

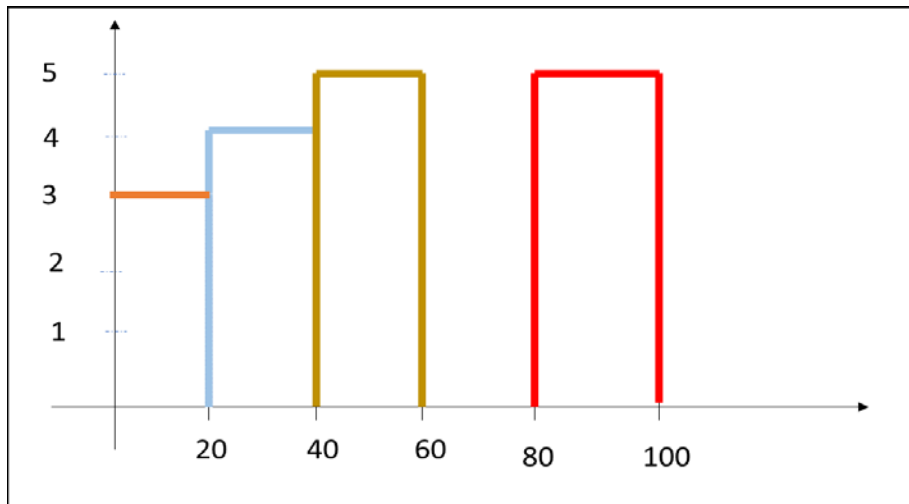
Que 1) Plot a histogram,

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

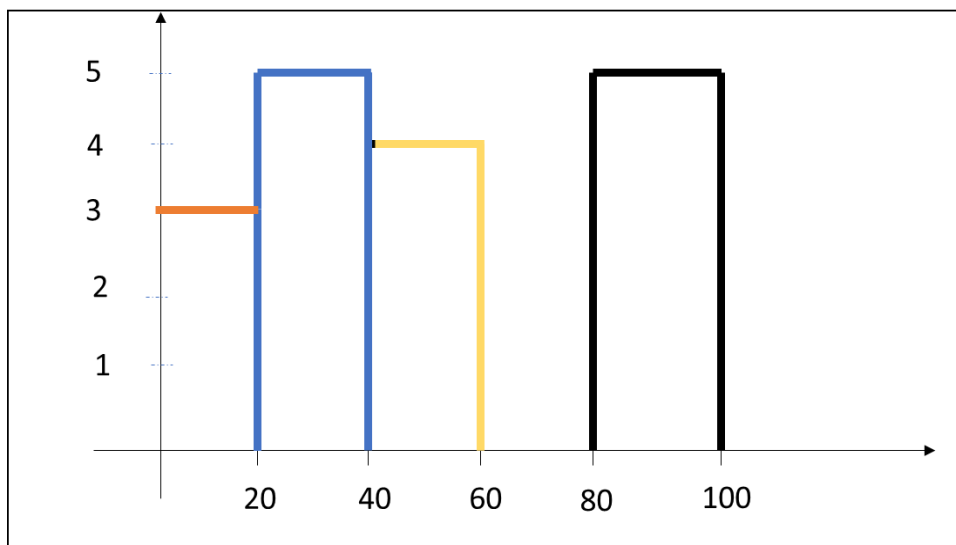
Ans.

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

1. If we consider 0 to 19 in a bin:



2. If we consider 1 to 20 in a bin:



Que 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. Given,

Population standard deviation (σ) = 100

Sample size (n) = 25

Sample mean (\bar{x}) = 520

Parameter = Point Estimate \pm Margin of Error

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

α = Significance Value

$$= 1 - \text{C.I.}$$

$$= 1 - 0.80$$

$$= 0.20$$

$$= Z_{\frac{\alpha}{2}} = Z_{0.10} = 1.28$$

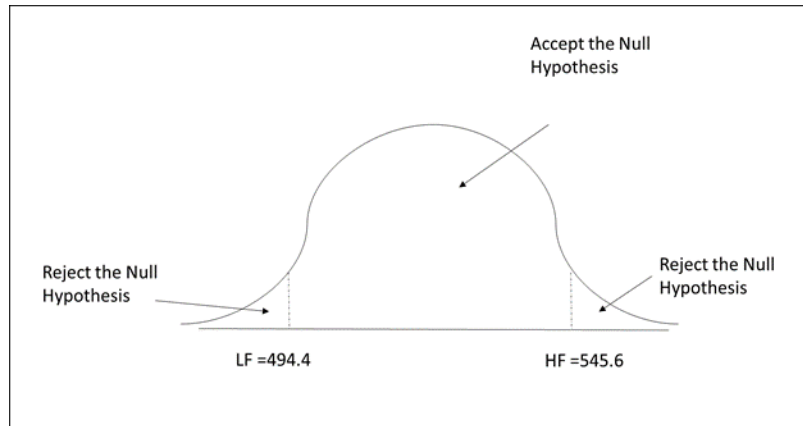
$$\text{Parameter} = \bar{x} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

$$\text{H.F.} = 520 + 1.28 * 20$$

$$= 545.6$$

$$\text{L.F.} = 520 - 1.28 * 20$$

$$= 494.4$$



Que 3) 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.

Ans. Given,

1. Null Hypothesis ($H_0: P_0 \leq 60\%$)

Alternate Hypothesis ($H_0: P_0 > 60\%$)

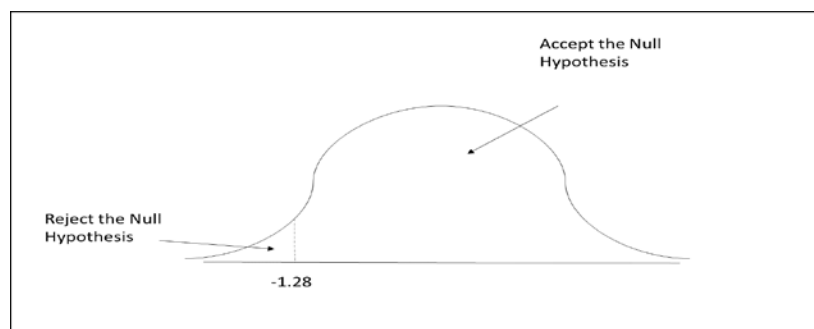
Then,

$$q_0 = 1 - P_0 = 1 - 0.60 = 0.40$$

2. Significance Value: $10\% = 0.1$

As it is 1-tail test, then the z-value is -1.28 for 0.1 significance value.

3. Decision boundary:



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

Then,

$$\begin{aligned} \text{Z-test with proportion} &= \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 Q_0}{n}}} \\ &= \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}} \\ &= 2.588 \text{ (P-value)} \end{aligned}$$

4. Conclusion:

-1.28 < 2.588, so null value is satisfied and city ABC owns vehicles are 60% or less.

5. Verification using P- value:

Area at 2.58 is 0.99506 so,

$$0.1 < 0.99506$$

Hence proved that null hypothesis is true and city ABC owns a vehicle is 60% or less.

Que 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

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

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

$$= 20.79 \text{ (index)}$$

$$\text{Value} = 12$$

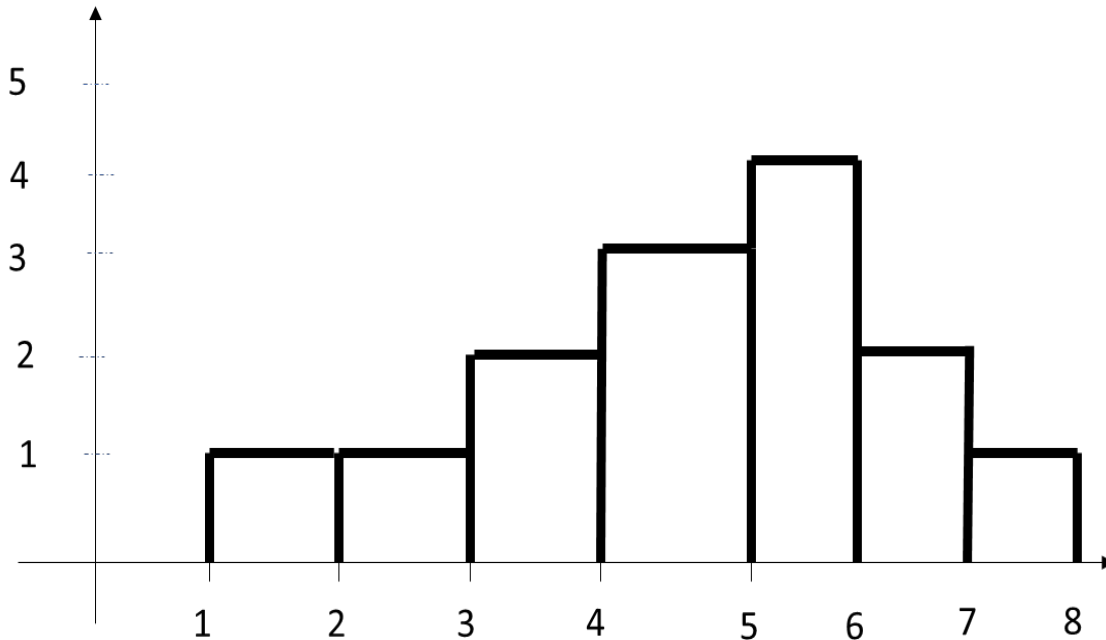
Que 5) In left & right-skewed data, what is the relationship between mean, median & mode?

Draw the graph to represent the same.

Ans. I want to explain this by an example. So my distribution is as follows:

Dataset: 2,3,4,4,5,5,5,6,6,6,6,7,7,8

1. Right Skewed Curve:



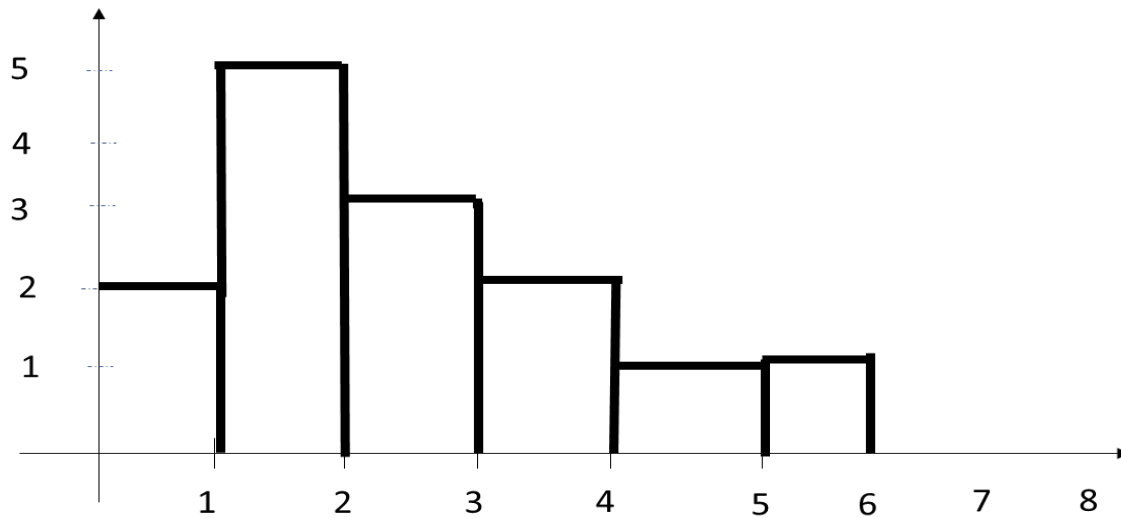
Mean -5.28, Median- 5.5 and Mode- 6

Conclusion: Here, the mean is 5.28 and the median is 5.5 but the mode is 6 more than the mean and median. In between, the mean and median, the median will be always higher than the mean. That means the mode will be always higher than both the mean and median in the case of the Negatively skewed curve. That means:

Mean < Median < Mode

2. Left Skewed Curve:

Dataset: 1,1,2,2,2,2,2,3,3,3,4,4,5,6



Mean -2.85, Median- 2.5 and Mode- 2

Conclusion: Here, the mean is 2.85 and the median is 2.5 but the mode is 2 less than the mean and median. In between, the mean and median, the median will be always lesser than the mean. That means the mode will be always lesser to both of them (mean and median) in the case of the Positively skewed curve. That means:

Mean > Median > Mode