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EE381 Homework #10

Problem 1.

(a) Confidence Level $= 0.9 \rightarrow \alpha = 0.1$

$$\epsilon = \frac{-\sqrt{V_9}}{\sqrt{9}} F_{T_8}^{-1}\left(\frac{0.1}{2}\right) = \frac{-\sqrt{0.36}}{3} F_{T_8}^{-1}(0.05) = 0.38$$

Confidence Interval $= [6.1 \pm 0.38]$

(b) $M_9 = 6.1$, $V_9 = 0.36$, $\mu = 5.4$, $\alpha = 0.05$

T-Statistic: $T = \frac{\sqrt{n}(M_n - \mu)}{\sqrt{V_n}} = \frac{\sqrt{9}(6.1 - 5.4)}{\sqrt{0.36}} = 3.5$

p-value $= 2F_{T_8}(-13.51) = 0.008$

→ the sample IS significantly different because we reject the null hypothesis, since $0.008 < 0.05$

(c) $M_{10} = \frac{(6.1 \cdot 9 + 5)}{10} = 5.99$

Problem 2.

(a) Two-Sample T-Test

(b) Sample Means: $M_{128}^{(1)} = 80$, $M_{128}^{(2)} = 83$

Sample Variances: $V_{128}^{(1)} = 60$, $V_{128}^{(2)} = 68$

Pooled Sample Variance: $\hat{\sigma}^2 = \frac{(127 \cdot 60 + 127 \cdot 68)}{(128 + 128 - 2)} = 64$

(c) T-Statistic: $T = \frac{(80 - 83)}{\sqrt{64\left(\frac{1}{128} + \frac{1}{128}\right)}} = -3$

(d) $\alpha = 0.01$, p-value $= 2F_{T_{254}}(-1 \cdot 31) = 0.00297$

since $0.00297 < 0.01$, reject the null hypothesis

Problem 3.

(a) One Sample T-Test

(b) $M_{25} = 11.92$, $V_{25} = 0.04$, $\mu = 12$

Test-Statistic: $T = \frac{\sqrt{25}(11.92 - 12)}{\sqrt{0.04}} = -2$

(c) $\alpha = 0.05$, p-value $= 2F_{T_{24}}(-1 \cdot 2) = 0.0569$

since $0.0569 \geq 0.05$, fail to reject the null hypothesis

(d) Confidence Interval $= 0.9 \rightarrow \alpha = 0.1$

$$\epsilon = \frac{-\sqrt{0.04}}{\sqrt{25}} F_{T_{24}}^{-1}(0.05) = 0.0684$$

Confidence Interval: $[11.92 \pm 0.0684]$