Assignment 10 Solution

1.

(a)

H_0: $\mu = 2$, H_1: $\mu < 2$

Rejection region: $t < -t_{0.10,13} = -1.35$

Test statistic: $t = -1.613$

Conclusion: Reject H_0. There is sufficient evidence that the manager is correct.

(b)

The number of times car owners change the oil in their cars is normally distributed.

2.

$H_0 : \mu = 8$ vs. $H_1 : \mu > 8$

Rejection region: $t > t_{0.01,6} = 3.143$

$$\bar{x} = \frac{63.5}{7} = 9.0714$$

$$s^2 = \frac{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}{n-1} = \frac{580.2 - \frac{(63.5)^2}{7}}{7-1} = 0.6940$$

Test statistic: $t = \frac{9.0714-8}{\sqrt{\frac{0.6940}{7}}} = \frac{1.0714}{0.3149}$ =3.402

Conclusion: Reject H_0. We can infer that the population mean is larger than 8.

3.

H_0: $\mu = 35$, H_1: $\mu < 35$

Rejection region: $t < -t_{.01,14} = -2.624$

Test statistics: $t = -1.547$

Conclusion: Cannot reject H_0. We can't conclude at the 1% significance level that the average age of people who buy their first life insurance plan is less than 35, according to this data.

4.

$\overline{X} \pm t_{0.05,99}(s/\sqrt{n}) = 250 \pm 8.3$. Thus, LCL = 241.7, and UCL = 258.3. We estimate that the mean water consumption for the population lies between 241.7 gallons and 258.3 gallons.

5.

LCL= $(n-1)s^2 / \chi^2_{0.05,9} = 10.426$

UCL= $(n-1)s^2 / \chi^2_{0.95,9} = 53.051$

We estimate that the variance of the time for the drug to become effective lies between 10.426 and 53.051.

6.

$s^2 = 123.12$

90% confidence interval estimate for the population variance is

LCL= $(n-1)s^2 / \chi^2_{0.05,9} = 65.494$

UCL= $(n-1)s^2 / \chi^2_{0.95,9} = 333.249$

Thus, 90% confidence interval estimate for the population standard deviation is

LCL = $\sqrt{65.494}$ = 8.093

UCL = $\sqrt{333.249}$ = 18.255

7.

H_0: $\sigma^2 = 35$, H_1: $\sigma^2 > 35$

Rejection region: $\chi^2 > \chi^2_{0.05,19} = 30.144$

Test statistic: $\chi^2 = 33.027$

Conclusion: Reject H_0. Yes, these statistics provide sufficient evidence at the 5% significance level to conclude that the population variance exceeds \$35 million^2.

8.

(a)

$H_0 : \sigma^2 = 250$

$H_1 : \sigma^2 \neq 250$

Rejection region: $\chi^2 < \chi^2_{1-\alpha/2,n-1} = \chi^2_{.975,24} = 12.4$ or $\chi^2 > \chi^2_{\alpha/2,n-1} = \chi^2_{.025,24} = 39.4$

$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(25-1)(270.58)}{250} = 25.98$, p-value = .7088. There is not enough evidence to infer that the population variance is not equal to 250.

(b) Demand is required to be normally distributed.