EXAM I

PSTAT 126 HSU 4/28/2022 5:00 - 6:15 p.m.

Fully explain your answer. Answers with no explaination will not receive credit.

Please submit your answers online by 6:30 p.m. California time. Late answers will not be accepted.

1. The management of a supermarket wants to find if there is a relationship between the number of times a specific product is promoted on the intercom system in the store and the number of units of that product sold. To experiment, the management selected a product and promoted it on the intercom system for 14 days. The following table gives the number of times (x) this product was promoted each day and the number of units sold (y). The regression function is assumed to be s straight line $E(Y|X = x) = \beta_0 + \beta_1 x$.

Number of promotions per day (x)	Number of Units Sold per Day in hundreds (y)
16	9
22	18
42	26
30	26
18	17
12	10
38	21
16	17
18	21
18	19
30	20
16	13
42	30
18	19

Note,

$\bar{x} = 24$ $\bar{y} = 19$

$\sum_{i=1}^{14}(x_i - \bar{x})^2 = 1400$ $\sum_{i=1}^{14}(y_i - \bar{y})^2 = 454$

$\sum_{i=1}^{14}(x_i - \bar{x})(y_i - \bar{y}) = 654$

(10%) (a) Determine the least squares regression equation $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$.

(10%) (b) Complete the following ANOVA table.

Source	SS	DF	MS
Regression			
Error	148.489		
Total			

(10%) (c) Compute the coefficient of determination and interpret your result.

(10%) (d) Estimate the coefficient of correlation between x and y.

(10%) (e) Test the hypothesis $H_0 : \beta_1 = 0$ vs. $H_1 : \beta_1 > 0$ with $\alpha = 0.05$.

(10%) (f) Construct a 95% confidence interval for the expected number of units sold on a day with 30 promotions.

(10%) (g) Predict the number of units of this product sold on a day with 30 promotions and construct a 95% prediction interval.

(10%) (h) The management plans to have 30 promotions for the next five days. Predict the average number of units sold each day and construct a 95% prodiction interval for it.

(10%) (i) The management plans to have 30 promotions for the next five days. Predict the total number of units sold for the five days and construct a 95% prodiction interval for it.

(10%) (j) The management plans to have promotions for the next two days; 20 promotions for the first day and 30 promotions for the second day. Predict the total number of units sold in those two days and construct a 95% prodiction interval for it.