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MAT271E HW3

Q1)

$H_0 \Rightarrow \mu = 15$

$H_a \Rightarrow \mu < 15$

$z_0 = \dfrac{12.5 - 15}{3.6/\sqrt{16}} \cong -2.778$

$z_{0.025} = 1.96$

Reject H_0 if $z_0 < -1.96 \rightarrow \boxed{\text{Reject } H_0}$

There is sufficient evidence to conclude the editor's claim is true at $a = 0.025$

Q2)

a)

$H_0 \Rightarrow \mu = 1000$

$H_a \Rightarrow \mu > 1000$

$z_0 = \dfrac{1014 - 1000}{25/\sqrt{20}} \cong 2.504$

$z_{0.05} = 1.64$

Reject H_0 if $z_0 > 1.64 \rightarrow \boxed{\text{Reject } H_0}$

There is sufficient evidence.

b)

$$\bar{X} - \frac{z_{0.025} \cdot \sigma}{\sqrt{n}} \leq \mu \leq \bar{X} + \frac{z_{0.025} \cdot \sigma}{\sqrt{n}}, \quad z_{0.025} = 1.96$$

$$\boxed{1003.04 \leq \mu \leq 1024.96}$$

Q3)

a)

$H_0 \rightarrow \mu = 17$

$H_a \rightarrow \mu \neq 17$

$t_0 = \dfrac{16.98 - 17}{0.318/\sqrt{6}} = -0.154$

$S = 0.318$

$t_{(0.005,5)} = 4.032$

$\bar{x} = 16.98$

Reject if not $-4.032 \leq t_0 \leq 4.032 \rightarrow$ $\boxed{\text{do not reject}}$

b)

$$\bar{x} - \frac{t_{(0.005,5)} \cdot 0.318}{\sqrt{6}} \leq \mu \leq \bar{x} + \frac{t_{(0.005,5)} \cdot 0.318}{\sqrt{6}}$$

$$\boxed{16.46 \leq \mu \leq 17.5}$$

Q4)

$H_0 \rightarrow \sigma^2 \leq 0.0001$

$H_a \rightarrow \sigma^2 > 0.0001$

$\chi_0^2 = \dfrac{14 \cdot (0.008)^2}{(0.01)^2} = 8.96$

$\chi^2_{(0.01,14)} = 29.14$

Reject if $\chi_0^2 > 29.14 \rightarrow$ $\boxed{\text{do not reject}}$

Not enough evidence.

Q5)

a)

$$\beta_1 = \frac{\sum xy - \frac{\sum x \cdot \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} = \frac{148.3 - \frac{(22)(49.8)}{8}}{71 - \frac{22^2}{8}}$$

$$= 1.08$$

$$\beta_0 = \frac{\sum y}{n} - \frac{\sum x}{n} \cdot 1.08$$

$$= 6.225 - 2.97 = 3.255$$

$$\boxed{y = 3.255 + 1.08x}$$

b)

$$3.255 + (1.08).(3.2) = \boxed{6.71}$$