Exercise 2: Statistics 213 (L05) - Fall 2007

1. A study is conducted to investigate the relationship between applied stress, X, (in kg/mm^2) and time to fracture, Y, (in hours), for stainless steel. Ten (10) different setting of applied stress were used, and the resulting data was obtained.

stress (x)	2.5	5.0	10.0	15.0	17.5	20.0	25.0	30.0	35.0	40.0
fracture time (y)	63	58	55	61	62	37	38	45	52	19

Note that $\sum x_i = 200$, $\sum y_i = 490$, $\sum x_i^2 = 5412.50$, $\sum y_i^2 = 25826$, and $\sum x_i y_i = 8617.5$.

a. Draw scatter plot.

b. Find the correlation coefficient, r.

c. Find the least squares line.

d. Predict the fracture time for a stress level of $28 kg/mm^2$.

e. Interpret the meaning of the slope.

f. Find the coefficient of determination, and explaining its meaning in this problem.

2. Health-conscious people often consult the nutritional information on food packages in an attempt to avoid foods with large amount of fat, sodium, or cholesterol. The following information was taken from eight different brands of cheese slices. Suppose that we treat calories as the response variable, and fat as the predictor variable.

Brand	Fat (g)	Calories
Kraft Deluxe	7	80
Kraft Velveeta Slices	5	70
Private Selection	8	100
Ralphs Singles	4	60
Kraft 2% Singles	3	50
Kraft Singles	5	70
Borden Singles	5	60
Lake to Lake	3	70

Note that $\sum x_i = 40$, $\sum y_i = 560$, $\sum x_i^2 = 222$, $\sum y_i^2 = 40800$, and $\sum x_i y_i = 2960$.

a. Draw a scatter plot of calories versus fat. Does there appear to be a linear component to the relationship between these two variables ? Comment on the direction and strength of this relationship.

b. Find the correlation coefficient between fat and calories.

c. Find the equation of the least squares line.

d. Predict the number of calories for a cheese slice with 6 grams of fat.

Partial Solutions: (1b). $r = -0.738$, (1c). $\hat{y} = 65.743 - 0.837x$, (1d). 42.307 hours, (1e). the average fracture time is predicted to decrease by 0.837 hours for each increase of stress level by one kg/mm^2, (1f). 0.5446. 55% of variation in the fracture time (Y) can be explained by the stress level (X). (2b). $r = 0.8528$, (2c). $\hat{y} = 33.636 + 7.2728x$, (2d). 77.2728