

Math 153 - Test 1
September 11, 2014

Name _____

Score _____

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

1. (2 points) What is the difference between a statistic and a parameter?

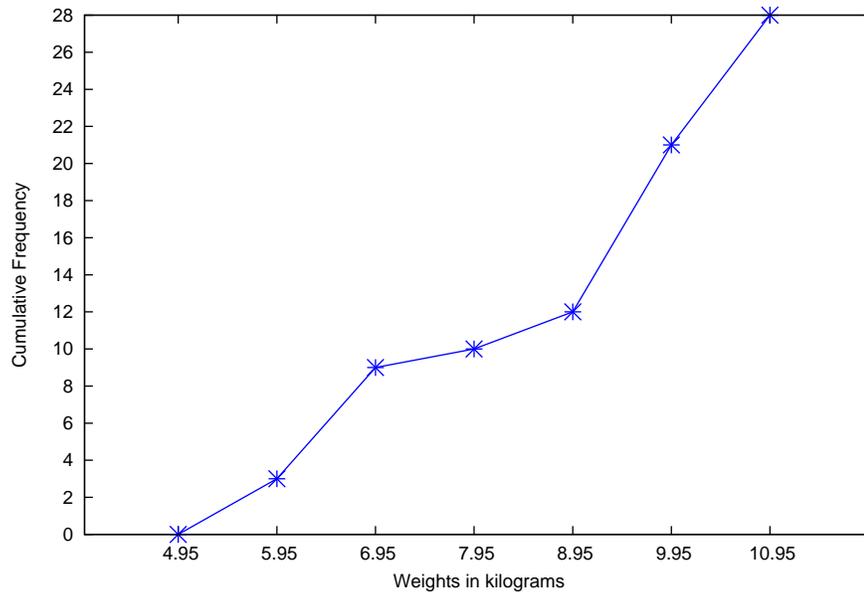
2. (2 points) Joanna sells childrens' t-shirts. One morning she sold 14 shirts—their sizes are shown below.

6, 10, 8, 12, 12, 8, 12, 6, 10, 12, 12, 12, 6, 12

Someone asked Joanna the size of her average customer. Should she report the mean, median, or mode? Briefly explain.

3. (2 points) Sketch a histogram showing a distribution that is skewed left.

4. (9 points) The following ogive shows the distribution of weights (in kilograms) of five-week-old piglets in a sample taken by a local farmer.



- (a) How many piglets are in the sample described by the ogive?
- (b) How many piglets had weights between 6.95 kg and 8.95 kg?
- (c) In which range of weights (4.95–5.95, 5.95–6.95, etc.) were there the most piglets?
- (d) If a **relative frequency histogram** was constructed with the same data, what would be the height of the bar associated with the interval 5.95–6.95?
- (e) If the marks along the horizontal axis represent class boundaries, what would be reasonable approximations for the class lower limits?
- (f) The farmer surveyed several other farmers by asking the following question: *Because large factory farms are bad for the environment, should they be banned?* What is wrong with this survey question?

5. (5 points) A collection of test scores have mean 68.5 and standard deviation 4.3. What are the cut-offs for unusually low and high test scores?
6. (6 points) For each of the following situations, tell which type of graph would best display the data. Choose from *dot plot*, *bar graph*, *time-series graph*, *scatterplot*, *pie chart*, *ogive*, *histogram*, or *stem-and-leaf plot*. You may get partial credit if you offer brief explanations.
- (a) For a class project, Bill constructs a graph to show how the population of Greenland has changed over the years.
 - (b) The chief financial officer for a large company wants to sketch a graph showing how the company's operating budget is divided among 5 different categories.
 - (c) The author of a geography textbook wants to show a graph displaying the current populations of the seven continents.
 - (d) Sally randomly selected 75 Initech employees. For each employee, she recorded age and annual salary. She then formed ordered pairs and plotted the data.
 - (e) A teacher graded 25 tests, and they all had scores that were whole numbers between 37 and 55. She wants to display the entire set of scores.
 - (f) Health researchers weighed 250 fourth-grade children. They want to make a graph showing the numbers of children in the different weight classes.

7. (8 points) Listed below are the numbers of manatee deaths caused each year by collisions with watercraft.

78 81 95 73 69 79 92 73 90 97

Compute the mean and standard deviation. Based on the numbers, is it unusual to have 95 annual deaths? What about 72 deaths?

8. (4 points) According to Chebyshev's Theorem, at least what percent of the data values from any set will lie within 2.25 standard deviations of the mean?

9. (6 points) Determine the level of measurement. Choose from nominal, ordinal, interval, or ratio. You may get partial credit if you offer brief explanations.

(a) Names of books written by Jhumpa Lahiri

(b) Weights of newborn babies

(c) College and university rankings

(d) Years in which popes were elected

10. (16 points) The following frequency distribution shows the costs (in dollars) of 30 portable GPS navigators.

GPS Costs (\$)	Frequency
65–104	6
105–144	9
145–184	6
185–224	4
225–264	2
265–304	1
305–344	2

- (a) What are the class boundaries associated with the first class listed above?
- (b) What is the class width?
- (c) If the frequency distribution was changed to a cumulative frequency distribution, what number would be associated with the class " ≤ 224 "?
- (d) What are the class midpoints?
- (e) Use class midpoints to estimate the mean cost.
- (f) Use class midpoints to estimate the median cost.
- (g) Of the two measures of center computed above, which is better and why?
- (h) Do the costs appear to be normally distributed? If so, explain why you think so. If not, describe the type of distribution.

11. (8 points) Math tests had a mean of 157.9 and a standard deviation of 27.3. Physics tests had a mean of 38.1 and a standard deviation of 6.2.
- (a) Compute the coefficients of variation for the tests. Which tests (math or physics) had greater variation?

 - (b) What would be an unusually high score on the math test?
12. (9 points) A sample of PSC students is obtained as described. Identify the type of sampling (random, systematic, convenience, stratified, cluster). You may get partial credit if you offer brief explanations.
- (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. (6 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

14. (3 points) A survey conducted by Globo Gym asked members to report the amount of time they work out each day. What is wrong with such a survey? How could the data collection be improved?

15. (2 points) Recent research indicates there is a strong correlation between the extinction of the woolly mammoths and the disappearance of a certain type of flower eaten by the mammoths. Does this suggest that mammoth extinction was caused by the flower disappearance? Explain.

16. (12 points) A group of 15 doctors believe that by playing Fruit Ninja, a smoker's desire for nicotine decreases. In order to justify their beliefs, they plan to study a sample of 90 people who smoke an average of 10 cigarettes per day. Some of the smokers will be asked to play Fruit Ninja for 30 minutes each day.
- (a) Is their study an experiment or an observational study? Briefly explain.

 - (b) Are the numbers of cigarettes smoked per day discrete or continuous?

 - (c) Study participants must rank their desire for nicotine on a scale of 0 through 10. Identify the level of measurement (nominal, ordinal, interval, ratio) associated with desires for nicotine.

 - (d) The sample of 90 participants is obtained by each doctor randomly selecting 6 volunteers from his or her own practice. Is this sample a simple random sample? Briefly explain.

 - (e) Suppose the sample of participants is selected by placing a radio advertisement asking smokers to volunteer. What type of sample is this?

 - (f) At the end of their study, the doctors conclusively showed that the Fruit Ninja players desired only 9 cigarettes per day. Is their result statistically significant, practically significant, or both? Explain.