Claim: The mean starting salary for college graduates who have taken a statistics course is equal to $46,000.

Sample data: $n = 65, \bar{x} = 45,678$ Assume that $\sigma = 9900$ and the significance level is $\alpha = 0.05$.

(a) $H_0: \mu = 46000$
(b) $H_a: \mu \neq 46000$
(c) $TS = z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{45678 - 46000}{9900 / \sqrt{65}} = -0.262$

(d) $p$-value $= 0.3974$ from Table A (see page 373 of book)

$$H_a : \mu \neq \mu_0 \text{ is } 2P(z \geq | -0.262 |)$$

$$2 \times 0.3974 = p\text{-value for 2 sided Ha, two-tailed test}$$

(e) Conclusion

Since $0.7948 \neq 0.05 = \alpha$,

we don't have enough evidence to reject the null $95\%$ confidence level hypothesis $H_0$. There isn't evidence to support salary being $\neq 46000$. 

Show your work.
Follow-up question to quiz question

How large a sample size would be needed to reject the $H_0: \mu = 46000$ if the $\bar{X}$ were still 45678?

$Z \geq |1.96|$ would be required

See Table A

\[
\frac{0.0250}{1.0000} + 0.95 + 0.0250
\]

$0.0250$

Note: $Z \leq -1.96$ or $Z \geq 1.96$

is equivalent to $Z \leq |z|$

(absolute value of $z = |z|$)

Given or Known:

\[
\bar{X} = 45678
\]

$\sigma = 9900$

$|Z| = 1.96$

Output

Goal or need to know or try to find or unknown

$n$
What will enable us to get from given (input) to goal (output)?

Mobilize past knowledge. Can you think of a formula to apply?

\[ Z = \frac{X - \mu_0}{\sigma / \sqrt{n}} \]

\[-1.96 =\frac{45678 - 46000}{\sqrt{9900}}\]

\[-1.96 \times \sqrt{9900} = -322 \]

\[-322 = \sqrt{n} = \frac{-19404}{-322} = 60.2 \]

Therefore \( n = 60.2^2 = 3631.4 \)
\[ \sqrt{3631.47} = 363.2 \]

is the smallest sample size that would be required to reject \( H_0 \) when the difference of \( \bar{x} \) and \( \mu_0 \) is 322 or -322.

\( \lceil x \rfloor \) is the smallest integer \( k \) such that \( x \leq k \)

(\( \lceil x \rfloor \) reads the ceiling of \( x \))

\[ \lceil 3.14159 \rceil = 4 \]

**Alternative approach**

\[ z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} \Rightarrow z \left( \frac{\sigma}{\sqrt{n}} \right) = \bar{x} - \mu_0 \]

\[ \Rightarrow \left( \frac{z}{\sigma} \right) = \sqrt{n} (\bar{x} - \mu_0) \]

\[ \Rightarrow \left( \frac{z}{\sigma} \right) \left( \frac{\sigma}{\bar{x} - \mu_0} \right) = \sqrt{n} \Rightarrow n = \left( \frac{\sigma^2}{(\bar{x} - \mu_0)^2} \right)^2 \]

Then answer = \( \lceil n \rceil \)