01 X - life time of a mobile phone battery.

$\sigma = 100$

$n = 81$ $\qquad \alpha = 0.05$

$\bar{x} = 550$ $\qquad \mu_0$ (hypothized value) $= 570$

μ - Actual (Population) mean

hypothesis,

$H_0 : \mu = 570$ $\qquad H_1 : \mu \neq 570$

Let's take the test statistic

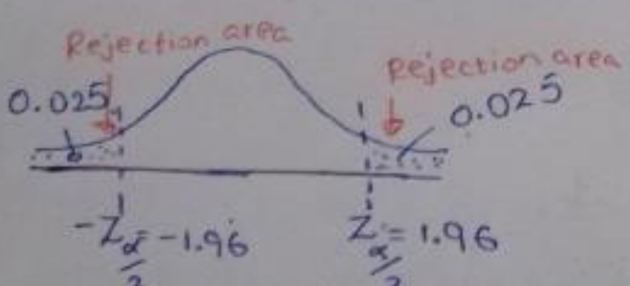
$$Z = \frac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}} \sim N(0,1)$$

$$Z_{cal} = \frac{550 - 570}{\frac{100}{\sqrt{81}}}$$

$$= \frac{-20}{\frac{100}{9}} = \frac{-18\cancel{0}}{10\cancel{0}} = \underline{\underline{-1.8}}$$

* This is a two tail test.

<u>Desicion Rule</u>: Reject H_0 if $|Z_{cal}| > |Z_{\frac{\alpha}{2}}|$



$Z_{\frac{\alpha}{2}} = |Z_{0.025}| = 1.96$

$|Z_{cal}| = |-1.8| = 1.8$

Desicion: Since $|Z_{cal}| < |Z_{0.025}|$, we do not reject H_0 at 5% level of significance.

Conclusion: True population mean life time is 570 hrs.

(Q2) Type I Error: Reject H_0 when H_0 is True

Type II Error: Do not Reject H_0 when H_0 is false.

(Q3) X – Cost of a text book

$\mu_0 = 520$ $\quad n = 100$

$\sigma = 45$ $\quad \bar{x} = 528$

μ – Actual Average cost of a book

$H_0 : \mu \leq 520$ $\qquad H_1 : \mu > 520$

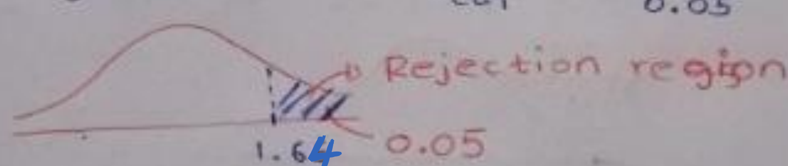
Let's Consider the test statistic,

$$Z = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} \quad \text{where } Z \sim N(0,1)$$

$$Z_{cal} = \frac{528 - 520}{\frac{45}{\sqrt{100}}} = \underline{\underline{1.778}}$$

* This is a one tail test.

Decision Rule: Reject H_0 if $Z_{cal} > Z_{0.05}$



Decision: Since $Z_{cal}(1.778) > Z_{0.05}(1.64)$, we have enough evidance to reject H_0 at 5% level of Significance.

Conclusion: It Can be concluded that, true Population Cost is higher than 520.

(04)

X - amount of miles, that a car owner rides.

$\mu_0 = 18000$

$n = 40$ $S = 1348$

$\bar{X} = 17463$ $\alpha = 0.05$

μ - Actual (population) average miles, that a Car owner rides.

$H_0: \mu \geq 18000$ $H_1: \mu < 18000$

Since $n > 30$, test statistic is

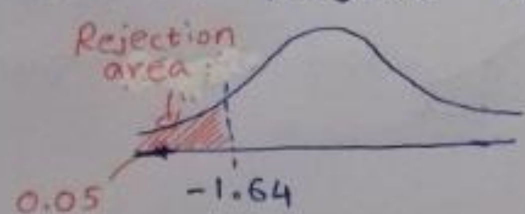
$$Z = \frac{\bar{X} - \mu}{\frac{S}{\sqrt{n}}} \text{, where } Z \sim N(0,1)$$

$$Z_{cal} = \frac{17463 - 18000}{\frac{1348}{\sqrt{40}}}$$

$$= -2.52$$

* This is a one tail test

Decision Rule: Reject H_0 if $Z_{cal} < -Z_{0.05}$



$Z_{cal} = -2.52$

$-Z_{0.05} = -1.64$

Decision: Since $Z_{cal} < -1.64$, we have enough evidence to reject H_0, at 5% level of Significance

Conclusion: Actual average miles that a car owner rides is less than 18000.

(05) X - tar Content of a cigarette.

$n = 8$

$\overline{X} = 18.6$ $\qquad \alpha = 0.01$

$S = 2.4$

μ - Actual average 'tar' content of a cigarette.

$H_0: \mu = 17.5$ $\qquad H_1: \mu > 17.5$

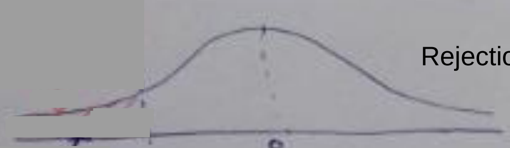
$(\mu \leq 17.5)$

Since $n < 30$ and population Standard deviation is unknown, test statistic is,

$$T = \frac{\overline{X} - \mu_0}{S/\sqrt{n}} \quad \text{where, } T \sim t_{n-1}$$

$$T_{cal} = \frac{18.6 - 17.5}{\frac{2.4}{\sqrt{8}}} = \underline{\underline{1.296}}$$

Decision Rule: Reject H_0 if $T_{cal} > -t_7(0.01)$



Rejection region

$t_7(0.01) = 2.998$

$T_{cal} = 1.269$

Decision: Since $T_{cal} < 2.998$, we don't have enough evidence to reject H_0 at 0.01 level of significant.

Conclusion: Therefore there is enough evidence to suggest that manufacturer's claim is correct.

(06) x - number of suppliers engaged by farm and power equipment

i) $\bar{x} = \frac{3+3+2+\dots+4+5+2}{12}$

$= \underline{\underline{3}}$

$sd(x) = \underline{\underline{1.044}}$

ii) μ - Actual mean number of suppliers

$H_0: \mu \leq 3.2$ $\quad$ $H_1: \mu > 3.2$

test statistic,

$$T = \frac{\bar{x} - \mu_0}{\frac{S}{\sqrt{n}}} \sim t_{(n-1)} \; (t_{(11)})$$

$$T_{cal} = \frac{3 - 3.2}{\left(\frac{1.044}{\sqrt{12}}\right)} = \underline{\underline{-0.664}}$$

at $\alpha = 0.05$,

Decision Rule: Reject H_0 if $T_{cal} > \underset{(1.796)}{t_{11, 5\%}}$ value.

Decision: Since $T_{cal} < 1.796$, we donot have enough evidance to reject H_0 at 5% level of significance

Conclusion: Mean number of suppliers engaged do not exceed 3.2.