Math 10 – Hypothesis Testing – Standard Deviation ANSWERS **gw18**

1. A doctor says the standard deviation of the lengths of stay for patients involved in a crash in which the vehicle struck a tree is 6.14 days. A random sample of 20 lengths of stay for patients involved in this type of crash has a standard deviation of 6.5 days. At $\alpha = 0.05$, can you reject the doctor's claim?

(a) (DESIGN) State your Hypothesis

Ho: The standard deviation of the lengths of stay for patients involved in a crash in which the vehicle struck a tree is 6.14 days

Ha: The standard deviation of the lengths of stay for patients involved in a crash in which the vehicle struck a tree is NOT 6.14 days

Ho: sigma = 6.14 Ha: sigma ≠ 6.14

(b) (DESIGN) State Significance Level of the test and explain what it means.

$\alpha = 0.05$**, which represents the maximum design probability of Type I error, which would be claiming the standard deviation is not 6.14, when it is.**

(DESIGN) Determine the statistical model (test statistic)

Chi-square Test of varaince vs. Hypothesized Value

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} \quad df = 19$$

(d) (DESIGN) Determine decision rule (critical value method)

Use alpha /2 = .025 in each tail

Reject Ho if Chi-sqaure< 8.907 or if Chi-square > 32.852

(e) (DATA) Conduct the test and **circle** your decision

$$\chi^2 = \frac{(19)6.5^2}{6.14^2} = 21.29$$

Fail to Reject Ho

(f) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision.

Insufficient data to conclude that the standard deviation of the lengths of stay for patients involved in a crash in which the vehicle struck a tree is NOT 6.14 days

2. A bottler needs to be sure that its liquid dispensers are set properly. The standard deviation of liquid dispensed must be no more than 0.0025 liter. A random sample of 14 bottles has a standard deviation of 0.0031 liter. Test the bottler's claim that the standard deviation is no more than 0.0025 liter at the $\alpha = 0.01$ level. What can you conclude?

(a) (DESIGN) State your Hypothesis

Ho: The standard deviation is no more than 0.0025 liter

Ha: The standard deviation is more than 0.0025 liter

$Ho: \sigma \leq 0.0025 \quad Ho: \sigma > 0.0025$

(b) (DESIGN) State Significance Level of the test and explain what it means,

$\alpha = 0.01$ **, which represents the maximum design probability of Type I error, which would be claiming the standard deviation is over 0.0025, when it is not over 0.0025**

(c) (DESIGN) Determine the statistical model (test statistic)

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} \quad df = 13$$

(d) (DESIGN) Determine decision rule (critical value method)

Use $\alpha = 0.01$ **, upper tail, df = 13**

Reject Ho if $\chi^2 > 27.688$

(e) (DATA) Conduct the test and **circle** your decision

$$\chi^2 = \frac{(13)0.0031^2}{0.0025^2} = 19.99$$

Fail to Reject Ho

(f) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision.

Insufficient data to conclude that the standard deviation is over 0.0025. Not enough evidence to assume the liquid dispensers are operating improperly.