

22S:30/105, Statistical Methods and Computing
Spring 2012, Instructor: Cowles
Midterm 1

Show your work on any problems that involve calculations.

Name: _____
Course no. (30, 105, or 197) _____

1. A study of computer-assisted learning examined the learning of “Blissymbols” by children. Blissymbols are pictographs that are sometimes used to help learning-impaired children communicate. The researcher designed two computer lessons that taught the same content using the same examples. One lesson required the children to interact with the material, while in the other, the children controlled only the pace of the lesson. Call these two styles “Active” and “Passive.” After the lesson, the computer presented a quiz that asked the children to identify 56 Blissymbols. The dataset contains the numbers of correct identifications by 24 children in the Active group and 24 children in the Passive group. The variables are:

```
group -- "A" for Active, "P" for Passive  
score -- number of correct identifications
```

Refer to the attached SAS output to answer the following questions:

- (a) What is the range of the `score` variable in the “A” group? (numeric answer; show your work)
- (b) The range is (circle one):
- a robust measure of center
 - a sensitive measure of center
 - a robust measure of spread
 - a sensitive measure of spread
 - none of the above
- (c) Is the range a good numeric summary to use with the `score` variable in the “A” group? Briefly state why or why not.
- (d) Which group – “A” or “P” – has the higher 3rd quartile? How could you tell from the SAS output?
- (e) THIS QUESTION WOULD NOT APPEAR ON MIDTERM 1 IN 2013. Was this study an experiment or an observational study? Briefly explain.

2. Forced expiratory volume in 1 second (FEV1) is a commonly-used measure of lung function. It can be adjusted for body size by dividing by height squared. $\frac{FEV_1}{ht^2}$ has a roughly linear relationship with age. A journal article reports the following estimated regression line for adult men:

$$\frac{\widehat{FEV}_1}{ht^2} = 1.67 - 0.0131 \text{ age}$$

where age is measured in years.

- (a) Which is the response variable (circle one):
- age
 - $\frac{FEV_1}{ht^2}$
- (b) Harry and Fred are adult men. Harry is 5 years older than Fred. Would you expect Harry’s $\frac{FEV_1}{ht^2}$ to be higher or lower than Fred’s? By how much? (show your work for the numeric part of the answer)
- (c) The correlation between $\frac{FEV_1}{ht^2}$ and age is (circle one):
- positive
 - negative
 - exactly 0
 - no way to tell from the information given
- (d) The article also discusses the fact that $\frac{FEV_1}{ht^2}$ on average is lower in women than in men. Would it be correct therefore to say that there is a correlation between $\frac{FEV_1}{ht^2}$ and gender? Why or why not?
3. (THIS QUESTION WOULD NOT APPEAR ON MIDTERM 1 IN 2013.) A biology professor wishes to investigate whether students’ scores on midterm exams are affected by whether they write the exams in pen or pencil. Before each midterm exam, she randomly assigns half of the students to use pencils on the exam and the other half of the students to use pen. She records the exam score for each student, along with whether the exam was written in pen or pencil.
- (a) The factor(s) in this study is or are (circle one):
- the individual students
 - writing implement
 - pen or pencil
 - the exam scores
 - none of the above
- (b) The treatments(s) in this study is or are (circle one):

- i. the individual students
- ii. writing implement
- iii. pen or pencil
- iv. the exam scores
- v. none of the above

(c) The experimental unit(s) in this study is or are (circle one):

- i. the individual students
- ii. writing implement
- iii. pen or pencil
- iv. the exam scores
- v. none of the above

4. What is the data type of each of the following variables (circle one for each):

(a) responses to a survey question that asks: "Do you believe that the U.S. economy is (a) getting better, (b) staying about the same, or (c) getting worse?"

- i. Binary
- ii. Nominal
- iii. Ordinal
- iv. Discrete quantitative
- v. Continuous quantitative

(b) responses to a survey question that asks: "Did you vote in the 2010 elections? (yes or no)"

- i. Binary
- ii. Nominal
- iii. Ordinal
- iv. Discrete quantitative
- v. Continuous quantitative

(c) the body weights of adult male lions

- i. Binary
- ii. Nominal
- iii. Ordinal
- iv. Discrete quantitative
- v. Continuous quantitative

5. The respiratory rate in healthy dogs follows a normal density with mean 26 breaths per minute and standard deviation 4 breaths per minute. What proportion of healthy dogs have a respiration rate between 21 and 23 breaths per minute? (Show your work.)

6. Draw a stem and leaf plot of the following values:

121 121 125 130 132 143 146 148 148 151 159 171

----- group=A -----

The UNIVARIATE Procedure
Variable: score

Stem Leaf	#	Boxplot
4 4	1	0
3 5	1	
3 1	1	
2 78889	5	+-----+
2 0011112334444	13	*---*---
1 567	3	

-----+-----+-----+
Multiply Stem.Leaf by 10**1

The UNIVARIATE Procedure
Variable: score

Schematic Plots

