Math 153 - Test 1a

September 10, 2015

Name key

Score _____

Show all work. Supply explanations when necessary.

1. (12 points) Jake at State Farm believes that people drive more carefully after reading about horrific traffic accidents. He asks drivers to read about about several bad accidents, and then he tracks their driving habits for one week.

   (a) Is his study an experiment or an observational study? Briefly explain.

   EXPERIMENT -- HE IS APPLYING A TREATMENT (READ ABOUT BAD ACCIDENTS).

   (b) Are car speeds discrete or continuous?

   CONTINUOUS

   (c) Identify the level of measurement (nominal, ordinal, interval, ratio) for car speeds.

   RATIO

   (d) Jake obtains his sample of 40 drivers by randomly selecting 20 males and 20 females from his list of clients. Is his sample a simple random sample? Briefly explain.

   NO, NOT EVERY SAMPLE OF 40 IS EQUALLY LIKELY. IN FACT, A SAMPLE OF 40 FEMALES IS IMPOSSIBLE.

   (e) Jake finds that young drivers tend to have poor driving habits. Does this mean that being young causes one to be a poor driver? Explain.

   NO, CORRELATION DOES NOT IMPLY CAUSATION.

   (f) What is the population that Jake is studying?

   THE SET OF DRIVERS.

3 4 4 1 2

2. (6 points) Stan received grades of B, A, A, D, C in classes with 3, 5, 4, 3, 1 credit hours, respectively. Compute Stan's GPA using a 4-point scale.

$$\frac{3(3)+4(5)+4(4)+1(3)+2(1)}{3+5+4+3+1} = \frac{50}{16} = 3.125$$

3. (10 points) In the following display, 4 | 5 means 45.

1	7
2	0
3	3 4
4	1 2 5
5	0 0 2 6 7 8
6	3 8 8
7	0

(a) What is the name of this type of display?

STEM-AND-LEAF PLOT

(b) Are the data values shown above approximately normally distributed? Briefly explain. If not normal, describe the distribution.

THE DISTRIBUTION DOES HAVE THE "SHAPE" OF A SMOOTH BELL CURVE BUT THE EXTREME SCORES ON THE LOW END SKEW THE DATA TO THE LEFT.

(c) Without computing the mean and median, which do you think is greater and why?

MEDIAN > MEAN BECAUSE THE EXTREME LOW SCORES PULL THE MEAN DOWN AND SKEW THE DATA TO THE LEFT.

(d) Compute the mean, median, and mode(s).

$$\bar{X} = \frac{17+20+33+\ldots+70}{17} = \frac{884}{17} \approx 48.47$$

MEDIAN = 9TH VALUE = 50

MODES ARE 50 AND 68

4. (10 points) Bags of a certain brand of corn chip are supposed to contain 10.25 oz of chips. The following frequency distribution, showing the weights of corn chips per bag, was obtained from a sample of 50 bags.

Weights (oz)	Frequency
10.10–10.15	4
10.16–10.21	9
10.22–10.27	21
10.28–10.33	11
10.34–10.39	5

(a) What is the class width?

$10.16 - 10.10 = \boxed{0.06}$

(b) What are the class boundaries associated with the last class?

10.335 & 10.395

(c) What are the class midpoints?

10.125, 10.185, 10.245, 10.305, 10.365

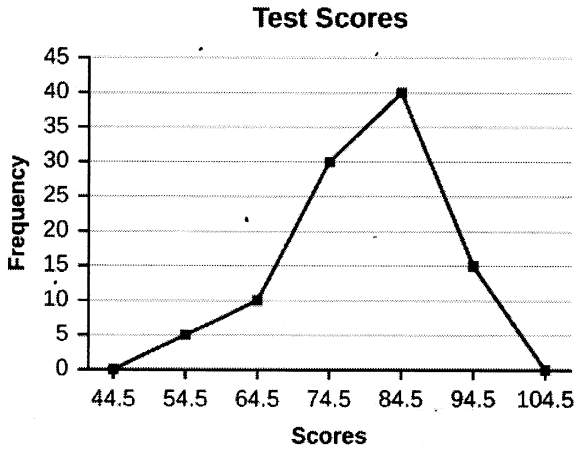
(d) If the frequency distribution was changed to a cumulative frequency distribution, what count would be associated with "Less than 10.335 oz"?

$4+9+21+11 = \boxed{45}$

(e) Do the weights appear to be normally distributed? Explain.

YES, AT LEAST ROUGHLY. THE DISTRIBUTION IS ROUGHLY SYMMETRIC, PEAKED IN THE MIDDLE, INCREASING & DECREASING SMOOTHLY AT THE SIDES.

5. (12 points) The following graph shows the distribution of test scores on a widely administered test.



(a) What is the name of this type of graph?

Frequency polygon

(b) How many test scores are in the sample?

$5 + 10 + 30 + 40 + 15 = \boxed{100}$

(c) If a **relative frequency** histogram was to be constructed based on the data, what would be the height of the bar centered on 74.5?

$\frac{30}{100} = \boxed{30\%}$

(d) Assuming that the numbers along the horizontal axis are class midpoints, use these numbers to estimate the mean test score.

$$\frac{5(54.5) + 10(64.5) + 30(74.5) + 40(84.5) + 15(94.5)}{100} = \frac{7950}{100} = \boxed{79.5}$$

(e) Assuming that the numbers along the horizontal axis are class midpoints, use these numbers to estimate the median test score.

$$\frac{50^{TH}\text{ score} + 51^{ST}\text{ score}}{2} \approx \frac{84.5 + 84.5}{2} = \boxed{84.5}$$

6. (7 points) A sample of students is obtained as described. Identify the type of sampling (random, systematic, convenience, stratified, cluster). You may receive partial credit if you explain your reasoning.

   (a) Students are separated into groups according to age, then 15 students are selected from each age group.

   SOME ARE SELECTED FROM ALL GROUPS

   STRATIFIED

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

   RANDOM EACH IS EQUALLY LIKELY

   (c) Students are selected as they walk in the main door.

   CONVENIENCE

   (d) A complete list of students is compiled and every 200th name is selected.

   SYSTEMATIC

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

   ALL ARE SELECTED FROM SOME GROUPS

   CLUSTER

   (f) A group of students from a single table in the cafeteria are selected.

   THIS COULD BE A CONVENIENCE SAMPLE OR A CLUSTER SAMPLE

   (g) Students are grouped according to which high school they attended. Two students are selected from each high school.

   STRATIFIED - SOME FROM ALL GROUPS

7. (6 points) Determine whether the data are discrete or continuous.

   (a) The body temperatures of humans

   CONTINUOUS

   (b) The numbers of wheels on vehicles on interstate I-80

   DISCRETE

   (c) The numbers of pages of newspapers

   DISCRETE

   (d) The weights of newspapers

   CONTINUOUS

8. (12 points) For each of the following situations, tell which type of graph would best display the data. Choose from *frequency polygon*, *dot plot*, *bar graph*, *time-series graph*, *scatterplot*, *pie chart*, *ogive*, *histogram*, *stem-and-leaf plot*, or *Pareto chart* You may receive partial credit if you explain your reasoning.

(a) A teacher has just returned the graded tests to a class of twenty-seven students. The test scores are whole numbers that range from 48 to 96. The teacher would like to show the entire list of scores.

STEM-AND-LEAF PLOT

(b) A botany class spent the day at Morton Arboretum collecting leaves from mature elm trees. The leaves were measured, placed into groups according to lengths, and counted. The class would like to draw a graph to illustrate the numbers of leaves in the different groups.

HISTOGRAM

(c) A company's annual budget is \$457,000. This money is budgeted into eight different categories. The company's president would like to make a chart showing the employees how the budget is divided into the eight categories.

PIE CHART

(d) Going back to 1990, the student government has obtained the total number of enrolled students for each academic year. The Student Government Association wants to make a chart showing how the enrollment has changed over the years.

TIME SERIES GRAPH

(e) Sarah randomly selected 55 middle school boys. For each boy, she recorded age and height in inches. She then formed ordered pairs and plotted the data.

SCATTER PLOT

(f) The author of a geography textbook wants to show a graph displaying the areas of the seven continents.

BAR GRAPH

9. (3 points) After stopping him for speeding, the state trooper told John that his speed was 93.18935 mph. Is this number an example of too much accuracy or too much precision? Explain.

Too much precision.

It is unlikely that the trooper's device has the high degree of precision that is indicated by the reported number.

10. (6 points) Determine the level of measurement. Choose from nominal, ordinal, interval, or ratio.

(a) Years in which winter olympics were held

Interval

(b) Colors of Starburst fruit chews

Nominal

(c) Weights of Starburst fruit chews

Ratio

(d) Movie ratings on a scale of 5 stars

Ordinal

11. (4 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

2|4 means 24

1	0 2 2
2	1 1 4 7 8
3	2 2 2 6 7 8
4	7 8 8 9
5	0 1

The data are roughly normal --- the outline is traced by a symmetric, smooth, bell-shaped curve.

Math 153 - Test 1b

September 10, 2015

Name key

Score _____

Show all work. Supply explanations when necessary. This problem is worth 12 points. **You must individually on this problem.**

While trying to estimate the life expectancy of an average human, a group of students collected the following data.

36.6	47.5	50.4	52.8	53.0	54.2	55.7	57.9	58.4	59.1
60.3	60.8	61.1	63.8	63.8	65.3	65.6	66.2	66.5	66.6
66.7	67.4	67.7	68.4	68.6	68.8	68.9	69.3	69.4	69.9
70.3	70.5	71.4	72.0	72.4	72.9	73.1	76.9	77.2	77.5
78.1	78.2	78.4	79.2	79.8	80.4	80.9	80.9	82.4	85.0

The numbers in the data set represent ages (in years) at death.

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1. Construct the corresponding frequency distribution. Use at least 6 classes.

Years	Frequency
31.0 - 40.9	1
41.0 - 50.9	2
51.0 - 60.9	9
61.0 - 70.9	20
71.0 - 80.9	16
81.0 - 90.9	2

Boundaries are

30.95, 40.95, ..., 90.95

2. Using class boundaries for tick marks along your horizontal axis, construct the histogram corresponding to your frequency distribution. Use a separate sheet of graph paper.

See attached sheet.

3. Based on your histogram, do ages at death appear to be normally distributed? Explain? If you don't think the ages are normally distributed, describe the distribution.

Although the distribution has somewhat of a bell-shape, it is not quite symmetric as it is not peaked in the middle. The distribution seems to be slightly skewed left.