Q.2) A car company belives that the % of citizens in city ABC who owns a vehicle are 60% or less. A sales manager disagrees with it. He conducted a Hypothesis test surveying 250 residents & found that 170 residents responded 'YES' to owning a vehicle.

a) State null & alternate Hypo.
b) At a 10% significance level, Is there enough evidence to support the idea that vehicle owners in ABC city are 60% or less.

Ans :- Given - $P_0 \leq 60\%$ (Propotion of H_0)

Propotion of Sample data) $\hat{p} = \frac{x}{n} = \frac{170}{250} = 0.68 \sim 68\%$

$q_0 = 1 - P_0 = 1 - 0.6 = 0.4$

Step (1) Null Hypothesis (H_0) $\Rightarrow P_0 \leq 60\% \Rightarrow 0.6$

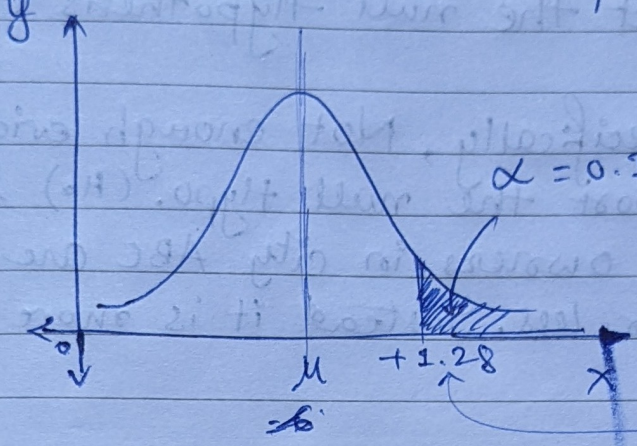
Alternate Hypo. (H_1) $\Rightarrow P_0 > 60\%$
(Not less than or equal to 60 i.e. $\not> 60$)

Step (2) C.I. = 90% as α = 10% i.e 0.1

$\therefore \alpha = 0.1$

Step ③ It is 1-tail test as we need to check % of citizens owning a vehicle is not $\leq 60\%$. (means Is it more than 60 or Not)

Also, It is a Z-test with propotion.



From Z-table, for Area = 0.1

Std. dev. limit = +1.28

Step ④ Calculate Z test statistics

$$\therefore Z\text{-score} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0 q_0}{n}}}$$

(with propotion)

$$= \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}}$$

$$\boxed{\therefore Z\text{-score} = +2.58}$$ ---> Std. dev. (of sample data w.r.t. pop^n)

Step (5) Conclusion :

As, Z-score (2.58) > 1.28 (std. dev. limit as per 'α')

∴ Reject the null Hypothesis (H_0)

More specifically, Not enough evidence to support the null Hypo. (H_0) & that vehicle owners in city ABC are not 60% or less. Instead it is more > 60%.