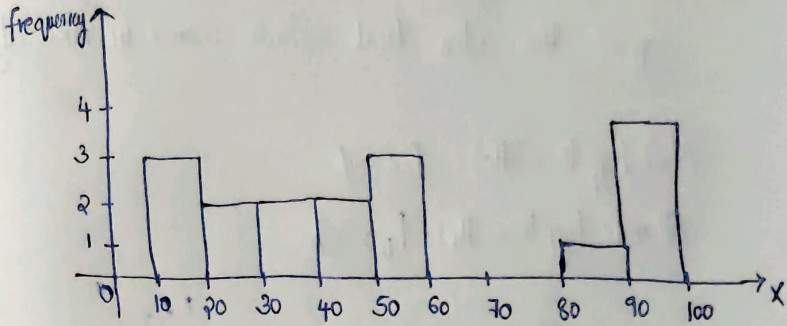# Assignment - 1 (Statistics)

1. Plot a histogram

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

   Let bin size = 10

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 ~~250~~ 520. Construct an 80% CI about the mean?

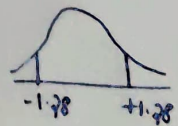Ans:- $\sigma = 100$, $n = 25$, $\bar{x} = 520$, $CI = 80\%$, $\alpha = 0.2$

   Since ~~vn<30~~, we go with ~~t-test~~

   Since σ is given, we go with z-test

   point estimate ± margin of error

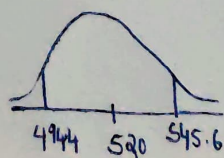 $$\bar{x} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

   $Z_{\alpha/2} = Z_{0.2/2} = Z_{0.1} = 1.28$

   lower fence = $\bar{x} - Z_{\alpha/2}(\sigma/\sqrt{n})$

   $= 520 - 1.28\left(\frac{100}{\sqrt{25}}\right)$

   $= 494.4$

   higher fence = $\bar{x} + Z_{\alpha/2}(\sigma/\sqrt{n})$

   $= 520 + 1.28\left(\frac{100}{\sqrt{25}}\right)$

   $= 545.6$

   $$CI \Rightarrow [494.4 - 545.6]$$

3. A company believes that 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:-

Null hypothesis (H_0): $P_0 \leq 60\%$
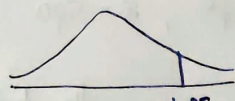
Alternate hypothesis (H_1): $P_D > 60\%$

$$n = 250, \quad x = 170$$

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

$$P_0 = 0.6, \quad q_0 = 1 - P_0 = 0.4$$

$$\alpha = 0.1$$

one tail test

$$+1.28$$
$$\rightarrow \text{from } Z\text{-table}$$
$$\rightarrow \text{since } n > 30$$

Test statistics:

$$z \text{ test} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 q_0}{n}}} = \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}}$$

$$= 2.58$$
$$\rightarrow > 1.28$$

So reject Null hypothesis

4. what is the value of the 99 percentile?

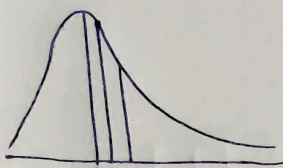2, 2, 3, 4, 5, 5, 5, 6, 7, 8, 8, 8, 8, 8, 9, 9, 10, 11, 11, 12

20 → index

$$value = \frac{percentile \times (n+1)}{100}$$

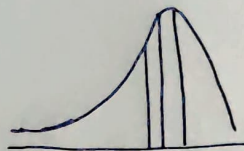$$= \frac{99}{100} \times 21 = 20.79$$

→ index values

So value at 99 percentile is '12'

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

Mode Median Mean
right skewed distribution
↳
Mode < Median < Mean

mean Median Mode
left skewed distribution
Mode > Median > mean