

Pledge:

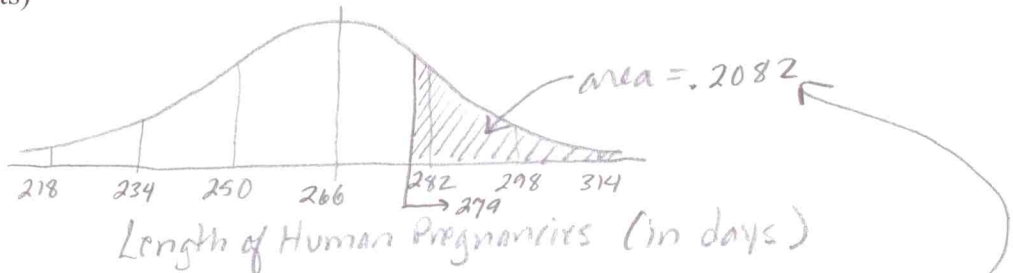
2/13/2007  
Dr. Lunsford

MATH 171  
Quiz 3

Name: Solution  
20 Points Possible

I. The length of human pregnancies from conception to birth can be modeled with a distribution that is approximately normal with mean 266 days and standard deviation 16 days. Please answer the following questions. Be sure to show all calculator input for full credit. (10 points total)

a. Draw a graph of the distribution. Be sure to draw the distribution with proper shape, label your axis, and show variable values at  $\pm 1$ ,  $\pm 2$ , and  $\pm 3$  standard deviations from the mean. (4 points)



b. According to this model, what percent of human pregnancies last longer than 279 days? Write your answer using a complete English sentence. Show the answer graphically on the distribution function you drew in part (a). (2 points)

$$\text{normalcdf}(279, 1E99, 266, 16) = .2082$$

Using this model, 20.82% of human pregnancies last longer than 279 days.

c. Approximately 7% of all infants are premature. Using this model, find the pregnancy times that would result in a premature birth. Please write your answer using a complete English sentence. (2 points)


$$\text{invNorm}(.07, 266, 16) = 242.39$$

↓  
? Pregnancy lengths shorter than 242.39 days would result in premature births.

d. What is the z-score for a pregnancy that lasts 279 days? (1 point)

$$z = \frac{x - \mu}{\sigma} = \frac{279 - 266}{16} = 0.8125$$

e. What length of pregnancy has a z-score of  $z = -2.23$ ? (1 point)

$$x = \mu + \sigma z = 266 + (-2.23)(16) = 230.32 \text{ days}$$

Pledge:

II. In order to evaluate the effectiveness of advertising expenditures, a national retail firm chose seven marketing regions that were similar in retail potential. Then they varied the advertising expenditures across the seven regions. In the table below are the Expenditures (in millions of dollars) and the resulting Sales (in millions of dollars). Please answer the following questions. (10 points total)

Expenditures	Sales
3.2	20.4
1.8	16.4
4.1	24
0.8	15.9
6.8	27.3
2.3	18.9
2.7	17.8

- a. Find the centroid of the data and add it to the scatterplot of the data below. Clearly indicate the coordinates of this point below and on the scatterplot. (2 points)

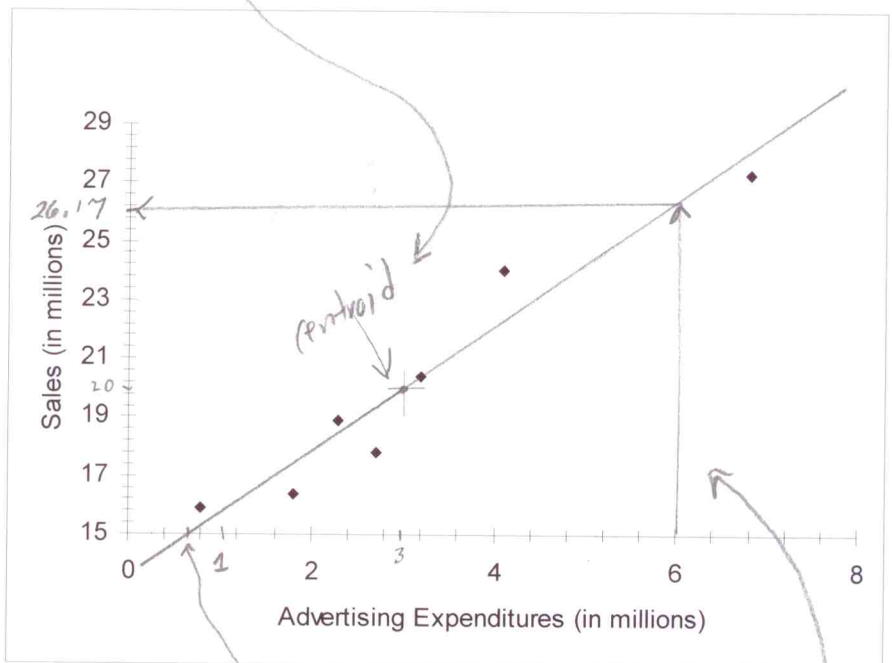
$$(\bar{x}, \bar{y}) = (3.1, 20.1)$$

- b. Find the value of the correlation coefficient for the data. (1 point)

$$r = .9648$$

- c. Describe the relationship between the variables *Expenditures* and *Sales* in terms of direction (i.e. association) and strength. (2 points)

There is a strong  
( $r = .9648$ ) positive  
linear association between  
these two variables



- d. Find the least square regression line for the data and accurately plot in on your graph above. Please use the variable names *Expenditures* and *Sales* in your equation. Note that the y-axis starts at  $y = 15$ . (3 points)

$$\hat{y} = 13.63 + 2.09x$$

$$\text{Sales} = 13.63 + 2.09(\text{Expenditures})$$

$$\hat{y} = 15 \Rightarrow 15 = 13.63 + 2.09x \Rightarrow x = .656$$

- e. Use the regression line to predict the sales for a region in which the advertising expenditures are 6 million dollars. Show this prediction using the up-and-over lines on your graph. (2 points)

$$\text{Sales} = 13.63 + 2.09(6) = 26.17 \text{ million}$$