

**Math 1530-017 Exam 1**  
**February 19, 2009**

Name \_\_\_\_\_  
Student Number E \_\_\_\_\_

There are five possible responses to each of the following multiple choice questions. There is only one "BEST" answer. Be sure to read all possible choices before selecting your answer. You may mark on this examination. You should use a calculator, but it is not required. However, a calculator manual cannot be used. Each problem is worth 7 points (for a total of 266 points).

1. Define the word DISTRIBUTION (used in the statistical sense).
  - (a) Measurements that are collected at regular intervals over a period of time.
  - (b) The values taken by a variable, among a group of "individuals," and the frequency with which it takes those values.
  - (c) The number of "individuals" falling into some group or category.
  - (d) A proportion or the ratio of some part relative to the whole.
  - (e) The scaled axis system used for a graph or plot.
2. Here is a small part of a data set that describes the fuel economy (in miles per gallon) of 2006 model motor vehicles.

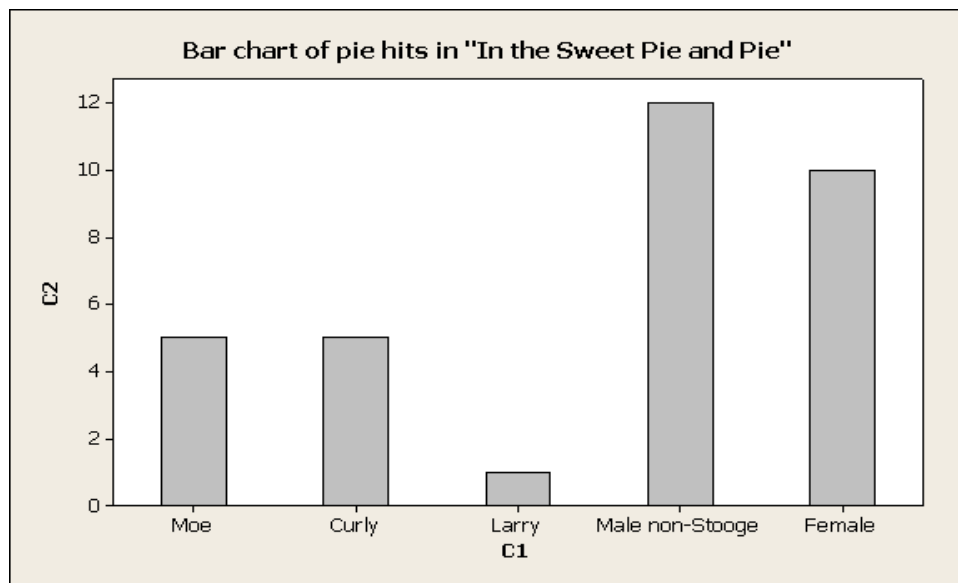
Make and model	Vehicle type	Transmission type	Number of cylinders	City MPG	Highway MPG
:					
Audi TT Roadster	Two-seater	Manual	4	20	29
Cadillac CTS	Midsized	Automatic	6	18	27
Dodge Ram 1500	Pickup truck	Automatic	8	14	19
Ford Focus	Compact	Automatic	4	26	32
:					

Which of the following is true of this data?

- (a) The individuals of the data set are the mileages.
  - (b) Transmission type is a quantitative variable.
  - (c) The Cadillac CTS is an outlier.
  - (d) The distribution is skewed right.
  - (e) Mileage is a quantitative variable.
3. In 1995 there were 90,402 deaths from accidents in the United States. Among these were 43,363 deaths from motor vehicle accidents, 10,483 from falls, 9,072 from poisoning, 4,350 from drowning, and the rest were due to other causes. What type of graph or display would NOT be appropriate to use in presenting this information?
    - (a) Bar graph.
    - (b) Frequency table.
    - (c) Histogram.
    - (d) None of the above listed displays is appropriate.
    - (e) Pie chart.

4. Suppose you are a real estate agent who is making an important presentation at a forum on regional growth and development in the state of Tennessee. You want to create a graphical display that will show the trends in single-family housing costs in the Tri-Cities over the past 20 years. What type of graph is most suitable for this purpose?
- Histogram.
  - Bar chart.
  - Pie chart.
  - Time plot.
  - Stemplot.

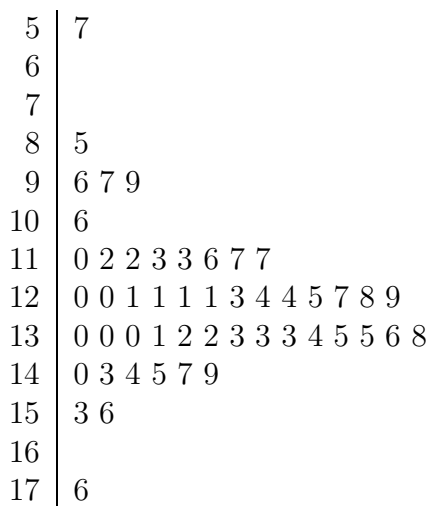
Use the following bar chart which was generated by Minitab to answer the next two questions.



This gives the number of pies-in-the-face for various individuals and groups in the Stooges' film *In the Sweet Pie and Pie*.

5. Comment on this graph.
- The distribution is roughly U-shaped.
  - The center of the distribution is "Larry."
  - Over 1/3 of the pies hit a "Male non-Stooge."
  - The distribution is skewed right.
  - 10% of the pies hit females.
6. Which of the following is NOT true of the bar graph:
- The same information could be put in a stem plot.
  - It shows that Moe and Curly were hit with pies the same number of times.
  - It represents categorical data along the horizontal axis.
  - The same information could be put into a pie chart.
  - It shows that about 3% of the pies hit Larry.

7. You look at real estate ads for houses in Sarasota, Florida. There are many houses ranging from \$200,000 to \$400,000 in price. The few houses on the water, however, have prices up to \$15 million. The distribution of house prices will be:
- (a) Skewed to the left.
  - (b) Skewed to the right.
  - (c) Roughly symmetric.
  - (d) Undefined since this represents categorical data.
  - (e) Dependent on the demand for housing.
8. The population of the United States is aging, though less rapidly than in other developed countries. Here is a stemplot of the percents of residents aged 65 and older in the 50 states, according to the 2000 census. The stems are whole percents and the leaves are tenths of a percent.



The center of the distribution is close to:

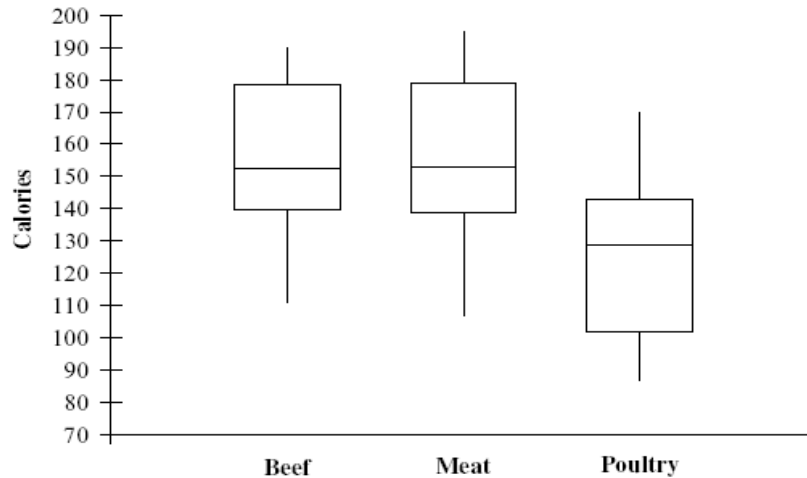
- (a) 14.0%            (b) 5.7% to 17.6%            (c) 138%            (d) 12.7%            (e) 11.0%
9. Use these data for this question. Suppose the grade point averages (GPA) of 7 randomly chosen students from your statistics class are 3.14, 2.37, 2.94, 3.60, 1.70, 4.00, and 1.85. What is the mean GPA for these students?
- (a) 0.28            (b) 3.6            (c) 7.8            (d) 4.0            (e) 2.8
10. Suppose a set of sample data has the following 5-number summary:

MIN	$Q_1$	MEDIAN	$Q_3$	MAX
20	45	72	97	122

Which of the following statements is INCORRECT?

- (a) The interquartile range (*IQR*) is 52.
- (b) 50% of the scores lie between 45 and 122.
- (c) 25% of the scores are below 45.
- (d) 50% of the scores are above 72.
- (e) 75% of the scores lie between 20 and 97.

Use the following boxplots to answer the next three questions. Here are the boxplots of the number of calories in 20 brands of beef hotdogs, 17 brands of meat hot dogs, and 17 brands of poultry hot dogs.



11. The main advantage of boxplots over stemplots and histograms is
  - (a) boxplots show more detail about the shape of the distribution.
  - (b) boxplots use the five-number summary, whereas stemplots and histograms use the mean and standard deviation.
  - (c) boxplots show skewed distributions, whereas stemplots and histograms show only symmetric distributions.
  - (d) boxplots show symmetric distributions, whereas stemplots and histograms show only skewed distributions.
  - (e) boxplots make it easy to compare several distributions, as in this example.
12. This plot shows that
  - (a) All poultry hot dogs have fewer calories than the median for beef and meat hot dogs.
  - (b) most poultry hot dog brands have fewer calories than most beef and meat hot dogs, but a few poultry hot dogs have more calories than the median beef and meat hot dog.
  - (c) about half of poultry hot dog brands have fewer calories than the median for beef and meat hot dogs.
  - (d) hot dog type is not helpful in predicting calories, because some hot dogs of each type are high and some of each type are low.
  - (e) the mean number of calories for poultry hotdogs is 130.
13. We see from the plot that the median number of calories of a beef hot dog is about:
  - (a) 153.      (b) 190.      (c) 179.      (d) 139.      (e) 129.
14. Here are the IQ test scores of 10 randomly chosen fifth-grade students:

96      110      118      118      122      125      126      130      139      145

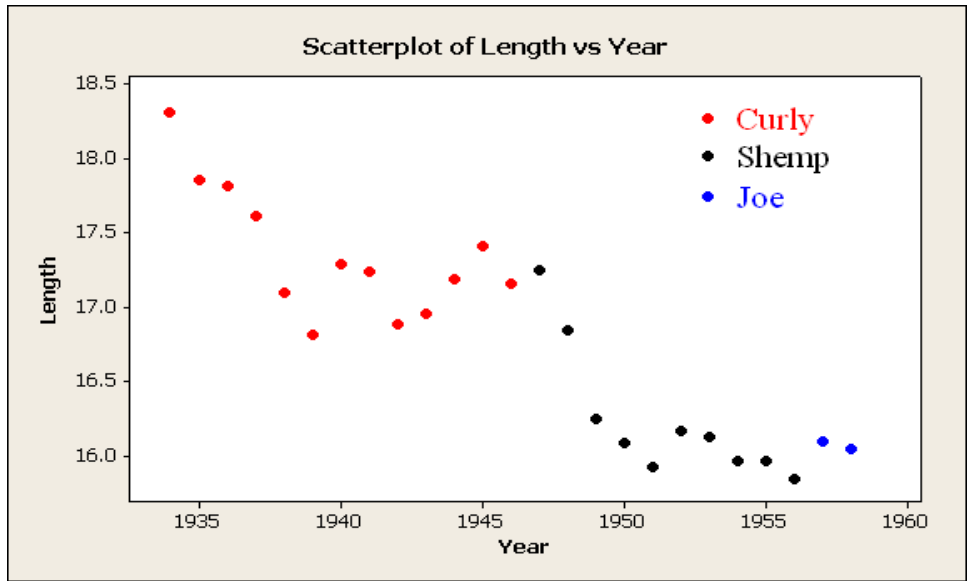
The five-number summary of these IQ scores is

- (a) 96, 114, 125, 134.5, 145      (b) 96, 118, 122.9, 130, 145      (c) 96, 118, 123.5, 130, 145
- (d) 96, 118, 123.5, 130, 145      (e) 96, 118, 125, 130, 145



20. Suppose the number of slaps per film of the Three Stooges films has distribution  $N(13.00, 4.50)$ . The Stooges' 24th film, *Goofs and Saddles*, has 8 slaps. The formula for the  $z$ -score is  $z = (x - \mu)/\sigma$ . If a Stooges film is chosen at random, what is the probability that it has less slaps than *Goofs and Saddles*? Use the Standard Normal Probabilities Table.
- (a) 50%            (b) 10            (c) 0.4880            (d) 13.35%            (e) 1.1111
21. Suppose the number of slaps per film of the Three Stooges films has distribution  $N(13.00, 4.50)$ . 84% of the films include at most how many slaps per film? Use the Standard Normal Probabilities Table.
- (a) 4.50 slaps per film.            (b) 12.00 slaps per film.            (c) 9.00 slaps per film.  
 (d) 8.5 slaps per film.            (e) 17.5 slaps per films.
22. Suppose the number of slaps per film of the Three Stooges films has distribution  $N(13.00, 4.50)$ . What is the range of the number of slaps per films for the center 95% of the films? Use the Standard Normal Probabilities Table or the 68-95-99.7 Rule.
- (a) 4 slaps per film to 22 slaps per film.  
 (b) 8.5 slaps per film to 17.5 slaps per film.  
 (c) 4.50 slaps per film to 13.00 slaps per film.  
 (d) 13.00% slaps per film to 95% slaps per film.  
 (e) 8.5 films to 17.5 films.
23. Which of these variables is least likely to have a normal distribution?
- (a) Income per person for 150 different countries.  
 (b) Lengths of 50 newly hatched pythons.  
 (c) Heights of 100 white pine trees in a forest.  
 (d) The weight of American males.  
 (e) The ACT score of 2008 ETSU freshman.
24. The scores of adults on an IQ test are approximately normal with mean 100 and standard deviation 15. Corinne scores 118 on such a test. She scores higher than what percent of all adults?
- (a) About 100.            (b) About 12%.            (c) About 88%.  
 (d) About 09%.            (e) About 15%.
25. If women always married men who were exactly 2 years older than themselves, what would be the correlation  $r$  between the ages of husbands and their wives?
- (a) 0.00            (b) 0.50            (c) 2.00            (d) -1.00            (e) 1.00
26. You have data for many families on the parents' income and the years of education their eldest child completes. You expect to see:
- (a)  $r < 0$ .  
 (b)  $\hat{y} = mx + b$ .  
 (c) A positive association.  
 (d) Very little association.  
 (e) A negative association.
27. The points on a scatterplot lie very close to the line whose equation is  $y = 4 - 3x$ . The correlation between  $x$  and  $y$  is close to:
- (a) 0            (b) 4            (c) -3            (d) -1            (e) 1

28. Use the following scatterplot to answer this question. This is a plot of the average length of Stooges' films in minutes for the years 1934 to 1958.



Which of the following is true about this data?

- (a) There is a rough linear relationship between the variables.
- (b) There is a negative association between the variables.
- (c) There is a positive association between the variables.
- (d) Both (a) and (b).
- (e) Both (a) and (c).

Use the following scatterplot to answer the next two questions.

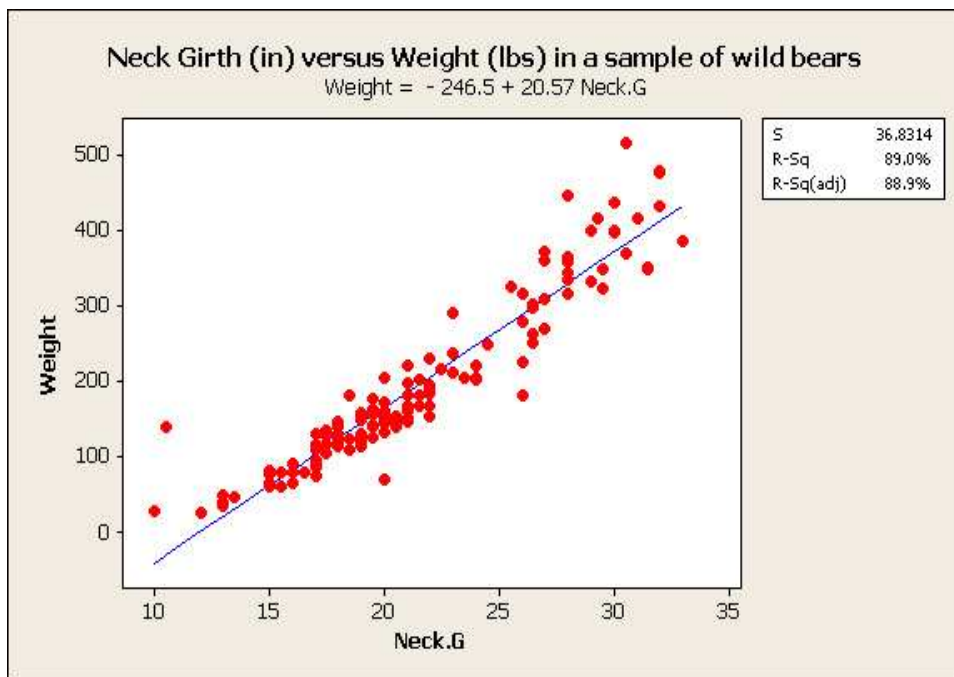


29. Which of the following is a plausible value for the correlation between MPG and horsepower in this sample of vehicles?

- (a) 100%
- (b) 0.9
- (c) 81%
- (d) -0.9
- (e) -1.00

30. Which of the following phrases best describes the association between horsepower and MPG?
- (a) Strong and positive.
  - (b) Strong and negative.
  - (c) Negative and no association.
  - (d) Little or no association.
  - (e) Weak and positive.
31. Listed below are some “facts” about least-squares regression. However, one of these facts is not correct. Which fact is FALSE?
- (a) The square of the correlation,  $r^2$  (often written as  $R^2$ ) is the fraction of the variation in the values of  $y$  that is explained by the regression or  $y$  on  $x$ .
  - (b) The regression line always passes through the point  $(\bar{x}, \bar{y})$ .
  - (c) The distinction between explanatory and response variable is essential when computing the parameters for a regression model.
  - (d) The regression line will always pass through every point shown in a scatterplot.
  - (e) Along the regression line, a change of one standard deviation in  $x$  corresponds to a change of  $r$  standard deviations in  $y$ .

Use the following information and scatterplot to answer the next two questions.



32. Wild bears in a sample of size  $n = 143$  were anesthetized, and their bodies were measured and weighed. One goal of the study was to make tables for hunters, so they could estimate the weight of a bear based on other measurements. This scatterplot shows the fitted least-squares regression line that models the linear association between weight (lbs.) and neck girth (in.). Notice that the equation of least-squares regression that models the data is given with the graph. Which is the proper interpretation of the slope in that equation? For the sampled bears (see next page)

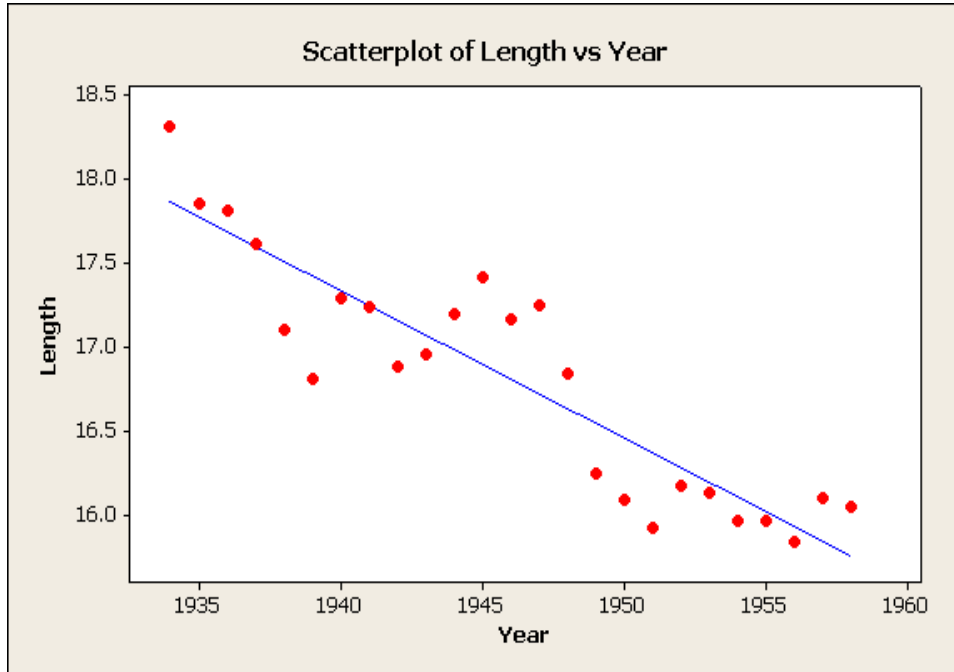


- (a) weight decreases by nearly 21 pounds for each additional inch of neck girth.  
 (b) weight decreases by about 246.5 pounds for each additional inch of neck girth.  
 (c) neck girth increases by about 20.57 inches for each additional pound of weight.  
 (d) neck girth is about 89% of a bear's weight.  
 (e) weight increases by about 20.57 pounds for each additional inch of neck girth.
33. What is the approximate value of the correlation between neck girth and weight for this sample of wild bears?  
 (a) 0.89            (b) 1.00            (c)  $-0.94$             (d) 0.94            (e) 0.21
34. The auto insurance industry crashed some test vehicles into a cement barrier at speeds of 5 to 25 MPH to investigate the amount of damage to the cars. They found a correlation of  $r = 0.60$  between speed (MPH) and damage (in hundreds of \$). How can we interpret the correlation value?  
 (a) 60% of the time, predicted damage (\$) is equal to actual damage (\$).  
 (b) The amount of damage seems to be positively related to the speed at which a car hits the barrier, with higher speeds tending to correspond to larger amounts of damage (\$).  
 (c) Predicted damage (\$) changes 600 dollars for every one MPH increase in speed.  
 (d) We would expect the damage to be equal to 60% of the mean damage.  
 (e) At 5 MPH we would expect  $(0.60 \times 5) \times \$100 = \$300$  damage and at 25 mph we would expect  $(0.60 \times 25) \times \$100 = \$1500$  damage.
35. A survey of the world's nations in 2004 shows a strong correlation between percentage of the country using cell phones and life expectancy in years at birth. The correlation is most likely due to:  
 (a) cause and effect (cell phones are good for your health).  
 (b) a mistake, since the correlation must be negative.  
 (c) "reverse" cause and effect (longer life causes more people to use cell phones).  
 (d) a large  $r^2$ .  
 (e) the effect of a lurking variable, such as general economic conditions.
36. It is difficult to determine a person's body fat percentage accurately without immersing him or her in water. Researchers hoping to find ways to make a good estimate immersed 20 male subjects, then measured their waists. The correlation between the two variables is  $r = 0.887$  and the least-squares regression line for predicting % Body Fat from Waist (inches) is

$$\% \text{ Body Fat} = -62.6 + 2.22 \times \text{Waist}$$

The estimated % body fat for a male with a waist size of 38 inches is about  
 (a) 15%            (b) 25%            (c) 22%            (d) 30%            (e) 44%

Use the following information and regression line to answer the next two questions.



37. The least-squares regression line is  $\hat{y} = -0.879x + 188$ , or in the form of Minitab output

$$\text{Length} = 188 - 0.0879 \times \text{Year}$$

What is the residual for the year 1945 in which the average length of a film was 17.41 minutes?

- (a) 0.38 minutes      (b) 0 minutes      (c) 17.03 minutes      (d) 188      (e)  $-0.0879$  minutes

38. Suppose we use the formula from the previous problem to estimate how long a *Three Stooges* film would have been in 1965, if the Stooges had continued to make films. This is an example of

- (a) extrapolation.  
(b) correlation.  
(c) a lurking variable.  
(d) an influential observation.  
(e) causation.

ANSWERS AND SOURCES OF QUESTIONS

#	Source	Answer
1.	Chapter 1 Quiz, #2	(b)
2.	BPS Exercise 1.1 Page 6	(e)
3.	Chapter 1 Quiz, #7	(c)
4.	Chapter 1 Quiz, #14	(d)
5.	Stooges Example S.1.1 data	(c)
6.	Stooges Example S.1.1 data	(a)
7.	BPS Exercise 1.22 Page 26	(b)
8.	Departmental Final Fall 2007A #37	(d)
9.	Chapter 2 Quiz #4	(e)
10.	Chapter 2 Quiz, #7	(b)
11.	Departmental Final Exam Fall 2008A #15	(e)
12.	Departmental Final Exam Fall 2008A #16	(b)
13.	Departmental Final Exam Fall 2008A #17	(a)
14.	BPS Exercise 2.15 Page 56	(c) or (d)
15.	BPS Exercise 2.22 Page 57	(e)
16.	Stooges S.2.6	(c)
17.	Based on information on page 68 of BPS	(e)
18.	Chapter 3 Quiz #3	(d)
19.	Chapter 3 Quiz #12	(d)
20.	Attendance Quiz February 10, 2009	(d)
21.	Example S.3.1a	(a)
22.	Example S.3.1d	(a)
23.	Exercise 3.15 Page 84	(a)
24.	Exercise 3.24 Page 85	(c)
25.	Chapter 4 Quiz #7 and Exercise 4.19 Page 106	(e)
26.	Exercise 4.13 Page 105	(c)
27.	Exercise 4.18 Page 106	(d)
28.	Stooges S.4.1	(d)
29.	Departmental Final Spring 2007A #17 (changed (a))	(d)
30.	Departmental Final Spring 2007A #18	(b)
31.	Chapter 5 Quiz #2	(d)
32.	Chapter 5 Quiz #8	(e)
33.	Chapter 5 Quiz #9	(d)
34.	Departmental Final Spring 2007A #19	(b)
35.	Departmental Final Spring 2008A #17	(e)
36.	Departmental Final Spring 2008A #19	(c)
37.	Stooges Example S.5.2	(a)
38.	Stooges Example S.5.1 data	(a)