Tutorial 07 - Part 2

(01) $n = 81$, $\bar{x} = 12$, $\sigma = 3$, $\alpha = 0.05$

C.I for μ is,

$$\bar{x} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

from the Z table, $Z_{0.025} = 1.96$

$$12 \pm 1.96 \times \frac{3}{\sqrt{81}}$$

$$12 \pm 1.96 \times \frac{\cancel{3}}{\cancel{9}\,3}$$

$$12 \pm 0.653$$

$$[11.347 , 12.653]$$

$$\therefore [11.347 < \mu < 12.653]$$

(02) Margin of error is 0.5

$$Z_{\alpha/2} \frac{\sigma}{\sqrt{n}} < 0.5$$

$$Z_{\alpha/2} \frac{\sigma}{0.5} < \sqrt{n}$$

$$n > \left(Z_{\alpha/2} \frac{\sigma}{0.5}\right)^2$$

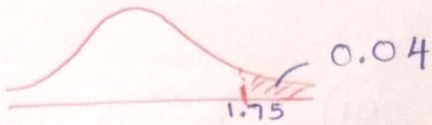
$$n > \left(1.96 \times \frac{3}{0.5}\right)^2$$

$$n > 138.29$$

$n = 139$ n Should be at least 139

03) a) x - time, worker takes

$\sigma = 3.6$, $n = 120$, $\bar{x} = 16.2$ $\alpha = 0.08$



C.I. is

$$\bar{x} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

$Z_{0.04} = 1.75$

$$16.2 \pm Z_{0.04} \frac{3.6}{\sqrt{120}}$$

$$16.2 \pm 1.75 \times \frac{3.6}{\sqrt{120}}$$

$$16.2 \pm 0.575$$

$$[15.625 , 16.775]$$

C.I is,

$$[15.625 < \mu < 16.775]$$

b)

$$Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} = 15$$

$$1.75 \times \frac{3.6}{\sqrt{n}} = 15$$

$$\left(\frac{17.5 \times 3.6}{15}\right)^2 = n$$

$$n = 17.64$$

$$\underline{\underline{n = 18}}$$

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(04)

a) X - number of concurrent users

$\bar{x} = 37.7$, $S = 9.2$, $n = 100$, $\alpha = 0.1$ (or 10%)

Since $n > 30$,

C.I is

$$\bar{X} \pm Z_{0.05} \frac{S}{\sqrt{n}}$$

$$37.7 \pm 1.64 \times \frac{9.2}{\sqrt{100}}$$

$$37.7 \pm 1.5088$$

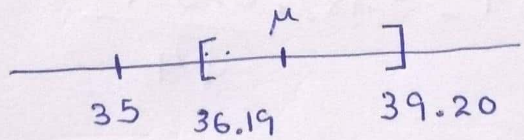
$$[36.19 , 39.20]$$

C.I. is ,

$$[36.19 < \mu < 39.20]$$ //

b) Yes, according to C.I , $[36.19 < \mu < 39.20]$

Ex ;



Therefore at 10% Significant level, we can Conclude that mean number is greater than 35.

(correct the significance level as 10% in the problem)

05 x- measured weight of a 1-grame

* $\bar{X} = \dfrac{0.95 + 1.02 + 1.01 + 0.98}{4}$

$= \underline{\underline{0.99}}$

* $S = \sqrt{\dfrac{\sum_{all\,i} (x_i - \bar{x})^2}{n-1}} = \underline{\underline{0.0316}}$

~~* Correction in q-05.~~

~~Ignore the, "Normal Distribution Assumption" in quesion 05, 3rd line.~~

a) $\bar{X} = 0.99$, $n = 4$, $S = 0.0316$, $\alpha = 5\%$.

Since $n < 30$ and σ is unknown

C.I is, $\bar{X} \pm t_{(n-1), \alpha/2} \dfrac{S}{\sqrt{n}}$

$0.99 \pm 3.182 \times \dfrac{0.0316}{\sqrt{4}}$

0.99 ± 0.050

$[0.94 , 1.04]$

There fore; C.I is

$[0.94 < \mu < 1.04]$

b) μ - Actual average weight of a 1 gram.

$H_0 : \mu = 1$ vs $H_1 : \mu \neq 1$

Since $n < 30$, and σ is unknown test statistic is,

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*Use the Confidence interval method to get the decision instead of the given method here.

$$T = \frac{\bar{X} - \mu}{\frac{S}{\sqrt{n}}}, \text{ where } T \sim t_{n-1}$$

$$T_{cal} = \frac{0.99 - 1}{\frac{0.0316}{\sqrt{4}}} = \frac{-0.01}{0.0158}$$

$$= -0.6329$$

Decision Rule: Reject H_0 if $|T_{cal}| > |t_{n-1, (\alpha/2)}|$

$|T_{cal}| = 0.63$

$|t_{n-1, \alpha/2}| = 3.182$

Decision: Since $|T_{cal}| < 3.182$, we do not have enough evidance to reject H_0 at 5% level of significance.

Conclusion: Actual average weight is 1 gram. There fore the scale is accurate.

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06 X - time, taken by a certain hardware.

$\sigma = 5$ min. $\alpha = 0.05$ (or 5%)

$n = 64$

$\overline{X} = 42$

C.I is;

$$\overline{X} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

$$42 \pm Z_{0.025} \times \frac{5}{\sqrt{64}}$$

$$42 \pm 1.96 \times \frac{5}{8}$$

$$42 \pm 1.225$$

$$[40.775, 43.225]$$

$$[40.775 < \mu < 43.225]$$