EXAM 1 (BOGNAR)
STATISTICS AND SOCIETY (22S:002, STAT:1010)
FEBRUARY 18, 2011

NAME: Key
DISCUSSION SECTION: _____

- INSTRUCTIONS:
  - Use a pencil
  - On your BUBBLE SHEET, fill in your NAME and STUDENT ID
  - On this TEST FORM, fill in your NAME and DISCUSSION SECTION
  - Read ALL of the answers, choose the best answer, fill your choice on the bubble sheet, and circle your answer on this test form
  - TURN IN your BUBBLE SHEET and this TEST FORM when you are finished
  - You must *completely* finish your exam, *including* filling out your bubble sheet, in the allotted time; no exceptions
- SCORING: Each of the 20 questions on the exam is worth 5 points (100 points total).

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1. Which of the following is/are true?
   (a) A census is a sample that consists of the entire population.
   (b) Convenience sampling typically yields a representative sample
   (c) If every member in the population has the same chance of selection, then we *must* be performing simple random sampling
   (d) Both (a) and (c)
   (e) Both (b) and (c)

2. Which of the following is/are true?
   (a) Confounding variables can be problematic in a case control study
   (b) It is easy to prove cause and effect relationships (e.g. smoking causes lung cancer) in a case control study
   (c) One can determine symmetry/skewness of a dataset by looking at a boxplot
   (d) Two factors are confounded if their effects are easily distinguished from one another
   (e) Both (a) and (c)

3. Which of the following is/are true?
   (a) In an experiment, randomization is a tool used to introduce confounding factors
   (b) In an experiment, there is typically no intervention by the experimenter
   (c) A meta analysis combines numerous studies and draws conclusions
   (d) In the Salk polio vaccine study described in class, the *control group* is the group of children that received the polio vaccine
   (e) Both (c) and (d)

4. Phone number area codes (such as 319 in Iowa City) constitute what type of data?
   (a) Quantitative
   (b) Qualitative
   (c) Continuous
   (d) Both (a) and (c)
   (e) Both (b) and (c)

5. A ship carries 425 shipping containers; each container holds hundreds of packages. To check for illegal drugs, inspectors examine 5 randomly selected packages from each container. What type of sampling scheme is this?

   (a) Stratified sampling
   (b) Cluster sampling
   (c) Simple random sampling
   (d) Systematic sampling
   (e) Convenience sampling

6. The temperature in Phillips Hall constitutes what type of data?

   (a) Ordinal
   (b) Interval
   (c) Ratio
   (d) Nominal
   (e) Chilly

7. The actual voltage at a particular point in an electronic circuit is exactly 9 volts. Suppose meter A measures 8.8 volts and meter B measures 9.12 volts. Which meter is more accurate? Which is more precise?

   (a) Meter A is more accurate, meter A is more precise
   (b) Meter A is more accurate, meter B is more precise
   (c) Meter B is more accurate, meter A is more precise
   (d) Meter B is more accurate, meter B is more precise
   (e) None of the above

8. The actual voltage at a particular point in an electronic circuit is exactly 9 volts. Suppose meter A measures 8.8 volts. What is the absolute error? What is the relative error?

   (a) Absolute error is -0.2 volts, relative error is -2.22%
   (b) Absolute error is -0.2 volts, relative error is -2.27%
   * (c) Absolute error is 0.2 volts, relative error is 2.22%
   (d) Absolute error is 0.2 volts, relative error is 2.00%
   (e) Absolute error is 0.2 volts, relative error is 2.27%

abs error = meas. val − true val
= 8.8 − 9 = −0.2

rel. error = $\frac{\text{abs error}}{\text{true val}} \times 100\% = \frac{-0.2}{9} \times 100\%$
$= -2.22\%$

9. The US national debt was 10.1 trillion in 2008 and is 14.2 trillion today. What is the absolute change from 2008 to today? What is the relative change?

   * (a) Absolute change is -4.1 trillion, relative change is -40.6%
   (b) Absolute change is -4.1 trillion, relative change is -28.9%
   (c) Absolute change is 4.1 trillion, relative change is 40.6%
   (d) Absolute change is 4.1 trillion, relative change is 4.1%
   (e) Absolute change is 4.1 trillion, relative change is 28.9%

abs. change = new val − ref. val = 14.2 − 10.1
= 4.1

rel change = $\frac{\text{abs. change}}{\text{ref val}} \times 100\% = \frac{4.1}{10.1} \times 100\%$
$= 40.6\%$.

10. Suppose a UI professor wants to inquire about the proportion of UI undergraduate students that voted in the 2008 election. Of the 1,000 undergraduate students randomly selected from the UI registrar list (using simple random sampling), 380 voted. Which of the following is/are true?

    (a) The population is the 1,000 randomly selected students
    (b) The population parameter is the proportion of the 1,000 randomly selected students that voted (i.e. the population parameter is equal to $380/1000 = 0.38$)
    (c) The sample consists of the 380 students that voted
    (d) Since some students claimed that they voted when in fact they didn't, the study will be biased
    (e) Both (b) and (c)

11. Suppose the mean is equal to 88 in a graph which is skewed to the right. Which of the following is/are true?

(a) The mode will be less than 88
(b) The mode will be more than 88
(c) The median will be more than 88
(d) Both (b) and (c)
(e) None of the above

12. The following data describe the length (in mm) of five grasshoppers: 81, 81, 81, 80, 82. What is the sample standard deviation s of these data?

$n = 5$ $\quad \bar{x} = 81$

$$s = \sqrt{\frac{(x_1-\bar{x})^2+\cdots+(x_n-\bar{x})^2}{n-1}} = \sqrt{\frac{(81-81)^2+(81-81)^2+(81-81)^2+(80-81)^2+(82-81)^2}{4}}$$

$$= \sqrt{\frac{2}{4}} = 0.707$$

(a) 1.000
(b) 0.632
(c) 0.400
(d) 0.500
(e) 0.707

13. The following table describes the ages of 25 third grade students.

Age	Freq.	Rel. Freq.	Cumul. Freq.
7	3	0.12	3
8	**A**	**B**	24
9	1	0.04	25

Find **A** and **B**.

(a) $\mathbf{A} = 3, \mathbf{B} = 0.12$
(b) $\mathbf{A} = 21, \mathbf{B} = 0.84$
(c) $\mathbf{A} = 21, \mathbf{B} = 0.96$
(d) $\mathbf{A} = 24, \mathbf{B} = 0.96$
(e) $\mathbf{A} = 24, \mathbf{B} = 0.12$

14. Consider the following two data sets:

A: 0.02, 0.02, 0.07, 0.05 ~ 0.02 0.02 0.05 0.07
B: 1.25, 0.32, 1.17, 1.26 ~ 0.32 1.17 1.25 1.26

Which of the following is/are true? (Hint: no calculations are necessary)

(a) The range of A is greater than the range of B
(b) The standard deviation of B is more than the standard deviation of A
(c) The distribution of B is skewed to the right
(d) Both (a) and (b)
(e) Both (a) and (c)

15. Which of the following is/are true?

(a) A histogram is appropriate for very large datasets
(b) A Pareto chart is a bar graph with the bars arranged in order
(c) Pie charts are used to describe qualitative data
(d) All of the above
(e) Both (a) and (b)

16. Consider the following stem and leaf plot.

Stem	Leaves
7	6799
8	
9	0
10	5

Which of the following is true?

(a) $Q_1 = 79$ and the distribution is skewed to the left
(b) $Q_1 = 77.33$ and the distribution is skewed to the right
(c) $Q_3 = 90$ and the distribution is skewed to the left
(d) $Q_3 = 79$ and the distribution is skewed to the right
(e) None of the above.

17. In a college course, suppose the first and second exams are worth 30% each, while the final exam is worth 40%. If a student received an 80 on the first exam, a 65 on the second exam, and a 50 on the final exam, what is his/her overall mean (average)?

Weighted Mean $= 80(0.30) + 65(0.30) + 50(0.40) = 63.5$

(a) 65.0
(b) 80.0
(c) 63.5
(d) 66.7
(e) 59.5

18. Which of the following is true?

(a) The standard deviation s can be less than 0
(b) The interquartile range can be less than 0
(c) If the standard deviation s equals 0, then all of the data *must* equal 0.
(d) The range is always greater than or equal to the interquartile range
(e) None of the above

19. Consider the following dataset:

$$2, 7, 8, 10, 13, 22, 22, 25$$

Which of the following is/are true?

$Q_1 = 7.5$
$Q_3 = 22$
$IQR = Q_3 - Q_1 = 14.5$

(a) IQR $= 13.75$
(b) IQR $= 14.5$
(c) Mode $= 11.5$
(d) Both (a) and (c)
(e) None of the above

20. As motivated in class, the ability to read mathematical equations is very important. Consider the following equation called Q:

$$Q = \frac{x_1^2 + x_2^2 + \cdots + x_n^2}{n}$$

Determine Q for the following dataset: $2, 4, 5$.

$Q = \frac{2^2 + 4^2 + 5^2}{3} = 15$

(a) $Q = 15$
(b) $Q = 45$
(c) $Q = 4$
(d) $Q = 18$
(e) $Q = 22.5$