This homework is due Tuesday, October 29th at the start of class. Late homework will not be accepted except for medical emergencies (with proof). Note that if a question says to explain your answer, you will get no credit without some explanation. Use JMP for problems 1-3.

1. Moore and McCabe, third edition, exercise 2.52. This is exercise 2.60 in the fourth edition. The data is in hotdog.JMP on the web page.

2. Moore and McCabe, third edition, exercise 2.54. This is exercise 2.62 in the fourth edition. The table is in gaschromat.JMP on the web page.

3. (Moore and McCabe, third edition, 2.58). The table in beef.JMP gives data on the amount of beef consumed (pounds per person) and average retail price of beef (dollars per pound) in the United States for the years 1970 to 1993. Because all prices were generally rising during this period, the prices given are “real prices” in 1993 dollars. These are dollars with the buying power that a dollar had in 1993.

(a) Economists expect consumption of an item to fall when its real price rises. Make a scatterplot of beef consumption $y$ against beef price $x$. Do you see a relationship of the type expected?

(b) Find the equation of the least squares line and draw the line on your plot. What proportion of the variation in beef consumption is explained by regression on beef price?

(c) Although it appears that price helps explain consumption, the scatterplot seems to show some nonlinear patterns. Find the residuals from your regression in (b) and plot them against time. Connect the successive points by line segments to help see the pattern. Are there systematic effects of time remaining after we regress consumption on price? (A partial explanation is that beef production responds to price changes only after some time lag.)

4. A study is done to assess the relationship between a measure of speed in learning a foreign language and scores on an educational achievement test. The study uses two groups, young children and adults aged 60 and over. It is found that within each group, there is a strong positive correlation between the measure of speed in learning a foreign language and educational achievement scores yet when all of the study’s participants are considered, there is a negative correlation between speed in learning a foreign language and educational achievement scores. The explanation for this is that on average, young children learn foreign languages more quickly than older people and young children have lower educational achievement scores than older people. Sketch a scatterplot with two groups of cases (young children and adults age 60 and over) that illustrates how a strong positive correlation within each group between speed in learning a foreign language and educational achievement test scores and a negative overall correlation can occur together. Hint: Begin by studying Figure 2.29 in the third edition or Figure 2.26 in the fourth edition.

5. (a) A doctor is in the habit of measuring blood pressures twice. She notices that patients who are unusually high on the first reading tend to have somewhat lower second readings. She concludes that patients are more relaxed on the second reading. A colleague disagrees, pointing out that patients who are unusually low on the first reading tend to have somewhat higher second readings, suggesting they get more nervous. Which doctor is right? Or perhaps both are wrong? Explain briefly.
(b) A large study was made on the blood-pressure problem discussed in the previous exercise. It found that first readings average 130 mm, and second readings average 120 mm; the standard deviation of both the first and second readings were about 15 mm. Does this support either doctor's argument? Or is it the regression effect? Explain.