

MAT 271E Probability and Statistics HW3

Due date: 12.01.2024

Prof. Dr. Canan SARIÇAM

1. Suppose an editor of a publishing company claims that the mean time to write a textbook is at most 15 months. A sample of 16 textbook authors is randomly selected and it is found that the mean time taken by them to write a textbook was 12.5. Assume also that the standard deviation is known to be 3.6 months. Assuming the time to write a textbook is normally distributed and using a 0.025 level of significance, would you conclude the editor's claim is true?
2. The life in hours of a 75 watt light bulb is known to be approximately normally distributed with a Standard deviation $\sigma=25$ hours. A random sample of 20 bulbs has a mean life of $\bar{x}=1014$ hours.
 - a. Is there evidence to support the claim that bulb life exceeds 1000 hours, use $\alpha=0,05$.
 - b. Construct a 95% two sided confidence interval on the mean life.
3. A particular brand of diet margarine was analyzed to determine the level of polyunsaturated fatty acid (in percent). A sample of 6 packages resulted in the following data: 16.8, 17.2, 17.4, 16.9, 16.5, 17.1.
 - a. Test the hypothesis $H_0: \mu=17$ against $H_1: \mu \neq 17$ using $\alpha=0.01$.
 - b. Find a 99% confidence interval on the mean μ .
4. A rivet is to be inserted into a hole. If the Standard deviation of hole diameter exceeds 0,01mm, there is an unacceptably high probability that the rivet will not fit. A random sample of $n=15$ part is selected and the hole diameter is measured. The sample Standard deviation of the hole diameter measurements is $s=0.008$ mm. Is there strong evidence to indicate that the standard deviation of hole diameter exceeds 0.01mm? Use $\alpha=0.01$
5. A biologist assumes that there is a linear relationship between the amount of fertilizer supplied to tomato plants and the subsequent yield of tomatoes obtained. Eight tomato plants of the same variety were selected at random and treated weekly with a solution in which x grams of fertilizer was dissolved in a fixed quantity of water. The yields y kilograms of tomatoes were recorded.

| Plant | A | B | C | D | E | F | G | H |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| x | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| y | 3.9 | 4.4 | 5.8 | 6.6 | 7.0 | 7.1 | 7.3 | 7.7 |

- (a) Calculate the simple linear regression equation.
- (b) Estimate the yield of plant treated weekly with 3.2 grams of fertilizer.