Classwork #24

a) Will slope of line be pos or neg?

b) c)
d) calculate r only, e) plus plot the scatter diagram and the regression line on the same axis.

a) Assume more promotion, more sales so positive slope.

b) \( n=7, \sum x = 177, \sum y = 144, \sum x^2 = 5285 \)

\[ \sum y^2 = 3224 \]

\[ \sum xy = 4049 \]

\[ \bar{x} = \frac{\sum x}{n} = \frac{177}{7} = 25.2857 \]

\[ \bar{y} = \frac{\sum y}{n} = \frac{144}{7} = 20.5714 \]

\[ SS_{xx} = \sum x^2 - \left( \frac{\sum x}{n} \right)^2 = 5285 - \left( \frac{177}{7} \right)^2 = 809.4286 \]

\[ SS_{yy} = \sum y^2 - \left( \frac{\sum y}{n} \right)^2 = 3224 - \left( \frac{144}{7} \right)^2 = 261.7143 \]

\[ SS_{xy} = \sum xy - \left( \frac{\sum x}{n} \right) \left( \frac{\sum y}{n} \right) = 4049 - \left( \frac{177}{7} \right) \left( \frac{144}{7} \right) = 407.8571 \]

\[ b = \frac{SS_{xy}}{SS_{xx}} = \frac{407.8571}{809.4286} = 0.5039 \]

\[ a = \bar{y} - b \bar{x} = 20.5714 - (0.5039)(25.2857) = 7.8299 \]

\[ \hat{y} = 7.8299 + 0.5x \]

or \[ \hat{y} = 7.8299 + 0.5039x \]

is the regression line

Slope is positive, as expected from part a)
Classwork #24

1) Continued

c) Explain $a = 7.8299$
   This is the y-intercept which is obtained by plugging $x = 0$ into $\hat{y} = 7.8299 + .5039x$.
   So when $x = 0$, $\hat{y} = 7.8299$

   So when there are zero promotions, 7.8299 (hundred) units are sold.

   Explain $b = .5039$
   This is the slope which is change in y over change in x.
   \[ b = .5039 = \frac{\text{change in } y}{\text{change in } x} = \frac{\text{hundreds of units sold}}{\text{promotions}} \]

   So when promotions increase by 1, sales increase by .5039 hundred units (about 50 units).

   d) $r = \frac{SS_{xy}}{\sqrt{SS_{xx} \cdot SS_{yy}}} = \frac{407.8571}{\sqrt{(809.4286)(261.7143)}} = .89$

      89% "pretty good correlation" (higher percentage is better)

   e) For $x = 35$, plug into $\hat{y} = 7.8299 + .5039x$.
      \[ \hat{y} = 7.8299 + .5039(35) = 25.4664 \text{ hundred units} \]

      When there are 35 promotions, about 2547 units sold.