Math13 - Introduction to Statistics (code 21947), Spring 2015

Homework 1; Monday, February 2

NAME:

---

1) In a statistical study what is the difference between an individual and a variable?

2) Are data at the nominal level of measurement quantitative or qualitative?
(explain your answer)

3) Numbers are often assigned to data that are categorical in nature. Consider the following number assignments for category items describing electronic ways of communication:

1 = twitter; 2 = email; 3 = text message; 4 = facebook; 5 = blog

Are these numerical assignments at the ordinal data level? *(explain your answer)*

4) Consider the number assignments for category items describing "Usefulness of Customer Service",

1 = not helpful; 2 = somewhat helpful; 3 = very helpful; 4 = extremely helpful

Explain at what level of measurement are these assignments.

5) A national survey asked 1385 U.S. adult fast-food customers which meal (breakfast, lunch, dinner, snack) they ordered.

a. Identify the variable

b. Is the variable quantitative or qualitative?

c. What is the level of measurement of the variable?

d. What is the implied population?

6) Identify the measurement level of the following variables:

a. Length of time to complete an exam

b. Time of first class

c. Major field of study

d. Course evaluation scale: poor, acceptable, good

e. Score on last exam (based on 100 possible points)

f. Overall grade (A, B, C, D, F)

g. Age of student

7) Label each of the following numerical measures as a statistic or a parameter:

a. The average score on the GRE for all U.S. students

b. The average score on the GRE for all Rutgers applicants

c. The average score on the GRE for a sample of California residents

d. The variance on the GRE Math scores for all applicants to UC Berkeley

e. The median score on the GRE for 100 female students sampled from SFSU

8) The highway mileages of 13 compact cars are:

Model	Mileage
Aston Martin Vanquish	19
Audi TT Coupe	29
BMW 325CI	27
BMW 330CI	28
BMW M3	23
Jaguar XK8	26
Jaguar XKR	23
Lexus SC 430	23
Mini Cooper	32
Mitsubishi Eclipse	31
Mitsubishi Spyder	29
Porsche Cabriolet	26
Porsche Turbo 911	22

a. Calculate the median

b. Calculate the mode

c. Calculate the mean

d. Calculate the range

e. Calculate the Interquartile Range (IQR)

9) Luke took the GRE test and scored in the 88th percentile. What percentage of the scores was above his score? Explain your choice.

(1) 87% (2) 13% (3) 89% (4) 88% (e) 12%

10) A person's metabolic rate is the rate at which the body consumes energy. Here are the metabolic rates of 77 men who took part in a study of dieting. (The units are calories per 24 hours.)

1792 1666 1362 1614 1460 1867 1439

Calculate the mean and standard deviation of the metabolic rates, showing each step in detail. First find the mean $\bar{x}$. Then find each of the deviations $(x_i - \bar{x})$, and their squares $(x_i - \bar{x})^2$. Finally, add all the squared deviations and divide them by $n-1$.

Write down all the computing steps

11) A small accounting firm pays each of its five clerks $35,000, two junior accountants $80,000 each, and the firm's owner $320,000.

a. What is the mean salary paid at this firm?

b. How many of the employees earn less than the mean?

c. What is the median salary?

12) The firm in the previous question gives no raises to the clerks and junior accountants, while the owner's take increases to $455,000.

a. How does this change affect the mean?

b. How does it affect the median?

13) Select the correct answer:

a.	$median > mode$	always true	sometimes true	never true
b.	$\bar{x} + 2 > 2$	always true	sometimes true	never true
c.	$\bar{x} < S^2$	always true	sometimes true	never true
d.	$\bar{x} - median < 0$	always true	sometimes true	never true
e.	$\bar{x} \times 3 > \bar{x}$	always true	sometimes true	never true
f.	$S \geq 0$	always true	sometimes true	never true
g.	$S^2 > S$	always true	sometimes true	never true
h.	$\sum_i^n (x_i - \bar{x}) = 0$	always true	sometimes true	never true

Optional Questions (Extra points)

A.1) Prove that $\sum_i^n (x_i - \bar{x}) = 0$. *Hint: Use the formula of* $\bar{x}$.

A.2) Let X be a quantitative variable (e.g. salary of BCC employees), and assume there are n observed values $x_1, x_2, ..., x_n$. Multiplying each observation x_i by a constant value a produces a new set of observations ax_i.

You already know that the formula of the variance for X is: $S_X^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2$

Show that: $S_{aX}^2 = a^2 S_X^2$

(i.e. show that the variance of the new variable aX is the variance of X multiplied by a^2)