Student Information

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Answer 1

a)

Sample mean:

$$\bar{x} = \frac{\sum x_i}{n} = \frac{6.4 + 9.5 + 8.2 + 10.2 + 7.6 + 11.1 + 8.7 + 7.3 + 9.1}{9} = 8.677$$

Standard deviation: $\sigma = 2.7$

Sample size: $n = 9$

$Z_{0.025} = -1.96$

Margin:

$$\triangle = |Z_{0.025} \times \frac{\sigma}{\sqrt{n}}| = |-1.96 \times \frac{2.7}{\sqrt{9}}| = 1.764$$

Confidence interval:

$$\left(\bar{X} - \triangle, \bar{X} + \triangle\right) = (8.677 - 1.764, 8.677 + 1.764) = (6.913, 10.441)$$

b)

Margin: $\triangle = 1.25$

$Z_{0.025} = -1.96$

Sample size (n):

$$n \geq \left(\frac{Z_{0.025} \times \sigma}{\triangle}\right)^2 = \left(\frac{-1.96 \times 2.7}{1.25}\right)^2 = 17.924$$

n must be at least 18 for a margin that is at most 1.25

Answer 2

a)

H_0: Average monthly revenue of the current year is equal to last year's revenue.

$$H_0 : \mu = 20000 \text{ (Mecnun's claim)}$$

H_A: Average monthly revenue of the current year is larger than last year's revenue.

$$H_A : \mu > 20000 \text{ (Leyla's claim)}$$

One sided Right Tail Alternative

b)

$\bar{X} = 22000$

$\sigma = 3000$

$n = 50$

$Z_{0.05} = 1.645$

$$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{22000 - 20000}{\frac{3000}{\sqrt{50}}} = \frac{2000}{424.264} = 4.716$$

$$Z = 4.716 > 1.645$$

Reject H_0

Revenue has increased.

c)

$$\text{p-value} = P(Z > 4.716) \approx 0$$

The p-value is almost zero which means that the threshold for
α values that makes H_0 acceptable, is very high.
Strong evidience against Null Hypothesis.

d)

Leyla & Mecnun:

$$\bar{X}_c = 22000 \quad \sigma_c = 3000 \quad n = 50$$

Rival:

$$\bar{X}_r = 24000 \quad \sigma_r = 4000 \quad m = 40$$

H_0: The current average revenue of Leyla & Mecnun is equal to the rivals.

$$H_0 : \mu_1 = \mu_2$$

H_A: The current average revenue of Leyla & Mecnun is higher than the rival's.

$$H_A : \mu_1 > \mu_2$$

Rigth Tail alternative

$$\alpha = 0.01$$

$$Z_{0.01} = -2.32$$

$$Z = \frac{\bar{X}_c - \bar{X}_r}{\sqrt{\frac{\sigma_c^2}{n} + \frac{\sigma_r^2}{m}}} = \frac{22000 - 24000}{\sqrt{\frac{3000^2}{50} + \frac{4000^2}{40}}} = \frac{-2000}{761.578} = -2.627$$

$$Z = -2.627 < -2.32$$

Accept H_0

Not enough evidence to claim that revenue is higher .

Answer 3