SOLUTIONS

King Fahd University of Petroleum & Minerals
Department of Mathematical Science- STAT319-Term041
Quiz #4 Section: 5

Name: ID: Serial:

Question 1(3+2 points)

The shelf life of a photographic film is of interest to the manufacturer. The manufacturer observes the following shelf life for eight units chosen at random from the current production:

108	134	124	116	128	163	159	134

a. Is there any sufficient evidence that the mean life is grater than 125 days? Test at $\alpha = .05$ assume that shelf life is normally distributed

1. $H_0: \mu = 125$ vs $H_1: \mu > 125$, $\bar{x} = 133.25$, $S = 19.26$

2. $t = \dfrac{\bar{x} - \mu_0}{S/\sqrt{n}} = \dfrac{133.25 - 125}{19.26/\sqrt{8}} = 1.211$ (3)

$t_{\alpha, n-1} = t_{.05,7} = 1.895 \Rightarrow t = 1.211 \not> 1.895$ ∴ Accept H_0.

$\Rightarrow$ There is no sufficient evidence that the mean grater than 125.

b. Find the $p-value$ and use it to test the hypothesis in part (a)

$p\text{-value} = p(t_{n-1} > t_c) = p(t_7 > 1.211) \approx .13 \not< \alpha$

∴ Accept H_0. (2)

Question 2(3-Points)

Suppose that two random samples were drawn from normal populations with equal variances. The sample data yields $\bar{x}_1 = 20.0, n_1 = 10, s_1 = 12.824$ and $\bar{x}_2 = 15.8, n_2 = 10, s_2 = 12.583$. Test the null hypothesis that the tow population means are equal at $\alpha = .01$

1. $H_0: \mu_1 - \mu_2 = 0$ vs $H_1: \mu_1 - \mu_2 \neq 0$, $S_p^2 = \dfrac{(9)(12.824)^2 + (9)(12.583)^2}{10+10-2} = 161.393$

2. $t_c = \dfrac{\bar{x}_1 - \bar{x}_2 - 0}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \dfrac{20 - 15.8 - 0}{12.704\sqrt{\frac{1}{10} + \frac{1}{10}}}$ $S_p = 12.704$ (1)

$t = 0.739$ (1)

$t_{\alpha/2, n_1+n_2-2} = t_{.005,18} = 2.878 \Rightarrow$ $|t_c| = .739 \not> 2.878$ } (1)

Accept H_0.

Question 3(2-Points)

A fuel oil company claims that one-fifth of the homes in a certain city are heated by oil. Do we have a reason to doubt this claim if, in a random sample of 1000 homes in this city, it is found that 136 are heated by oil? Use $\alpha = .05$

1. $H_0: p = \frac{1}{5} = 0.20$ vs $H_1: p \neq .2$, $\hat{p} = \frac{x}{n} = \frac{136}{1000} = .136$ } (1)

2. $Z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = \dfrac{.136 - .2}{\sqrt{\frac{(.2)(.8)}{1000}}} = -5.06$

(1)

$Z_{\alpha/2} = Z_{.025} = 1.96$

$|Z_c| = 5.06 > Z_{.025} = 1.96 \Rightarrow$ Reject H_0.