

Math 153 - Test 1
February 21, 2013

Name _____

Score _____

Show all work to receive full credit. Supply explanations where necessary. You may use your calculator for all statistical computations.

1. (9 points) Refer to the snowfall data on the attached sheet.
 - (a) Find the percentile for the value 13.1.

 - (b) Find the value of the 85th percentile.

 - (c) Find the value of the 25th percentile.

2. (4 points) The prices for a gallon of gasoline have mean \$3.74 and standard deviation \$0.108. Suppose you recently paid \$3.95 per gallon. Compute the z -score for your price and determine whether the price you paid is unusual.

3. (2 points) When should you use coefficients of variation to compare the spread in different sets of data?

4. (12 points) Refer to the snowfall data on the attached sheet.
- (a) Compute the quartiles.

 - (b) Find the IQR (interquartile range).

 - (c) Find the mean and sample standard deviation. You may use your calculator.

 - (d) Determine whether the snowfall data include any unusual values.

 - (e) Does the range rule of thumb, $s \approx \text{range}/4$, provide a good approximation for the standard deviation? Justify your answer.

 - (f) Would it be wise to use a stem-and-leaf plot to display the snowfall data? Explain.
5. (4 points) According to Chebyshev's Theorem, at least what percent of the data values from any set will lie within 1.75 standard deviations of the mean?

6. (12 points) The frequency distribution shown below gives the salaries (in thousands of dollars) of the employees at a small company.

Salary (thousands of \$)	Frequency
12.7–29.0	13
29.1–45.4	8
45.5–61.8	5
61.9–78.2	1
78.3–94.6	2
94.7–111.0	1

- (a) What are the class boundaries associated with the last class listed above?
- (b) What is the class width?
- (c) What are the class midpoints?
- (d) Use class midpoints to estimate the mean salary.
- (e) Use class midpoints to estimate the median.
- (f) Do the salaries appear to be normally distributed? Explain.

7. (12 points) A group of 20 dieticians believe that meditation is an effective weight-loss strategy. In order to justify their beliefs, they plan to study a sample of 200 patients. Some patients will be asked to meditate for 30 minutes each day.
- (a) Is their study an experiment or an observational study? Briefly explain.

 - (b) Are the weights of patients discrete or continuous?

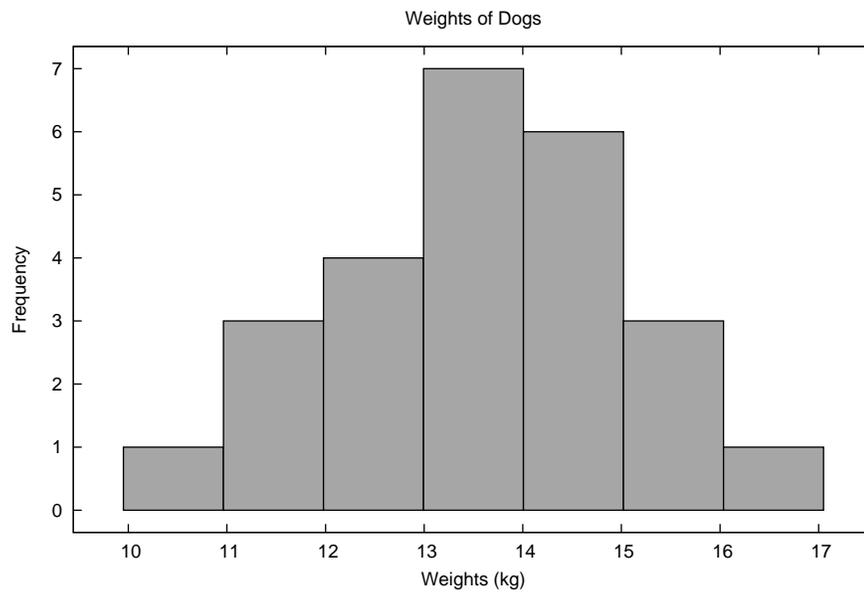
 - (c) Identify the level of measurement (nominal, ordinal, interval, ratio) for the weights of patients.

 - (d) The sample of 200 patients is obtained by each dietician randomly selecting 10 volunteers from his or her own practice. Is this sample a simple random sample? Briefly explain.

 - (e) One of the dieticians, Dr. Wesley Roberts, reported that his ten patients lost 4 pounds per month, on average. Is this number a statistic or a parameter?

 - (f) At the end of their study, the dieticians are convinced that their results are statistically significant. What is the difference between statistical significance and practical significance?

8. (10 points) The following histogram shows the distribution of weights of dogs in a local shelter.



- (a) How many dogs are in the sample?
- (b) If the histogram was changed to a relative frequency histogram, what would be the height of the fourth bar?
- (c) Are numbers of dogs discrete or continuous?
- (d) Estimate the median dog weight.
- (e) Are the dogs' weights approximately normally distributed? Explain.

9. (3 points) Describe a situation where a pie chart (circle graph) would be the best kind of graphical display.
10. (5 points) Organize the following data into a stem-and-leaf plot. Are the data approximately normally distributed? Explain.

47 32 48 51 10 27 50 21 24 12
21 32 48 12 28 32 36 37 38 49

11. (8 points) Julio scored 180 on a math test with mean 157.9 and standard deviation 27.3. Mary scored 43 on a physics test with mean 38.1 and standard deviation 6.2.
- (a) Compute the corresponding z scores. Who scored better and why?
- (b) Compute the coefficients of variation for the tests. Which tests (math or physics) had greater variation?
- (c) What would be an unusually high score on the math test?

12. (6 points) A sample of PSC students is obtained as described. Identify the type of sampling (random, systematic, convenience, stratified, cluster).
- (a) Students are selected as they walk in the main door.

 - (b) Students are separated into groups according to age, then 20 students are selected from each age group.

 - (c) A complete list of students is compiled and every 150th name is selected.

 - (d) Students are separated into groups according to last initial. Ten letters are chosen at random and all students with that initial are selected.

 - (e) Student ID numbers are selected at random by using a computer.

 - (f) Students are grouped according to which high school they attended. Two students are selected from each high school.
13. (4 points) Give an example of a random sample that is not a simple random sample.

Intentionally blank

14. (9 points) Consider the snowfall data on the attached sheet.

(a) Construct a frequency distribution for the data.

(b) On graph paper, construct the corresponding relative frequency histogram.

(c) On graph paper, construct the boxplot for the data. Do not consider outliers.

January Snowfall at O'Hare Airport (Inches)

1960-2005 (Excluding 1997 and 1998)

0.4	0.5	1.5	1.6	2.0	3.0	3.2	3.5	3.5	3.7
4.3	5.0	5.4	5.6	5.9	6.2	6.9	7.2	7.4	7.6
9.5	10.0	10.0	10.4	11.1	11.7	13.1	13.6	14.2	14.6
15.2	15.5	15.5	16.8	17.2	17.3	18.6	18.9	21.9	22.9
25.1	27.8	29.6	34.3						