

Q.1] Plot a histogram

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

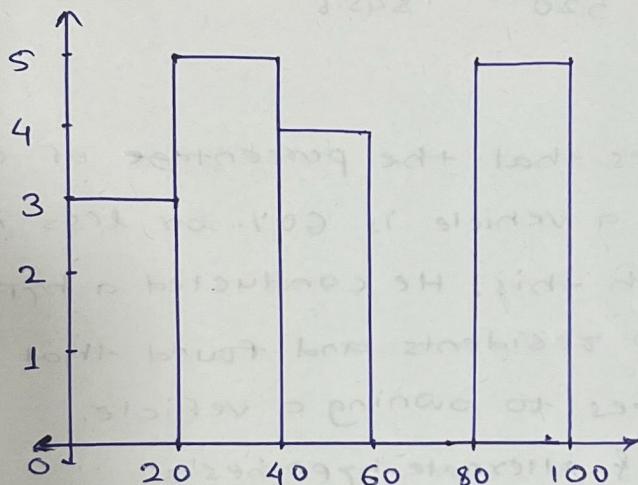
Ans:- Step I] Sort the numbers

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

Step II] We are considering bins = 5

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

∴ Histogram →



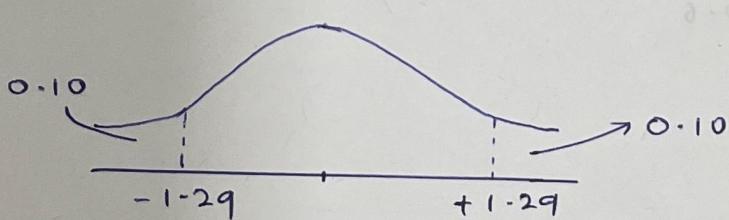
Q.2] In a quant test of the CAT exam, the population standard deviation is known to be 100. A sample of 25 tests taken has a mean of 520. Construct an 80% CI about the mean.

Ans:- Here $\sigma = 100$, $n = 25$, $\bar{x} = 520$

$$\alpha = 1 - C.I = 1 - 0.80 = 0.20$$

$$Z_{\alpha/2} = Z_{\frac{0.20}{2}} = Z_{0.10}$$

$$1 - 0.10 = 0.9 = 1.28$$

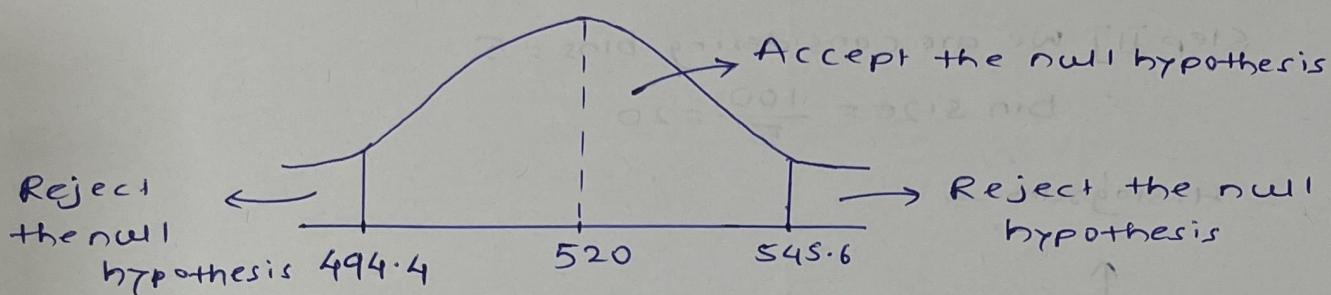


$$\begin{aligned} \text{Lower fence} &= \bar{x} - Z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}} \\ &= 520 - 1.28 \times \frac{100}{\sqrt{25}} \\ &= 520 - 1.28 \times 20 \\ \text{Lower fence} &= 494.4 \end{aligned}$$

$$\text{Higher fence} = \bar{x} + Z_{\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}$$

$$= 520 + 1.28 \times \frac{100}{\sqrt{25}}$$

$$\text{Higher fence} = 545.6$$



Q.3] A car dealer 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 and 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.

Ans:-

$$H_0 : P_0 \leq 60\%$$

$$H_1 : P_0 \neq 60\%$$

$$n = 250, x = 170$$

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

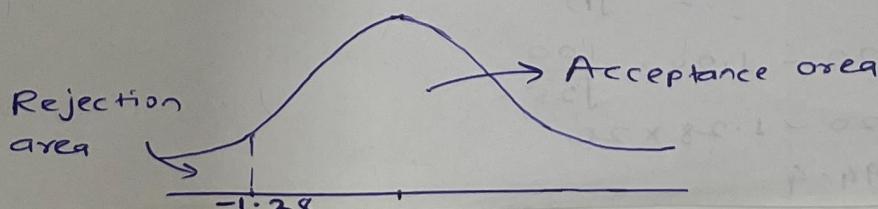
$$q_0 = 1 - P_0 = 1 - 0.6$$

$$q_0 = 0.4$$

$$\alpha = 0.1$$

$$1 - 0.1 = 0.90$$

$\hookrightarrow 1.28$ in z-table

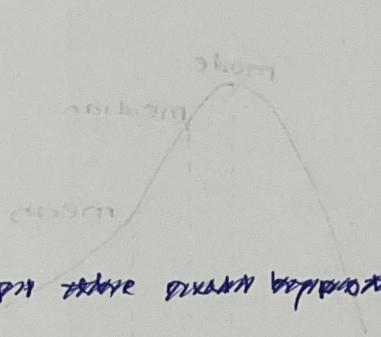


Z test with proportion

$$Z\text{-test} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 \cdot Q_0}{n}}}$$
$$= \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}}$$

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

$$Z\text{-test} = 2.58$$

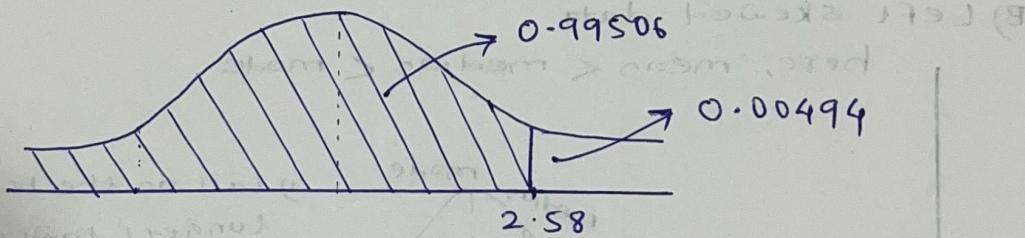


" \therefore Z-test is the hypothesis we are testing here is null hypothesis

Let's find p-value associated with Z-test score i.e., 2.58

contradicting null hypothesis

with statement of hypothesis to check if



$\because 0.00494 < 0.1$ we reject the null hypothesis.

This indicates that there is enough evidence to support the idea that the vehicle owner in ABC city is greater than 60%.

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

Ans:- Sort the numbers in ascending order

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

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

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

$$= 20.79 \rightarrow \text{index}$$

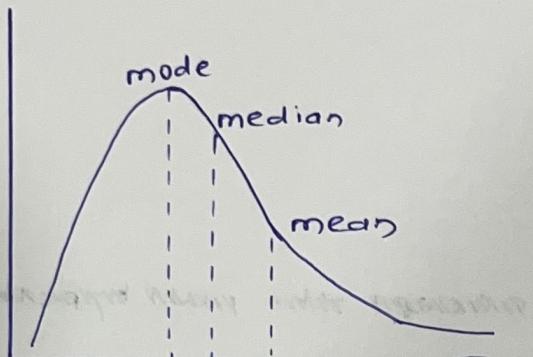
\hookrightarrow it corresponds to value 12.

\therefore 99 percentile value = 12

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

Ans:- A) Right skewed data -

here, mean $>$ median $>$ mode



i) tail on the right side is longer (higher values)

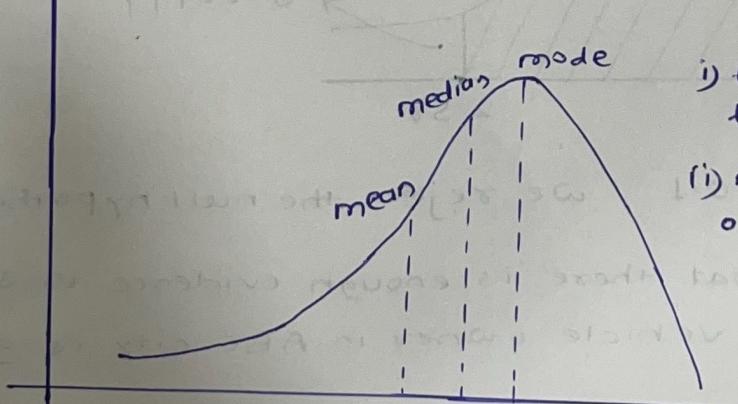
ii) majority data is concentrated on the left side (lower values)

ex:- i) wealth distribution

ii) length of comments on youtube videos

B) Left skewed data

here, mean $<$ median $<$ mode



i) tail on the left side is longer (lower values)

ii) majority data is concentrated on the right side (higher values)

ex:- life span of human being