Q1: In a company there are 1000 employees. How many L-Tshirts and XL-Tshirts are needed if the sample data given is 500 and sample mean for XL is 300 and sample mean for L is 200?

Given:

$n = 500$

$\alpha = 0.05$

For XL:

$\bar{x} = 300$

$\hat{p} = \frac{300}{500} = 0.6$

$Z_{\alpha/2} = Z_{\frac{0.05}{2}} = Z_{0.025} = 1.96$

$$C.I. = \hat{p} \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

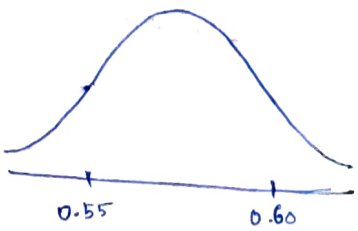
$$C.I. = 0.6 \pm 1.96 \sqrt{\frac{0.6(1-0.6)}{500}}$$

$$\text{Lower Fence} = 0.6 - 1.96 \sqrt{\frac{0.6(0.4)}{500}}$$

$$= 0.6 - 1.96\,(0.0219)$$

$$= 0.6 - 0.0429$$

$$= 0.55$$



$$\text{Higher Fence} = 0.6 + 1.96 \sqrt{\frac{0.6(0.4)}{500}}$$

0.00048

$$= 0.6 + 1.96\,(0.0219)$$

$$= 0.6 + 0.0429$$

$$= 0.64$$

55% to 64% of the entire population will be XL-Tshirts.

for L:

$\bar{x} = 200$

$\hat{p} = \frac{200}{500} = 0.4$

$Z_{\alpha/2} = \frac{Z_{0.05}}{2} = Z_{0.025} = 1.96$

$$C.I. = \hat{p} \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$= 0.4 \pm 1.96 \sqrt{\frac{0.4(1-0.4)}{500}}$$

$$= 0.4 \pm 1.96 \sqrt{\frac{0.4(0.6)}{500}}$$

Lower fence $= 0.4 - 1.96(0.0219)$

$= 0.4 - (0.0429)$

$= 0.35$

Higher Fence $= 0.4 + 1.96(0.0219)$

$= 0.4 + (0.0429)$

$= 0.44$

35 % to 44 % of the entire population will be L-T shirts

Q2: A car company believes that the percentage of residents in city ABC that owns a vehicle is 60% or less. A sales manager disagrees with this. He conducts a hypothesis testing surveying 250 residents and found that 170 responded yes to owning a vehicle.

a) State the Null & Alternate Hypothesis.

b) At 10% significance level, is there enough evidence to support the idea that vehicle ownership in ABC city is 60% or less?

Given:

$n = 250$

$x = 170$

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

① Null Hypothesis H_0 : $P_0 \leq 60\%$

$P_0 \leq 0.60$

Alternate Hypothesis H_1 : $P_0 > 60$

② $\boxed{\alpha = 0.10}$

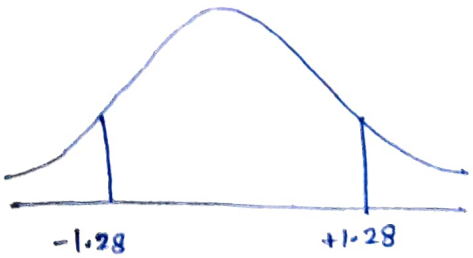
③ Decision Boundary

$\boxed{P_0 = 0.60}$

$q_0 = 1 - P_0$

$= 1 - 0.60$

$\boxed{q_0 = 0.40}$



(H) Z-test statistics:

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

$$= \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}}$$

$$= \frac{0.08}{\sqrt{0.00096}}$$

$$= \frac{0.08}{0.0309}$$

$$\boxed{Z = 2.5889}$$

Since the z-value is greater than 1.28, we reject the null hypothesis.

∴ The vehicle ownership in city ABC is not 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

$\boxed{n = 20}$

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

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

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

$$= 20.79 \Rightarrow \text{Index}$$

So, the value at 20th index is 12

∴ The value of the 99 percentile is 12