Math 153 - Test 1
September 15, 2016

Name key

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (12 points) Identify the type of sampling. Choose from random, systematic, convenience, stratified, or cluster.

   (a) A reporter interviewed the neighbors of a person who was the focus of a story.

   CONVENIENCE

   (b) A sample of words was obtained by selecting 20 pages at random from a book and collecting all the words on each of those pages.

   CLUSTER (ALL OF SOME)

   (c) Ten customers are selected at random from each Walmart store in the United States.

   STRATIFIED (SOME OF ALL)

   (d) Students are each assigned a unique 4-digit code. Then a computer is used to randomly select 10 of the codes.

   RANDOM --- EACH EQUALLY LIKELY

   (e) ABC News organized an exit poll in which a few specific polling places were randomly selected and all voters at those polling places were surveyed as they left the premises.

   CLUSTER (ALL OF SOME)

   (f) A biologist studying soil microbes took soil samples every 20 feet along a line.

   SYSTEMATIC

2. (3 points) A table in the atrium was under a banner that read, "Please take our survey on abortion rights." 123 students took the survey. What is wrong with this survey?

   IT IS A VOLUNTARY RESPONSE SURVEY.
   THESE TEND TO BE BIASED BECAUSE THOSE
   WITH STRONG OPINIONS TEND TO PARTICIPATE.

3. (4 points) Explain why a systematic sample of 10 PSC students is not a simple random sample.

NOT EVERY SAMPLE OF 10 IS EQUALLY LIKELY.

FOR EXAMPLE, A SAMPLE OF 10 THAT IS NOT PART OF YOUR "SYSTEM" IS IMPOSSIBLE.

4. (3 points) Determine whether each data value comes from a discrete collection or a continuous collection of data.

   (a) The Apollo 10 spacecraft attained a record speed of 24,791 mph.

   SPEEDS ARE CONTINUOUS

   (b) A beehive contained 24,791 bees.

   COUNTS ARE DISCRETE

   (c) Mount Gongga is 24,791 feet tall.

   HEIGHTS ARE CONTINUOUS

5. (6 points) Listed below are times (in minutes) spent on personal hygiene and grooming in the mornings from a randomly selected group of people.

0	5	12	15	15	20	22	24	25	25
25	27	27	28	30	30	35	35	40	45

Construct a relative frequency distribution with at least 5 classes.

Time (min)	Relative Frequency
0-9	10%
10-19	15%
20-29	45%
30-39	20%
40-49	10%

6. (4 points) In each case, tell whether the number is accurate, precise, both, or neither.

   (a) The national debt currently stands at $19 trillion.

   ACCURATE BUT NOT PRECISE

   (b) A news article claims the national debt is $19,345,287.75.

   PRECISE BUT NOT ACCURATE

7. (10 points) The frequency distribution shown below gives the salaries (in thousands of dollars) of the employees at Initech, Inc.

Salary (thousands of $)	Frequency
14.5–29.9	5
30.0–45.4	13
45.5–60.9	27
61.0–76.4	26
76.5–91.9	15
92.0–107.4	3

$5+13+27+26+15+3 = 89$

   (a) What are the class boundaries associated with the last class listed above?

   91.95 & 107.45

   (b) What is the class width?

   $30 - 14.5 =$ **15.5**

   (c) What is the relative frequency of the third class listed above?

   $\frac{27}{89} \approx 30.3\%$

   (d) If the frequency distribution was changed to a cumulative frequency distribution, what count would be associated with "$\leq$ $76,400"?

   $5+13+27+26 =$ **71**

   (e) Does the distribution of salaries at Initech appear to be normal? Explain.

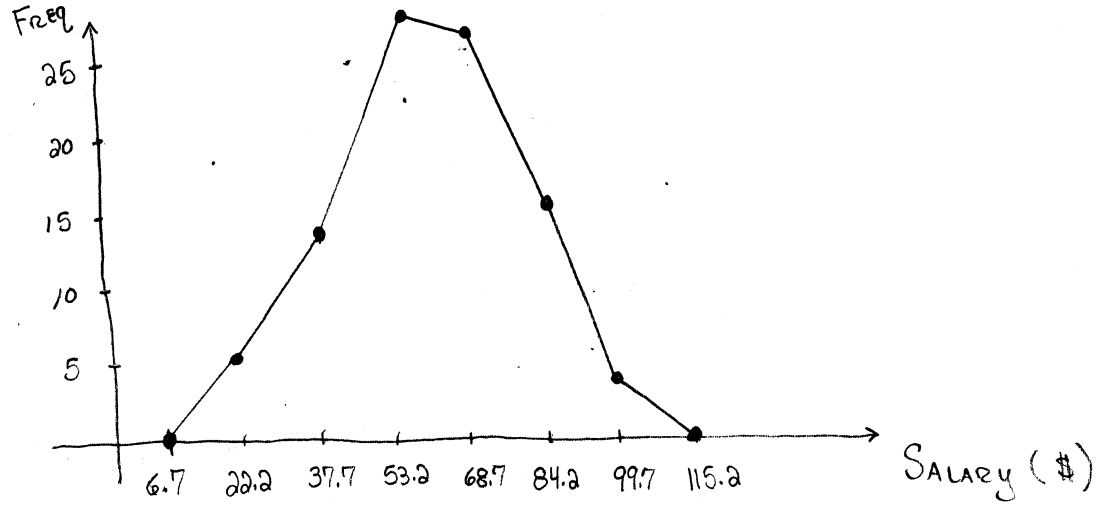
   YES, THE CORRESPONDING HISTOGRAM WOULD BE FAIRLY SYMMETRIC, RISING TO A PEAK IN THE MIDDLE, AND DECREASING TO THE SIDES (CHARACTERISTIC BELL-SHAPE OUTLINE)

8. (6 points) Refer to the Initech problem on the previous page.

   (a) What are the class midpoints?

   $\frac{14.5+29.9}{2}$ = 22.2, 37.7, 53.2, 68.7, 84.2, 99.7

   (b) Construct the frequency polygon associated with the frequency distribution. Label your axes.



9. (6 points) Determine the level of measurement. Choose from *nominal*, *ordinal*, *interval*, or *ratio*.

   (a) Social security numbers

   Nominal

   (b) Temperatures measured in degrees centigrade

   Interval

   (c) Cities of birth of U.S presidents

   Nominal

   (d) Seniority of members of the U.S. Senate

   Ordinal

10. (2 points) A very famous study conducted in New Zealand in 2012 showed a strong correlation between marijuana smoking as a teen and lower IQ scores later in life. Does this study establish that smoking marijuana causes lower IQ scores? Explain.

    No, correlation does not imply causation.

11. (10 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) A geologist studying the eruption cycle of Old Faithful measures the duration of each eruption (in minutes) and the waiting time (in minutes) until the next eruption. She forms ordered pairs and plots the data.

Scatterplot

(b) During a major telethon, fundraisers collected a large number of individual donations ranging from \$1.25 to \$12,999.99. Wanting to show the total number of donations, the telethon organizers construct a graph whose horizontal axis shows dollar ranges and whose vertical axis shows cumulative frequency.

Ogive

(c) A teacher graded 25 tests, and they all had scores that were whole numbers between 35 and 48. She wants to display the entire set of scores.

Dotplot

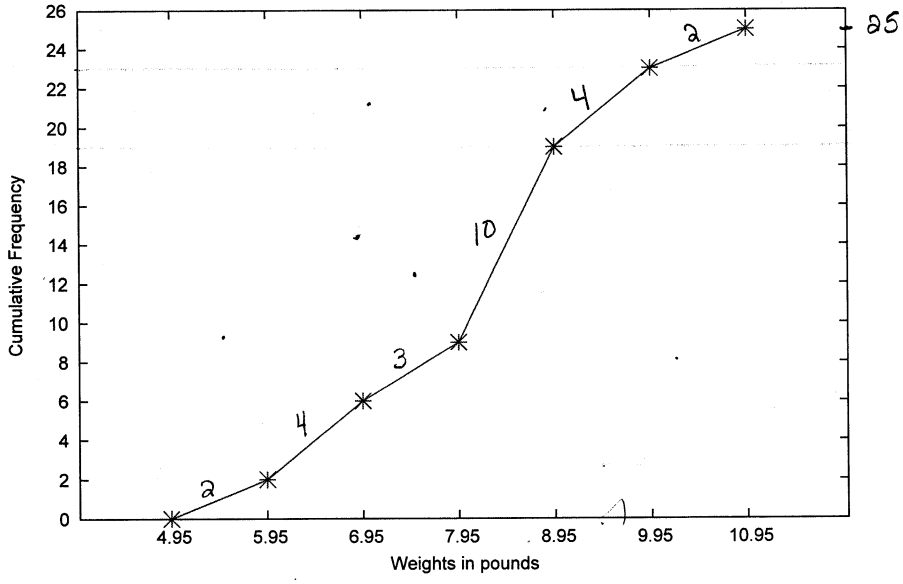
(d) Climatologists construct a graph showing sea surface temperatures over the last 500 years.

Time-series graph

(e) You share a 20 gigabyte cellular data plan with 4 other family members. Your service provider sends you a graph showing how data usage is shared between the 5 of you.

Pie chart

12. (15 points) The following ogive shows the distribution of birth weights of the full-term babies born last month at a local hospital.



(a) How many babies are in the sample described by the ogive?

25

(b) How many babies had birth weights between 8.95 lbs and 9.95 lbs?

23 - 19 = 4

(c) In which range of birth weights were there the most babies?

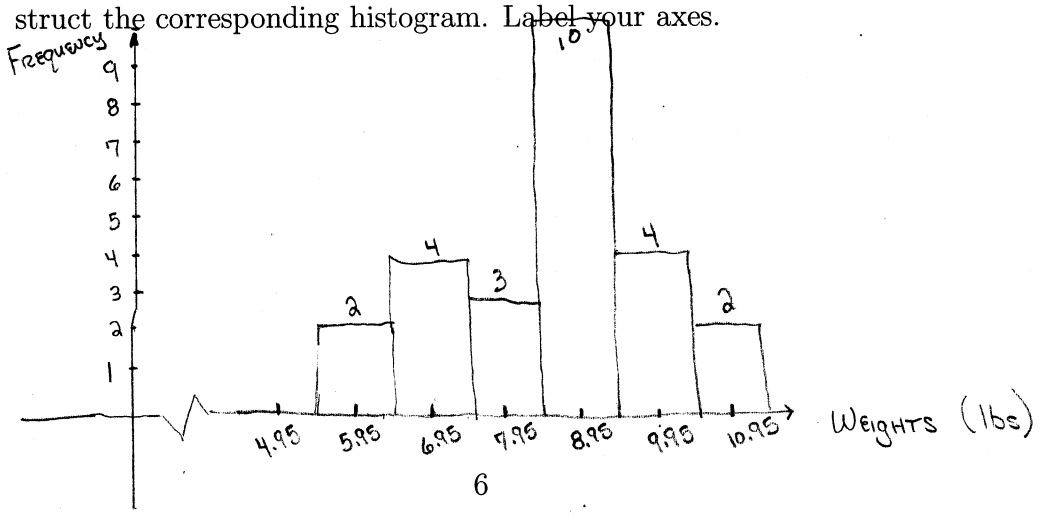
7.95 - 8.95 lbs (Segment steepest)

(d) In which range of birth weights were there the fewest babies?

In both 4.95 - 5.95 lbs & 9.95 - 10.95 lbs There were only 2

(e) Are birth weights continuous or discrete? Are numbers of babies continuous or discrete?

(f) Assume the numbers along the horizontal axis represent class midpoints. Construct the corresponding histogram. Label your axes.



Problem #5

13. (5 points) Refer to the data in Problem #6 (the hygiene/grooming problem). Construct a stem-and-leaf plot for the data.

3 | 5 means 35

0	0 5
1	2 5 5
2	0 2 4 5 5 5 7 7 8
3	0 0 5 5
4	0 5

14. (6 points) In a study of the Marisa Waite diet, four subjects lost an average of 45 pounds. It was found that there is a 30% chance of getting such results without a diet. Do the results have practical significance? Do they have statistical significance? Explain your reasoning.

Since losing 45 lbs makes for a great diet, the result is practical. However, there is a big chance that the diet is not causing the weight loss, so it lacks statistical significance.

15. (4 points) On a certain sports team, the players' jerseys are numbered 1, 8, 17, 18, 23, 31, 40, 42, and 55.

(a) Does it make sense to compute the average of the numbers? Explain.

No, the numbers are just labels. The average would have no meaning.

(b) Which of the following best describes the level of measurement of these numbers: nominal, ordinal, interval, or ratio?

Nominal

16. (4 points) Identify the population and the sample: A survey of 1012 U.S. adults found that 5% consider pet-friendliness an important factor for choosing a hotel.

Population: All U.S. adults

Sample: 1012 U.S. adults who were surveyed