

Lesson #6 A: Understanding Line of Best Fit and Applying Linear Regression
(Reference: Lesson #45 in book)**Problem**

1. For each of the following scenerios use your graphing calculator to find the line of best fit or the equation of the regression line, the correlation coefficient, explain the results, and answer the prediction question for each of the scenerios.

1. Enrollment at a high school for the years 2000 through 2007 are shown below. Make a scatter plot of the data and use your graphing calculator to find the equation that models this data, find the correlation coefficient, and explain what is happening with this data. What is the predicted enrollment for 2009?

<u>YEAR</u>	<u>NUMBER OF STUDENTS</u>
2000	149
2001	175
2002	198
2003	240
2004	262
2005	332
2006	418
2007	451

2. Jocelyn is analyzing the sales of her company from the past 6 years to see how her company is doing. The table below shows the total sales for each of the past six years. Find the regression line that best models the data, find the correlation coefficient and explain what you see in the data. Use the regression line to predict the sales this company could have in 2015.

<u>YEAR</u>	<u>SALES (in the Millions)</u>
2003	31.2
2004	34.6
2005	28.9
2006	37.7
2007	41.3
2008	45.1

3. Anthropologists use a linear model that relates femur length to overall height of the person. The model allows an anthropologist to determine the height of an individual when only a partial skeleton (including the femur) is found. In this problem we can find the model equation by analyzing the data on femur length and height for the eight males given below. Use the data to find the model equation that best fits the data, find the correlation coefficient, and explain what you see from the data. If an anthropologist finds a femur that is 58 cm long, how tall was that person?

<u>FEMUR LENGTH (CM)</u>	<u>HEIGHT (CM)</u>
50.1	178.5
48.3	173.6
45.2	164.8
44.7	163.7
44.5	168.3
42.7	165.0
39.5	155.4
38.0	155.8

4. A convenience store manager notices that sales of soft drinks are higher on hotter days, so he assembles the data below. Find the equation that best models this data, the correlation coefficient and explain what you see from the data. Use the equations to help predict soft drink sales if the temperature is $95^{\circ}F$.

<u>HIGH TEMPERATURE ($^{\circ}F$)</u>	<u>NUMBER OF CANS SOLD</u>
55	340
58	335
64	410
68	460
70	450
75	610
80	735
84	780

5. To estimate ages of trees, forest rangers use a linear model that relates tree diameter to age. The model is useful because tree diameter is much easier to measure than tree age (which requires special tools for extracting a representative cross section of the tree and counting the rings). Use the data below that was collected from certain variety of oaks answer the following. Find the equation that best models the data, find the correlation coefficient, and explain what you see in the data. Use the equation to estimate the age of an Oak tree whose diameter is 18in.

<u>DIAMETER (IN.)</u>	<u>AGE (YEARS)</u>
2.5	15
4.0	24
6.0	32
8.0	56
9.0	49
9.5	76
12.5	90
15.5	89

6. Biologists have observed that the chirping rate of crickets of a certain species appears to be related to temperature. The table belows shows the chirping rates at various temperatures. Find the regression line that best models the data, find the correlation coefficient and determine if it is resonable to determine that these two factors are related, and explain what you see in the data. Use the regression line to estimate the chirping rate at $100^{\circ}F$.

<u>TEMPERATURE ($^{\circ}F$)</u>	<u>CHIRPING RATE (CHIRPS/MIN)</u>
50	20
55	46
60	79
65	91
70	113
75	140
80	173
85	198
90	211

7. An advertising firm is examining their advertising costs and seeing how those costs impact their sales on a particular item. The following table contains the advertising costs for the particular item and the number of items sold at the particular advertising cost. Find the regression equation that best models the data, find the correlation coefficient and explain what you see in the data and what the slope of the equation means. Use the regression equation to predict the items sold when 1500 dollars is spent on advertising and how much should be spent on advertising to increase their demand to 12,000 items sold.

<u>ADVERTISING COSTS</u>	<u>NUMBER OF ITEMS SOLD</u>
100	4700
200	5200
300	5500
400	6800
500	7300
900	8300
1000	8600

8. A real estate company is building the same model houses at various distances from a well known beach in the area. In order to price the new cottages correctly the real estate company plans to compare the prices of their current model houses at various distances from the same beach. The table below shows the prices of the current houses on the market and the distance they are from the beach. Find the regression equation that best models the data, find the correlation coefficient and explain what you see in the data and what the slope of the regression equation means. The real estate company has just finished houses 3 block and 9 blocks away from the beach, use the regression equation to predict the prices they should charge for each of the houses.

<u>NUMBER OF BLOCK FROM BEACH</u>	<u>PRICE OF A COTTAGE</u>
5	132,000
0	310,000
4	204,000
2	238,000
1	275,000
7	60,800