

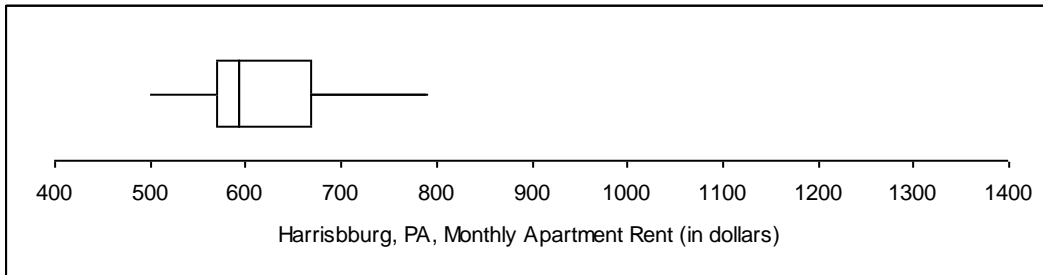
10/1/2008  
Dr. Lunsford

MATH 171  
Test 1

Name: \_\_\_\_\_  
100 Points Possible

Please show all work on this test. No work shown implies no full credit if (even if the answer is correct!) and no partial credit if the answer is incorrect.

**Problem I.** Below you are given the boxplot for monthly apartment rents (in dollars) in Harrisburg, Pennsylvania and the data for the monthly apartment rents (also in dollars) in Philadelphia, Pennsylvania. Use this information to answer the following questions. (14 points total)



Philadelphia (n=15): 475, 525, 540, 575, 600, 600, 645, 700, 725, 755, 885, 930, 965, 1180, 1300

(a) Find the five-number summary for apartment rents in Philadelphia. Clearly indicate your answers. (5 points)

(b) Draw a boxplot of the distribution of apartment rents in Philadelphia. Draw this boxplot above the boxplot of the Harrisburg apartment rents on the graph given above. (4 points)

(c) For the Harrisburg apartment rents distribution we have:

$$Q_1 = \$569 \quad \text{median} = \$592.5 \quad Q_3 = \$680$$

Use the 1.5 IQR rule to determine which (if any) Philadelphia apartment rents would be considered high outliers for the Harrisburg apartment rent distribution? (5 points)

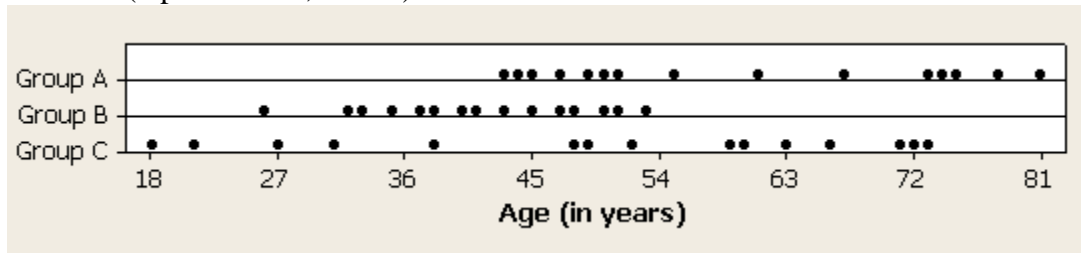
**Problem II.** Suppose Ben records the noon temperature in New York City on every day in the month of June, and Frank records the noon temperature in New York City on every day in an entire year. Which one (Ben or Frank) would you expect to have the greater standard deviation of temperatures, or would you expect the standard deviations to be very similar? Explain briefly. (4 points)

**Problem III. Multiple Choice, True/False, Short Answer.** (27 points total)

1. Suppose the observational units in a study are customers arriving at a post office. For each of the following variables recorded, identify if it is quantitative or categorical. (2 points each, 8 points total)

- \_\_\_\_\_ Gender (male or female)
- \_\_\_\_\_ Total time spent waiting in line and being served
- \_\_\_\_\_ Total amount of money spent
- \_\_\_\_\_ Whether they used a credit card or not.

2. Consider the following dotplots of ages (graphed on the same scale) for three groups of people to answer the questions below. No calculation is needed to determine your answers. (3 points each, 6 total)



- (a) Which group has the oldest mean (average) age?
  - (b) Which group has the smallest standard deviation in ages?
3. If the variable  $X$  has a mean of 58 and a standard deviation of 10, then the  $z$ -score for  $X = 43$  is (circle one): (2 points)
- a)  $z = 15$
  - b)  $z = 37.2$
  - c)  $z = 1.5$
  - d)  $z = -1.5$
4. **True** or **False** (circle one) If people with larger feet tend to be less intelligent, then we would expect the correlation between foot size and intelligence to be negative. (2 points)
5. **True** or **False** (circle one) If the linear association between two variables is strong, then we would expect the correlation coefficient  $r$  to be closer to one or negative one than to zero. (2 points)
6. **Yes** or **No** (circle one) Suppose John moves from City A to City B, and no one else moves between the two cities. Is it possible for the mean IQ in *both* cities to decrease? (2 points)
7. Circle all of the following numerical summaries of quantitative data that are **not** resistant to outliers. (5 points)

Mean                  Median                  Standard Deviation                  IQR                  Range

**Problem IV.** An article in the October 7, 2007, issue of Parade magazine claimed that one-third of all homicides in the United States remain unsolved. Please answer the following. (2 points each - 6 points total)

- (a) Is this number (one-third) a parameter or statistic?
- (b) What are the observational units?
- (c) If a researcher studies a random sample of 150 homicides from around the United States, will he/she necessarily find that one-third of them remain unsolved? Explain briefly.

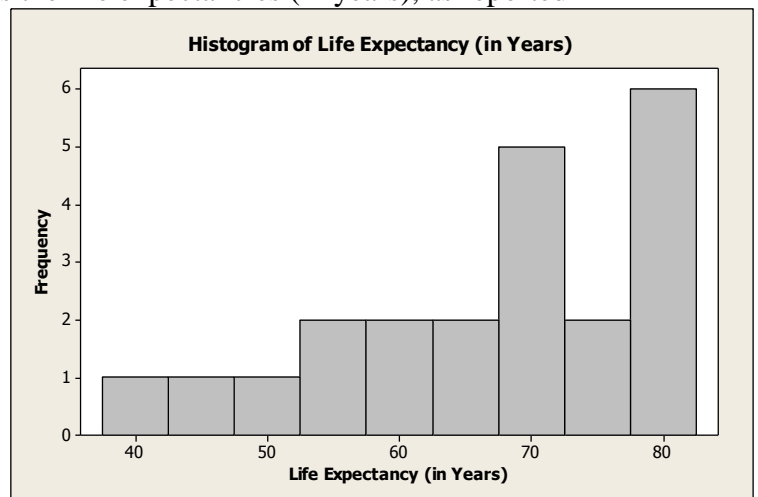
**Problem V.** “Headset Phones May Still Pose Risks for Drivers” (Jesse Drucker, September 24, 2004) reported on a University of Utah study that used a driving simulator to see how drivers performed when randomly assigned to talk on a headset cell phone or to talk to another passenger. Part of the simulation instructed the drivers to take a specific exit. Twelve of 24 using a cell phone with a headset missed the exit, 3 of 24 talking to a passenger missed it. Please answer the following questions. (6 points total)

- (a) Is this an experimental or observational study? Briefly explain. (3 points)
- (d) If the researchers find that the difference in percentages of those who missed the exit between the two groups is significant, would it be appropriate to conclude that using the cell phone *caused* the subjects to be more likely to miss the exit than talking to a passenger? Briefly explain. (3 points)

**Problem VI.** The histogram below displays the life expectancies (in years), as reported by The World Almanac and Book of Facts 2006, for a sample of 22 countries. (11 points total)

- (a) Circle all words below that this distribution. (3 points)

Symmetric      unimodal      uniform  
 Left skewed    right skewed    normal



**Problem VI, continued (continue to use the graph of the histogram on the previous page).**

(b) Two measures of center for this distribution are 67.0 and 70.7. One of these is the mean and the other is the median. Which is which? Justify your answer. (4 points)

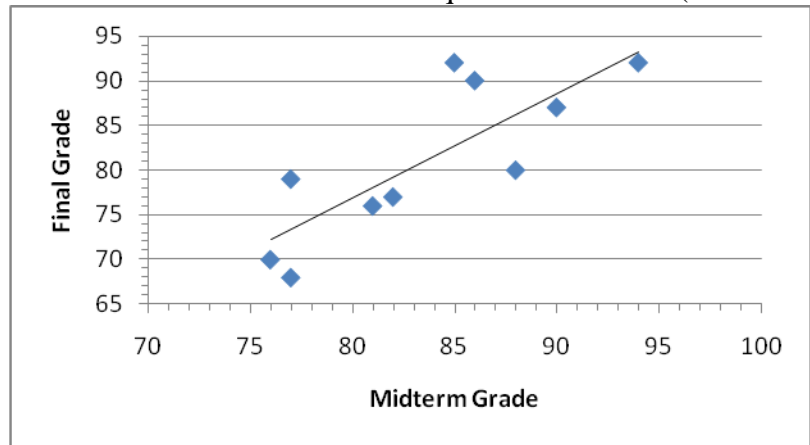
(c) Approximately what *percent* of the 22 countries have a life expectancy of no more than 52.5 years? Note that frequency is plotted on the vertical axis. Please show all work to answer this question. (4 points)

**Problem VII.** SAT scores from a recent year can be modeled with a normal distribution with mean 1030 and standard deviation 210. ACT scores from the same year can also be modeled with a normal distribution with mean 22 and standard deviation 4. Please answer the following being sure to show all calculator input. (18 points total)

1. Draw the distribution of SAT scores. Be sure to label your axis and show scores that are plus/minus one, two and three sigma from the mean on the axis. (4 points)
2. What percent of SAT test takers got a score of at least 1240? Show this percent graphically on the distribution you drew in part (a). (3 points)
3. What score would a person need to make in order to be in the top 5% of all ACT test takers? (4 points)
4. Alex makes a 1380 on the SAT, while Brian makes a 31 on the ACT. Assuming both tests are measuring the same thing, who did better in relation to his peers, Alex or Brian? (4 points)
5. A z-score of  $-2.3$  corresponds to what SAT score? (3 points)

**Problem VIII.** Below are the data from 10 randomly selected students from Dr. L.'s Fall 2004 MATH171 Classes. For each student we are given the student's midterm grade and their final class grade. You are also given a scatterplot of the data including the least squares regression line. Please use this information to answer the questions below. (14 points total)

Midterm Grade (x)	Final Grade (y)
82	77
81	76
88	80
85	92
90	87
86	90
94	92
77	79
76	70
77	68



- (a) Find the centroid of the data and plot it on the scatter plot. Clearly indicate the answer below and clearly show the centroid on your graph. (2 points)
- (b) Find the equation of the least squares regression line. Clearly indicate your answer below. (3 points)
- (c) Use the regression model found in part (b) to estimate the average final grade for students who have a midterm grade of 80. Show your work below and this estimation graphically (using up-and-over lines) on the scatterplot above. (3 points)
- (d) According to the regression model found in part (b), an increase of *10 points* in midterm grade corresponds to what change in final grade? (3 points)
- (e) Do you think the least squares regression line found in part (b) is a good predictive model of calculus scores given algebra scores? Why or why not? (Hint: Use the coefficient of variation,  $r^2$ , to answer this question.) (3 points)