Math 115 - Test 1

September 18, 2014

Name key

Score _____

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

1. (10 points) Determine whether each statement is true (T) or false (F).

   (a) F A statistic is a numerical value that describes a ~~population~~ SAMPLE characteristic.

   (b) T To select a cluster sample, divide a population into groups and then select all of the members of at least one of the groups.

   (c) F Data at the ordinal level are quantitative only. QUALITATIVE IS ALSO POSSIBLE, e.g. LETTER GRADES

   (d) T A sample is a subset of the population.

   (e) F Numerical calculations can be performed on data at the nominal level. † NOMINAL = LABELS ONLY

   (f) F In a frequency distribution, the class width is the distance between ~~the lower and upper limits of a class~~. CONSECUTIVE LOWER LIMITS

   (g) F The mean is the measure of central tendency that is ~~least~~ GREATLY affected by outliers.

   (h) F The standard deviation of a sample could be a negative number. ALWAYS POSITIVE OR ZERO.

   (i) F The mode is ~~never~~ SOMETIMES a good measure of central tendency. See Quiz 3.

   (j) F Asking your ten best friends to participate in a survey is an example of a ~~systematic~~ CONVENIENCE sample.

2. (5 points) A sample of PSC students is obtained as described. Identify the type of sampling. Choose from *random, systematic, convenience, stratified, cluster.*

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

   CONVENIENCE

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

   STRATIFIED

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

   SYSTEMATIC

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

   CLUSTER

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

   RANDOM

3. (3 points) Determine whether the data are quantitative or qualitative.

   (a) Weights of infants in a hospital

   QUANTITATIVE

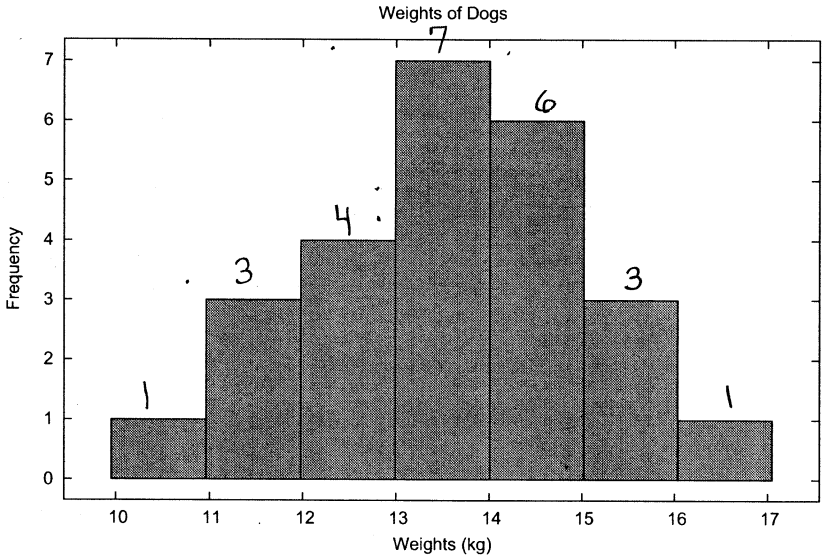
   (b) Student ID numbers

   QUALITATIVE

   (c) Eye colors

   QUALITATIVE

4. (3 points) The following histogram shows the distribution of weights of dogs in a local shelter.



(a) How many dogs are in the sample?

$1+3+4+7+6+3+1 = \boxed{25}$

(b) If the histogram was changed to a relative frequency histogram, what would be the height of the fourth bar?

$\frac{7}{25} = 28\%$

(c) Are numbers of dogs discrete or continuous?

DISCRETE

5. (10 points) The frequency distribution shown below gives the daily high temperatures (in °F) last year in Cleveland, OH.

High Temp (°F)	Frequency
20–30	19
31–41	43
42–52	68
53–63	69
64–74	74
75–85	68
86–96	24

TOTAL: 365

(a) What is the class width?

$31-20 = \boxed{11}$

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

$\boxed{85.5 \text{ AND } 96.5}$

(c) What are the class midpoints?

$\frac{20+30}{2} = 25$ $\qquad \boxed{25, 36, 47, 58, 69, 80, 91}$

(d) Use class midpoints to estimate the (weighted) mean salary.

$$\bar{x} \approx \frac{25(19)+36(43)+47(68)+58(69)+69(74)+80(68)+91(24)}{365}$$

$$= \frac{21951}{365} \approx \boxed{60.14^\circ}$$

(e) Use class midpoints to estimate the (weighted) median.

THERE ARE 365 TEMPERATURES $\Rightarrow$ THE 183RD IS THE MEDIAN.

$\Rightarrow$ THE MEDIAN LIES IN THE 4TH CLASS

$\Rightarrow \boxed{\text{MEDIAN} \approx 58^\circ}$

6. (4 points) The depths (in inches) at which 10 artifacts were found at an archaeological dig are listed below.

20.7 24.8 30.5 26.2 36.0 34.3 30.3 29.5 27.0 38.5

(a) Find the range of the data set.

$38.5 - 20.7 = \boxed{17.8}$

(b) Change 38.5 to 60.5, and then find the range of the new data set.

$60.5 - 20.7 = \boxed{39.8}$ ← This illustrates how sensitive the range is to extreme values.

(c) Use your calculator to compute the standard deviation.

$S_x \approx 5.4$

7. (2 points) You are applying for jobs at two companies. Company A offers starting salaries with $\bar{x} = \$31{,}000$ and $s = \$1000$. Company B offers starting salaries with $\bar{x} = \$31{,}000$ and $s = \$5000$. From which comapny are you more likely to get an offer of \$33,000 or more? Explain why you think so.

Because the std. dev. in Company A's starting salaries is rather small, you're likely to get an offer very close to \$31,000.

Company B's std. dev. is much greater so you are more likely to get an offer far from \$31,000.

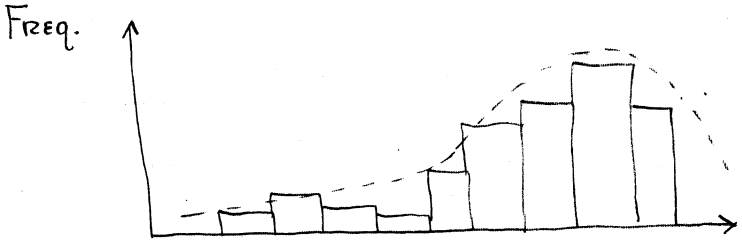
8. (2 points) Identify the population and the sample: A survey of 1012 U.S. adults found that 5% consider pet-friendliness an important factor for choosing a hotel.

POPULATION: ALL U.S. ADULTS

SAMPLE: 1012 U.S. ADULTS SURVEYED

9. (3 points) Sketch a histogram showing a distribution that is skewed left. In your distribution, which is greater, the mean or median?

TAIL TO LEFT



MEAN IS PULLED DOWN BY LOW VALUES

$\Rightarrow$ MEAN < MEDIAN

10. (8 points) Construct a stem-and-leaf plot for the following data (be sure to provide a key). Then find the mean, median, and mode.

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

STEM	LEAF
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

3|6 REPRESENTS 36

$$\text{MEAN} = \frac{10+12+12+\cdots+50+51}{20} = \frac{655}{20} = \boxed{32.75}$$

$$\text{MEDIAN} = \frac{10^{TH}+11^{TH}}{2} = \frac{32+32}{2} = \boxed{32}$$

$$\text{MODE} = \boxed{32}$$