Homework is due by 5:00 PM on the due date at your course instructor’s office. You can always hand in your homework at the end of lecture on Friday.

You may talk with others about the homework problems but please write your solutions up independently.

Please answer homework questions in complete sentences. Make sure to staple the pages of your assignment together. Be sure to indicate your lab section letter on your paper. Homework with out the correct lab section will marked as late.

You normally will have an opportunity to get help on homework during lab.

Reading: Jan. 28 - Feb. 1 Section 2.1, 2.2
Feb. 4 - Feb. 8 Sections 2.3, 2.4

Assignment:

1. Read pages 78 - 106 of the text and do problems 2.2 and 2.18.
Read pages 106 - 139 of the text and do problems 2.36 and 2.46. For problem 2.46 the correlation coefficients and least squares regression lines for all four data sets are given below.

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Correlation Coefficient</th>
<th>Least Squares Regression Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.82</td>
<td>( \hat{Y} = 3.00 + 0.50X )</td>
</tr>
<tr>
<td>B</td>
<td>0.82</td>
<td>( \hat{Y} = 3.00 + 0.50X )</td>
</tr>
<tr>
<td>C</td>
<td>0.82</td>
<td>( \hat{Y} = 3.00 + 0.50X )</td>
</tr>
<tr>
<td>D</td>
<td>0.82</td>
<td>( \hat{Y} = 3.00 + 0.50X )</td>
</tr>
</tbody>
</table>

2. An educational foundation would like to give scholarships to high school seniors who will be successful in college. The foundation wishes to see if there is a relationship between the score on a verbal aptitude test and the grade point average (GPA) in college. If there is, the foundation could use the verbal aptitude test as a predictor of success in college and thus help them decide who should get the scholarships. The verbal aptitude test is on a scale of 200 to 800 and GPA is on a scale from 0 to 4. Below is a plot GPA versus the verbal aptitude test score for 50 students randomly selected from all students at a large public university.
(a) From the plot, what is the lowest GPA? What verbal aptitude score is associated with the lowest GPA?

(b) From the plot, what is the highest GPA? What verbal aptitude score is associated with the highest GPA?

(c) Describe the general pattern of the relationship between verbal aptitude score and GPA.

(d) The value of the correlation coefficient for these 50 pairs of verbal aptitude score and GPA is 0.516. However, there appears to be an unusual pair or outlier. What are the verbal aptitude score and GPA for that apparent outlier? If this apparent outlier were removed, would the correlation coefficient calculated using the remaining 49 students be smaller than, about the same as or larger than the 0.516? Explain briefly.

(e) Using the following summary information (verbal aptitude test score is X and GPA is Y) for the 49 students excluding the outlier, calculate the value of the correlation coefficient, r. Does this agree with your assessment in (d)?

\[ n = 49 \quad \sum Y = 135.3 \quad \sum X = 29,674 \]
\[ \sum (X - \bar{X})(Y - \bar{Y}) = 1083.0 \quad \sum (Y - \bar{Y})^2 = 16.71 \quad \sum (X - \bar{X})^2 = 246,074.88 \]

(f) Use the correlation coefficient and the summaries in (e) to come up with the least squares regression line for predicting GPA from verbal aptitude score.

(g) Use the least squares regression line in (f) to predict the college GPA of a student with a verbal aptitude test score of 700.

(h) Does a high verbal aptitude test score cause a high GPA? If so, explain how you know. If not, explain why.

3. The following data were collected at a house in south-east England. The home owner had recently installed cavity-wall insulation. The weekly gas consumption (in 1000 cubic feet) and the average outside temperature for the week (in degrees Celsius) were recorded for 15 weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td>0.8</td>
<td>1.0</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>2.3</td>
<td>2.5</td>
<td>3.3</td>
<td>3.6</td>
<td>4.0</td>
<td>4.0</td>
<td>4.2</td>
<td>4.3</td>
<td>4.7</td>
<td>4.9</td>
</tr>
<tr>
<td>Gas</td>
<td>4.6</td>
<td>4.7</td>
<td>4.4</td>
<td>4.2</td>
<td>4.2</td>
<td>4.1</td>
<td>4.0</td>
<td>3.9</td>
<td>3.7</td>
<td>3.5</td>
<td>3.7</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Refer to the JMP output when answering the following questions.

(a) What is the explanatory variable? What is the response variable? Briefly explain your choice.

(b) Describe the general relationship between the two variables.

(c) What is the average temperature? What is the standard deviation for temperature?

(d) What is the average gas consumption? What is the standard deviation for gas consumption?

(e) Give the value for the slope of the least squares regression line. Give an interpretation of this value within the context of the problem.

(f) Give the value for the intercept of the least squares regression line. Give an interpretation of this value within the context of the problem.

(g) Give the equation of the least squares regression line for this problem. Use this equation to predict the gas consumption for a temperature of 2.5 C. What is the residual for this prediction?

(h) Would you use this least squares regression line to predict the gas consumption for a temperature of 20 C? Briefly explain your reasoning.

(i) Would you use this least squares regression line to predict gas consumption for an uninsulated house? Briefly explain your reasoning.