23K-0032

Saif

Assignment 3

Date:

(Q1) $n = 50$, $\bar{x}$ 1.8 h, avg = 2.1h

$\sigma = \frac{20 \text{ min}}{60} = \frac{1}{3}$ h

confidence level = 90%. , $\alpha = 0.1$

$= z_{\alpha/2} = 1.645$ (for 90%)

confidence level $= \bar{x} \pm z_{\alpha/2} \times \frac{\sigma}{\sqrt{n}}$

$= 1.8 \pm 1.645 \times \frac{1/3}{\sqrt{50}}$

$= 1.8 \pm 0.0775$

$\Rightarrow 1.7225 < \mu < 1.8775$ hours

Therefore, the workers are distracted for lesser hours then the study claimed.

(Q2) $\bar{x} = 217.7$

$SD = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}} = 17.486$

for 95% CI $\Rightarrow n-1 = 9$, $t_{\alpha/2} = \frac{0.05}{2} = 0.025, 9 \approx 2.262$

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$$\Rightarrow \bar{x} \pm t_{\alpha/2} \times \frac{\sigma}{\sqrt{n}}$$

$$\Rightarrow 217.7 \pm 2.62 \times \frac{17.486}{\sqrt{10}} \Rightarrow 217.7 \pm 12.52$$

$$205.18 < \mu < 230.22$$

(Q3) $n = 30$

$H_0 : \mu \leq 42000$

$H_1 : \mu > 42000$ (right tailed)

$$z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$$

$$z = \frac{1260}{954.89} \Rightarrow 1.32$$

critical z-value for right tailed test at $\alpha = 0.05$ in $Z_{0.05} = 1.645$ as $P(z > z_\alpha) = 0.05$

$0.05 = 1 - P(z < z_\alpha)$

$0.05 = 1 - 0.95$

$P(z < z_\alpha) = 0.95$

$z_\alpha = 1.6449$

$z < z_\alpha \rightarrow$ fail to reject H_0

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(Q4) $n = 50$, $\sigma = 28.7$, $\alpha = 0.05$

$\bar{x} = 31.5$

$H_0 = \mu \leq 24$

$H_1 = \mu > 24$

↓

right tailed

$$z = \frac{31.5 - 24}{28.7/\sqrt{50}} \Rightarrow 1.848$$

$P = 1 - P(z < 1.848)$

$P = 1 - 0.9677 \Rightarrow 0.323$ ∴ H_0 reject

(Q5) $n = 20$, $H_0 = \mu = 5.8$, $H_1 = \mu \neq 5.8$ (two tailed test)

$\bar{x} = 3.85$

$$S^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{120.55}{19}$$

$$S = \sqrt{6.34717} \Rightarrow 2.5199$$

$$t = \frac{\bar{x} - \mu_0}{S/\sqrt{n}} = \frac{3.85 - 5.8}{(2.5199)/\sqrt{20}} \Rightarrow -3.462$$

degree of freedom $\Rightarrow df = n - 1 = 20 - 1 = 19$

$t_{\alpha/2, df} = \pm 2.093$

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$|t| = |-3.462| \rightarrow 3.462$

$|t| > |t_{\alpha/2}|$ ∴ we reject H_0.

(Q6) $n_1 = 12$, $\bar{x}_1 = 85$, $s_1 = 4$ (material 1)

$n_2 = 10$, $\bar{x}_2 = 81$, $s_2 = 5$ (material 2)

$\Delta_0 = 2$ units

$\alpha = 0.05$

$H_0 : \mu_1 - \mu_2 \leq 2$

$H_1 : \mu_1 - \mu_2 > 2$

(right tailed test)

$(s^2_p) = (\quad) s_1^2 + (n$

$$s^2_p = \frac{(n_1 - 1)s_1^2 + (n_2 + 1)s_2^2}{n_1 + n_2 - 2}$$

$$= \frac{(12-1)(4)^2 + (10-1)(5)^2}{12+10-2}$$

$$= \frac{401}{20} = 20.05$$

$$s_p = \sqrt{20.05} \Rightarrow 4.477$$

$$t\text{-score} = \frac{(85-81) - 2}{4.477\sqrt{\frac{1}{12} + \frac{1}{10}}}$$

Date:

$t = 1.043$

$t_{0.05, 20} \Rightarrow t_{\alpha/2} = 1.725$

$df = n_1 + n_2 - 2 \Rightarrow 20$

∴ $t(1.043)$ is less than $t_{\alpha/2}$, we fail to reject H_0. Hence 0.05 level, there is not enough evidence to prove that wear of material 1 exceeds that of material 2.