

Homework Set 1

Due Wednesday, February 2, 2011, before class starts

1. Reading: Sections 11.1-11.4.

Do the following problems **without using Minitab**:

2. In a study conducted to examine the quality of fish after 7 days in ice storage, ten raw fish of the same kind and approximately the same size were caught and prepared for ice storage. Two of the fish were placed in storage immediately after being caught, two were placed in storage 3 hours after being caught, and two each were placed in storage at 6, 9, and 12 hours after being caught. Let y denote a measurement of fish quality (on a 10-point scale) after the 7 days of storage, and let x denote the time after being caught that the fish were placed in ice packing. The sample data appear here:

y	8.5	8.4	7.9	8.1	7.8	7.6	7.3	7.0	6.8	6.7
x	0	0	3	3	6	6	9	9	12	12

- a. Plot the sample data in a scatter diagram.
 - b. Use the method of least squares to obtain estimates of the parameters in the model $y = \beta_0 + \beta_1 x + \varepsilon$.
 - c. Interpret the value of $\hat{\beta}_1$ in the context of this problem.
3. For the data in problem 2, test the research hypothesis that the quality of fish decreases as the time between fish being caught and placed in ice storage increases. Calculate a p -value and state the conclusions in the context of the setting. Use $\alpha = 0.05$.
 4. For the data in problem 2, obtain a 95% confidence interval for β_1 , the slope of the true regression line. Interpret your confidence interval.
 5. (Class example on Wednesday, January 26) Suppose a fire insurance company wants to relate the amount of fire damage in major residential fires to the distance between the residence and the nearest fire station. The study is to be conducted in a large suburb of a major city; a sample of 15 recent fires in this suburb is selected. The amount of damage (y , in thousands of dollars) and the distance (x , in miles) between the fire and the nearest fire station are recorded for each fire. Assume that the linear regression model $y = \beta_0 + \beta_1 x + \varepsilon$ is appropriate. Summary calculational results are: $\sum x = 49.2$, $\sum y = 396.2$, $\sum x^2 = 196.16$, $\sum xy = 1,470.65$, $\sum y^2 = 11,376.48$.
 In addition, we have obtained the following results:
 $\bar{x} = 3.28$, $S_{xx} = 34.784$, $s_\varepsilon = 2.32$, $\hat{y} = 10.27 + 4.92x$
 Suppose $x_{n+1} = 8$.
 Calculate the 95% confidence interval for $E(y_{n+1})$ and interpret.
 Calculate the 95% prediction interval for y_{n+1} and interpret.