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Question ①:

$n = 25, \; s = 237.52$

$s^2 = (237.52)^2 = \cancel{1353978.01}$
56415.7504

For 95% C.I

$1 - 0.95 = 0.05$

$\alpha = 0.05$

$\alpha/2 = 0.025$.

$1 - 0.025 = 0.975$

$n - 1$.

$25 - 1 = 24$

Critical values

$\alpha/2 = 0.025 = \boxed{39.364}$

$1 - \alpha/2 = 0.975 = \boxed{12.401}$

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \le \sigma^2 \le \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$$

$$\frac{24 \times \cancel{1353978.01}\ 56415.7504}{39.364} \le \sigma^2 \le \frac{24 \times \cancel{135}\ 56415.7504}{12.401}$$

$$\frac{1353978.01}{39.364} \le \sigma^2 \le \frac{1353978.01}{12.401}$$

$$34396.35225 \le \sigma^2 \le 109182.9699$$

for 50% C.I

$\alpha = 0.5$

$\frac{\alpha}{2} = 0.25$

$1 - \frac{\alpha}{2} = 0.75$

critical values

$0.25 = \boxed{28.241}$

$0.75 = \boxed{19.037}$

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \le \sigma^2 \le \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$$

$$\frac{1353978.01}{28.241} \le \sigma^2 \le \frac{1353978.01}{19.037}$$

$$47943.69923 \le \sigma^2 \le 71123.49687$$

Q2) $n_1 = 5$, $S_1 = 3.4$

$n_2 = 6$, $S_2 = 2.6$

$S_1^2 = 3.4^2 = 11.56$

$S_2^2 = 6.76$

$v_1 = n_1 - 1 = 5 - 1 = 4$

$v_2 = n_2 - 1 = 6 - 1 = 5$

For 99% C.I

$\alpha = 0.01$

$\frac{\alpha}{2} = 0.005$

$v_1, v_2 = 15.56$

$v_2, v_1 = 22.46$.

$$\frac{S_1^2}{S_2^2} \times \frac{1}{f_{\alpha/2}(v_1, v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{S_1^2}{S_2^2} \times f_{\alpha/2}(v_2, v_1)$$

$$\frac{11.56}{6.76} \times \frac{1}{15.56} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{11.56}{6.76} \times 22.46$$

$$0.1099 < \frac{\sigma_1^2}{\sigma_2^2} < 38.4079$$

For 90% C.I

$\alpha = 0.10$

$\frac{\alpha}{2} = 0.05$

$v_1 v_2 = 7.39$

$v_2 v_1 = 9.36$

$$\frac{11.56}{6.76} \times \frac{1}{7.39} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{11.56}{6.76} \times 9.36$$

$$0.231 < \frac{\sigma_1^2}{\sigma_2^2} < 16.0061$$

Q3) $\mu = 60$, $\sigma = 12$, $n = 225$, $\bar{X} = 65$

$\alpha = 2\% = 0.02$

step ① = $H_0 : \mu = 60$

$H_1 : \mu \neq 60$

step ② = $\alpha = 0.02$

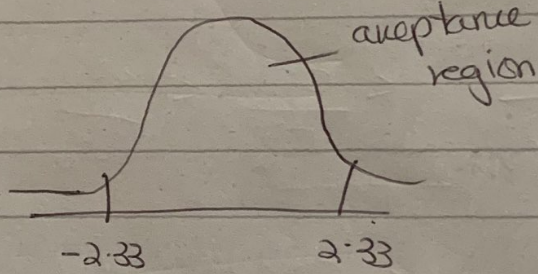
$\alpha/2 = 0.01$

$1 - 0.01 = 0.99$ from table $Z = 2.33$

step ③ Z- test

$$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

step ④



$Z > -2.33$

$Z < 2.33$

step ⑤ $Z = \dfrac{65 - 60}{\frac{12}{\sqrt{225}}} = \dfrac{5}{0.8} = 6.25$

value 6.25 is greater than 2.33 so its present in rejection region, so we reject H_0 and accept H_1 i.e $\mu \neq 60$

P-value

$Z = 6.00$ (6.25 is not available in table)

$P(\cancel{Z} > 6.00) = 0.9999$

$P(Z < 6.00)$ — ignored because not in table

$1 - 0.9999 = 0.0001$

p value $< \alpha$

$0.0001 < 0.02$

So we reject Ho and accept H_1

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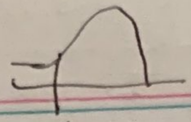
Practice Qs SSC

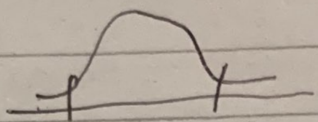
Q4



-1.6

$z = -1.5$

we will accept null hypothesis. b/c value is present in acceptance region.



-3.2 3.2

$z = 2.9$

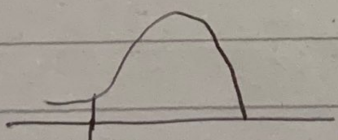
As value is present in acceptance region so we will accept the null hypothesis

Q5 $\mu = 1$, $n = 20$, $S = 0.02$

- $H_0 : \mu = 1$
  $H_1 ; \mu < 1$

- t-test will be used b/c 'σ' is unknown and sample standard deviation is known.

- Nature of test is one tail b/c H_1 value or alternate hypothesis is on negative side of the distribution, it is left tail.



z value

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Q6) $\pi = 88\% = 0.88$, $n = 100$, $p = \frac{93}{100} = 0.93$

$\alpha = 0.01$

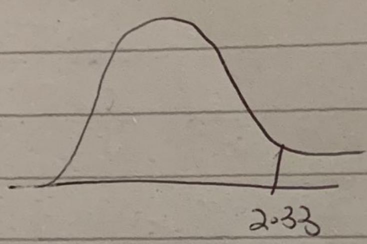
Step (1) $H_0 : \pi = 0.88$

$H_1 : \pi > 0.88$

step (2) $\alpha = 0.01$ $1 - 0.01 = 0.99 - Z = 2.33$

step (3) Z-test $Z = \dfrac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}}$

step (4)



$Z > 2.33$

step (5) $Z = \dfrac{0.93 - 0.88}{\sqrt{\dfrac{0.88(1-0.88)}{100}}}$

$Z = \dfrac{0.05}{\sqrt{\dfrac{0.88 \times 0.12}{100}}} = \dfrac{0.05}{\sqrt{0.001056}} = 1.5386$

value 1.538 is less than 2.33, its in acceptance region so we accept Ho and reject H_1 i.e $\pi > 0.88$.

P-value

$P(Z > 1.5386)$

round off $P(Z > 1.54) = 0.9382$

$1 - 0.9382 = 0.0618$

P value > α

so we accept Ho and reject H_1