For the first two laboratory assignments we looked at percentage body fat for a random sample of 44 men under the age of 55. Measuring percentage body fat by displacement of water is a time consuming process that requires the individual to be naked. Could a less time consuming and less invasive measurement, like the circumference of a man’s abdomen (cm), be used to predict the percentage body fat? Data on the percentage body fat and abdomen circumference are available in a JMP data table on the course web page:

http://www.public.iastate.edu/~wrstephe/stat301.html

1. Down load the data table and use JMP to produce output that can be used to answer the following questions. It is not sufficient to simply hand in JMP output. You must answer the questions completely. Directing someone to see the JMP output is not an acceptable answer to a question. Turn in the JMP output attached at the end of your written (or word processed) solutions.
   a) Use Fit Y by X to obtain a plot of Body Fat (%) (Y) versus Abdomen circumference (cm) (X). Describe the general relationship between the two variables.
   b) Give the least squares equation of the line that relates Body Fat to Abdomen circumference.
   c) Give an interpretation of the estimated slope within the context of the problem.
   d) Why is there no reasonable interpretation of the estimated intercept within the context of the problem?
   e) Give the value of $R^2$ and an interpretation of this value within the context of the problem.
   f) Give the value of the estimate of the error standard deviation, $\sigma$.
   g) Test the hypothesis that the slope parameter, $\beta_1$, is zero against the alternative that it is not zero. Be sure to include all the steps for a test of hypothesis.
   h) Construct a 95% confidence interval for the slope parameter, $\beta_1$. Does this agree with the results of your test in above? Explain briefly.
   i) Use Confid Shaded Indiv to put prediction bands on your plot of the data. Do any of the points fall outside the prediction bands? If so, what is the Abdomen circumference, Body Fat and Predicted Body Fat associated with the points(s)?
   j) Save Predicteds and Save Residuals. What is the predicted Body Fat for a man with a 100 cm Abdomen circumference? What is the residual associated with this prediction?
   k) Use Fit Y by X to obtain a plot of Residuals versus Abdomen circumference. Are there any unusual patterns or points? If so, comment on the pattern and/or indicate the unusual points.
   l) Use Analyze + Distribution to analyze the residuals. Based on this analysis, and any plots from the previous analysis, comment on each of the conditions necessary for regression analysis.
   Remember to turn in the JMP output with the answers to the questions.

2. On a separate sheet of paper write a brief summary of what you have learned about the relationship between abdomen circumference and percentage body fat in men.