9MA0-31 – Hypothesis testing - Worked Solutions

1.

Using the given values and conditions $\mathrm{P}(X \leq 0) = 0.3487$ therefore any observed value would give the same conclusion.

2.

$0.63 > 0.4973$ since r is greater than the critical value there is sufficient evidence, at the 5% significance level, to conclude that there is a positive linear correlation between the number of hours students spend studying and their exam scores.

3.

$\mathrm{H}_0: p = 0.3, \mathrm{H}_1: p > 0.3$

$X \sim \mathrm{B}(35, 0.3)$

$\mathrm{P}(X \geq 15) = 1 - \mathrm{P}(X \leq 14)$

$\mathrm{P}(X \geq 15) = 1 - 0.9269$

$\mathrm{P}(X \geq 15) = 0.0731$

$0.0731 > 0.05$ do not reject H_0, there is insufficient evidence to suggest $p > 0.3$

4.

$\mathrm{H}_0: \rho = 0$

$\mathrm{H}_1: \rho \neq 0$

Critical value for two tail test at 5% significance level for $n = 30$ is 0.3610

Since $0.57 > 0.3610$ reject H_0

There is sufficient evidence to suggest there is a correlation between height and weight of the players.

5(a).

Outcomes are mutually exclusive parts are either faulty or not and there is a fixed sample size (40).

5(b).

If they test every part to destruction they would have not parts to sell.

5(c).

$H_0: p = 0.05, H_1: p > 0.05$

$X \sim B(40, 0.05)$

$P(X \geq 5) = 1 - P(X \leq 4)$

$P(X \geq 5) = 1 - 0.9520$

$P(X \geq 5) = 0.0480$

$0.0480 < 0.05$ Reject H_0, there is sufficient evidence to take the machine out of production.

6.

$H_0: p = 0.2, H_1: p > 0.2$

$X \sim B(50, 0.2)$

$P(X \geq 16) = 1 - P(X \leq 15)$

$P(X \geq 16) = 1 - 0.9692$

$P(X \geq 16) = 0.0308$

16 or more adults with the allergy would be sufficient evidence to suggest the pollution level has increased.

7(a).

W = weight of adult gym member

$P(W < 88) = 0.6484$

64.84% of adult gym members weigh less than 88kg.

7(b).

$H_0: \mu = 86.4$

$H_1: \mu \neq 86.4$

Adjusting variance $\frac{4.2^2}{30}$

T = weight of adult non gym member

$P(\bar{T} > 88) = 0.0185$

$0.0185 < 0.0250$

Reject H_0 there is sufficient evidence to support the instructor's claim

7(c).

$2 \times 0.0185 = 0.0370$

8.

$H_0: \mu = 32.6$, $H_1: \mu \neq 32.6$

$\frac{4.9}{\sqrt{40}} = 0.7748$

$0.0467 > 0.0250$

Do not reject H_0, there is not sufficient evidence to suggest the mean time has changed.

9.

$H_0: \mu = 86$, $H_1: \mu < 86$

$\frac{16}{\sqrt{80}} = 1.79$

$0.0127 < 0.0500$

Reject H_0, there is sufficient evidence to suggest mean time spent responding to emails is less than 86 minutes.

10.

$H_0: \mu = 2.5$, $H_1: \mu < 2.5$

$\frac{0.06}{\sqrt{30}} = 0.0110$

$0.0031 < 0.0100$

Reject H_0, there is sufficient evidence to suggest Lucas' suspicion is correct, the mean amount of tea in the sachets is less than 2.5g.