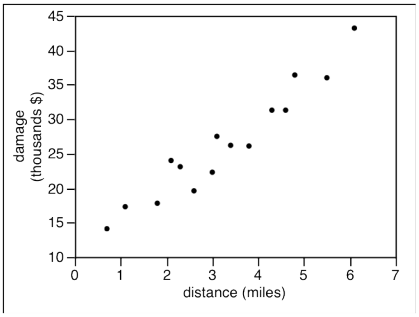
Show **all** of your work on this assignment and answer each question fully in the given context.

1. **Fire Damage.**

A fire safety inspector wants to relate the amount of fire damage in major residential fires (in thousands of dollars) to distance between the residence and the nearest fire station (in miles). The study was conducted in the suburb of a major city; a sample of 15 recent fires in this suburb is selected. Below is a scatterplot displaying these 15 fires.



The following summaries were are computed from the data:

$$\sum_{i=1}^{15} x_i = 49.2 \qquad \sum_{i=1}^{15} x_i^2 = 196.16 \qquad \sum_{i=1}^{15} y_i = 396.2 \qquad \sum_{i=1}^{15} y_i^2 = 11376.48 \qquad \sum_{i=1}^{15} x_i y_i = 1470.65$$

It is worth mentioning that b_1 can be written in the following ways:

$$b_1 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} = \frac{\sum_{i=1}^{n} x_i \cdot y_i - n\bar{x}\bar{y}}{\sum_{i=1}^{n} x_i^2 - n\bar{x}^2}$$

Use this information to answer the following questions by hand. Show all your work and the relevant formulas.

(a) Identify the explanatory and response variables for this problem.

(b) Does it appear that a linear relationship is appropriate to describe the relationship between fire damage and distance from the fire station? If so, is the relationship positive or negative?

(c) Calculate the fitted least squares regression equation.

(d) Provide an interpretation of the estimated slope **within the context of the problem.**

(e) Provide an interpretation of the estimated intercept **within the context of the problem.** Does the estimated value of the intercept make sense? Explain briefly.

(f) Use the fitted least squares regression equation to predict the amount of fire damage for a house located 5.5 miles from the nearest fire station.

(g) The actual fire damage for the house in part (f) was 36 thousand dollars. Calculate the residual.

(h) Use the fitted least squares regression equation to predict the amount of fire damage for a house located 30 miles from the nearest fire station.

(i) Why should we not trust the prediction obtained in part (h)?

(j) Give the value of R^2 and provide an interpretation of this value within the context of the problem.

2. Using `JMP` answer from the text Chapter 4, Section 1, Problem 4 (page 140). I have already put the data into a `.jmp` file on the course page (`tools.jmp`). Print and attach all plots requested. The point break down is as follows:

   (a) 5 points for the plot, 5 points for R^2, and 5 pts for the explanation.

   (b) 5 points for the plot, 5 points for R^2, and 5 pts for the explanation.

   (c) 5 points for the prediction of tool life, 5 points for the discussion of the relationship between x and y. Note that the this means you need to write an equation that relates x and y directly, not $\log(x)$ to $\log(y)$ or x to $\frac{1}{y}$ - an equation using x and y. The "*By the way*" part from the book might be helpful here in thinking about the form of the equation.