Show **all** of your work on this assignment and answer each question fully in the given context.

Please staple your assignment!!

1. Chapter 4, Ex 1

   (a) In order to calculate the slope by hand, we have the following equations:

   $$b_1 = \frac{\sum_{i=1}^{n} x_i \cdot y_i - n\bar{x}\bar{y}}{\sum_{i=1}^{n} x_i^2 - n\bar{x}^2}$$

   $$b_0 = \bar{y} - b_1\bar{x}$$

   We can calculate the sums we need as with this information:

   $$n = 9, \bar{x} = 0.5, \bar{y} = 2765.889, \sum_{i=1}^{n} x_i^2 = 2.265, \sum_{i=1}^{n} x_i y_i = 12399.1$$

   which gives us the following values for b_1:

   $$b_1 = \frac{(12399.1) - (9)(0.5)(2765.889)}{(2.265) - (9)(0.5)^2} = \frac{-47.4}{0.015} = -3160$$

   $$b_0 = (2765.889) - (-3160)(0.5) = 4345.889$$

   This gives us the fitted line:

   $$\hat{y} = 4345.889 - 3160 \cdot x$$

   (b) To compute correlation we can use:

   $$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}} = \frac{(-47.4)}{\sqrt{(0.015)(154794.9)}} = -0.9836813$$

   (c) This can be found by interpreting R^2, which we can get by squaring r:

   $$R^2 = (r)^2 = (-0.9836813)^2 = 0.9676288$$

   So 96.76% of our variability in the 14-Day Compressive Strength can be explained its relationship to Water/Cement Ratio.

   (d) The residuals can be found by finding the fitted value for each x in our dataset and then using the definition of the residual:

   $$e_i = y_i - \hat{y}_i$$

   To get the each residuals values. In this case, the fitted values are:
   We can get our normal quantile plot (here called a normal plot) from JMP:

Water/Cement Raition, x	Observed 14-Day Compressive Strength, y	Fitted	Residual
0.45	2954	2923.8888889	30.111111111
0.45	2913	2923.8888889	-10.88888889
0.45	2923	2923.8888889	-0.888888889
0.50	2743	2765.8888889	-22.88888889
0.50	2779	2765.8888889	13.111111111
0.50	2739	2765.8888889	-26.88888889
0.55	2652	2607.8888889	44.111111111
0.55	2607	2607.8888889	-0.888888889
0.55	2583	2607.8888889	-24.88888889