

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

Solutions:

1) Null hypothesis $H_0: P_0 = 60\%$

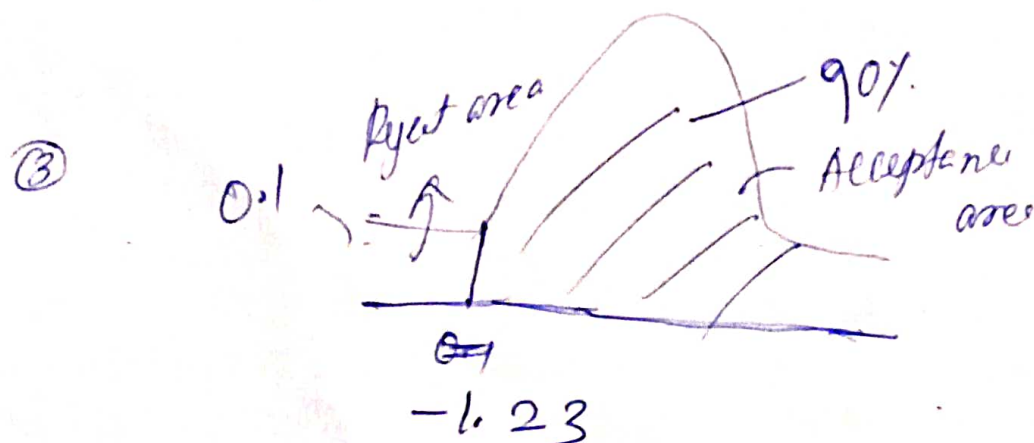
$H_1: P_0 \neq 60\%$

$n = 250, x = 170$

$$Q_0 = 1 - P_0 = 1 - 0.6 = 0.4$$

② $\alpha = 0.1$

1 tail test



④ Z-test with proportions

$$Z_{\text{test}} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

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

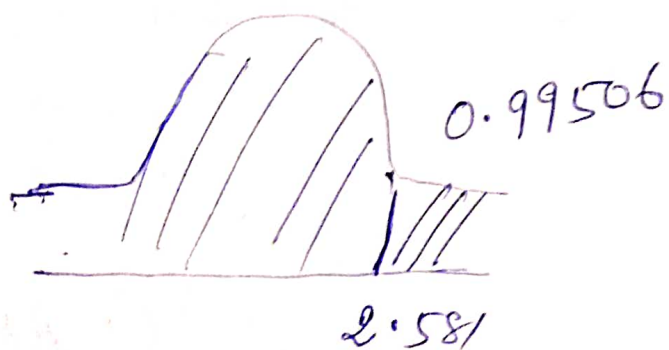
$$= \frac{0.68 - 0.60}{\sqrt{\frac{0.6 \times 0.4}{250}}} = \frac{0.08}{0.030984}$$

$$= 2.581$$

⑤ $2.581 > -1.23$ Reject the Null Hypothesis.

P-value

$$Z_{\text{score}} = 2.581$$



$$P = 0.99506$$

$0.99506 > 0.1$ Reject Null Hypothesis.

$$\boxed{P\text{-value} < \alpha}$$

100k employees in a dyz company, how many XL and L-size T-shirt we need to order. HR has given sample of 300 out of 500 people in XL, 200 out of 500 in L. CI=95%

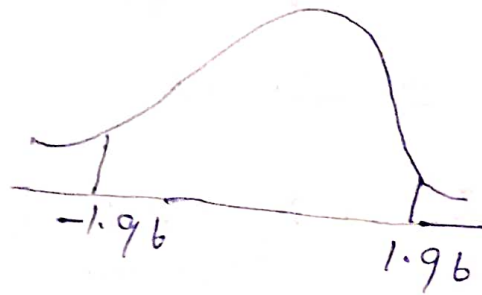
Solutions:

1) Null Hypothesis $H_0: P_1 = P_2$

$H_1: P_1 \neq P_2$

2) $\alpha = 0.05$ CI = 95%

③



④ Z-test with proportions

$$Z = \frac{\hat{P}_1 - \hat{P}_2}{\sqrt{\hat{P}(1-\hat{P})} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$\hat{P}_1 = \frac{300}{500} = 0.6$$

$$\hat{P}_2 = \frac{200}{500} = 0.4$$

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} \quad \begin{array}{l} n_1 = 500 \\ n_2 = 500 \end{array}$$

$$= \frac{360 + 200}{500 + 500} = 0.5$$

$$= \frac{0.6 - 0.4}{\sqrt{0.5(1-0.5)} \sqrt{\frac{1}{500} + \frac{1}{500}}}$$

$$= \frac{0.2}{0.5 \times 0.063246}$$

$$= 6.324511$$

$6.32 > 1.96$ Reject the Null Hypothesis