frac{100}{5}$

$= 520 \pm 1.28 * 20$



$$C.I = \begin{cases} 520 - 25.6 \\ 520 + 25.6 \end{cases}$$

$$C.I = \begin{cases} 494.4 \\ 546.6. \end{cases}$$

lower fence = 494.4

higher fence = 546.6

Q3) A car believes that the percentage of citizens in city ABC that owns a vehicle is 60% & less. A sales manager disagrees with this. He conducted a hypothesis testing surveying 250 residents and 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 owns in ABC city is 60% & less.

Ans)

a) $H_0 \longrightarrow \mu \leq 60\%$.

$H_1 \longrightarrow \mu > 60\%$.

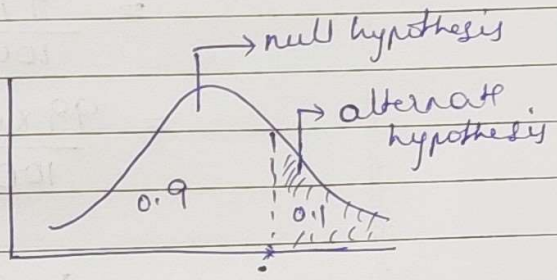
b) ~~p =~~ $n = 250$.

This is a one-tail Z test with proportion.

$\hat{p} = 60\% = 60/100 = 0.6$.

$\hat{P} = 170/250 = 0.68$.

$\alpha = 10\% = 0.1$



Decision Boundary

$$Z_{(1-0.1)} = Z_{(0.9)} = \underline{+1.29}$$

Calculate test statistics

$$Z_{stat} = \frac{\hat{P} - \hat{p}}{\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}} = \frac{0.68 - 0.6}{\sqrt{\frac{0.6(0.4)}{250}}}$$

$$= \frac{0.08 \times \sqrt{250}}{\sqrt{0.6 \times 0.4}} = \underline{2.5819}$$

$\therefore Z_{stat} > +1.29$

We reject the null hypothesis.

There is no evidence to support that the vehicle ownership in the city is 60% or less.

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

Ans Value of 99 percentile $= \frac{\text{Percentile}}{100} \times (n+1)$

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

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

$= \frac{2079}{100}$

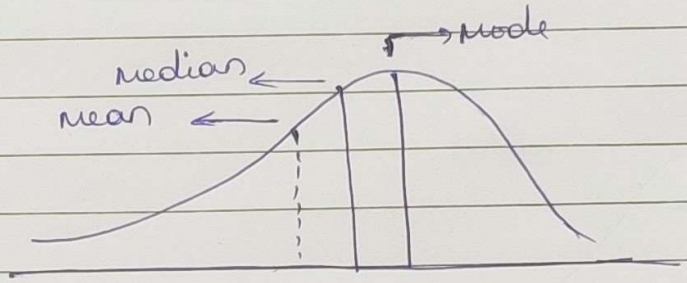
$= 20.79^{th}$ index

$= 12$

Value = 12.

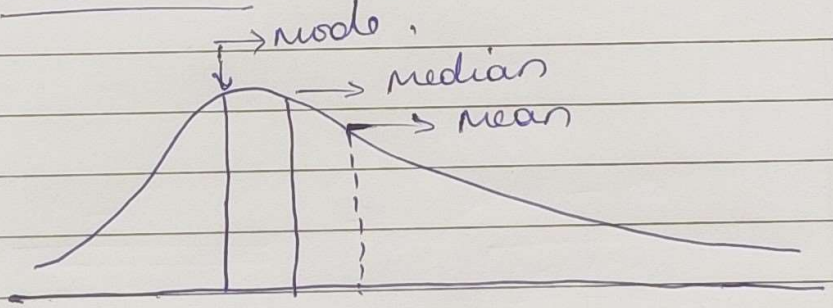
Q5) In left and right-skewed data, what is the relationship between mean, median and mode? Draw the graph to represent the same.

Ans.) Left-skewed data.



In left-skewed data, Mean < Median < Mode.

Right-skewed data.



In right-skewed data, Mean > Median > Mode.