SOLUTIONS

King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
STAT-212-Term063-Quiz2

Name: ID: Serial:

Q1. The makers of a new chemical fertilizer claim that hay yields will average 0.4 tons more per acre if its fertilizer is used than if the leading brand is used. The agricultural testing service was retained to test this claim. A random sample of 52 acre-sized pots was selected, and the new fertilizer was applied. A second sample of 40 acre-sized plots was selected, but leading fertilizer was used. The following sample data (in tons per cares) were observed.

Current Leading brand	New Product
$n_1 = 40$	$n_2 = 52$
$\overline{X}_1 = 4.3 tons/acre$	$\overline{X}_2 = 5.2 tons/acre$
$S_1 = 0.8 tons$	$S_2 = 0.7 tons$

Then using $\alpha = 0.05$. The hypotheses are:

H_0: $\mu_2 - \mu_1 = .4$ H_A: $\mu_2 - \mu_1 \neq .4$ ② pts

or $\mu_{New} - \mu_{current} = .4$ $\mu_{New} - \mu_{current} \neq .4$.

1. The test statistic value:

$$Z_c = \frac{(\bar{X}_2 - \bar{X}_1) - d_0}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = \frac{(5.2 - 4.3) - .4}{\sqrt{\frac{(.8)^2}{40} + \frac{(.7)^2}{52}}} = 3.1359 \simeq 3.14$$

$\simeq 3.14$ } ② pts

2. Decision Rule:

Using the critical value approach : $Z_{\alpha/2} = Z_{.025} = 1.96$

Reject H_0 if $|Z_c| > Z_{\alpha/2}$

$|3.141| > 1.96$ ✓ $\therefore$ Reject H_0 } ② pts

3. conclusion:

The difference is NOT .4 tons more per acre. } ① pt.

Q2. Given the following null and alternative hypotheses:

$H_o: P_1 - P_2 \leq 0$ VS $H_A: P_1 - P_2 > 0$, if $n_1 = 60, x_1 = 30$, $n_2 = 80, x_2 = 24$, if the test statistic value is **2.41** calculate the P-value and determine whether the null hypothesis would be rejected?

P-value $= p(Z > Z_c)$

$= p(Z > 2.41)$

$= 0.5 - 0.4920 = 0.008$

Reject H_0 if the P-value $< \alpha \Rightarrow .008 < .05$

$\therefore$ Reject H_0. } ③ pts