Practice Midterm

STA 110A Spring 1998

1. Two draws are made at random with replacement from the box

$\boxed{\boxed{G}\ \boxed{O}\ \boxed{O}\ \boxed{B}}$

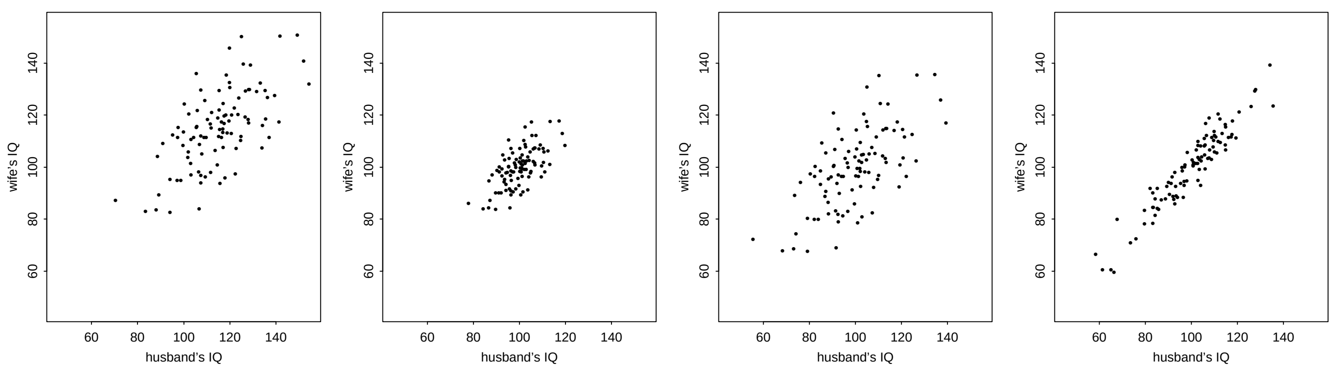
a. What is the chance that the letters are different?

b. What is the chance of getting a vowel at least once in the two draws?

2. A study of IQs of husbands and wives obtained the following results:

for husbands, average IQ = 100, SD = 15
for wives, average IQ = 100, SD = 15
correlation $r = .6$

a. One of the following is a scatterplot of the data. Which one?



b. What is the regression equation for predicting wife's IQ given the husband's IQ?

3a. Three data sets are collected, and the correlation coefficient is computed in each case. The variables are:
(a) grade point average in freshman year and in sophomore year

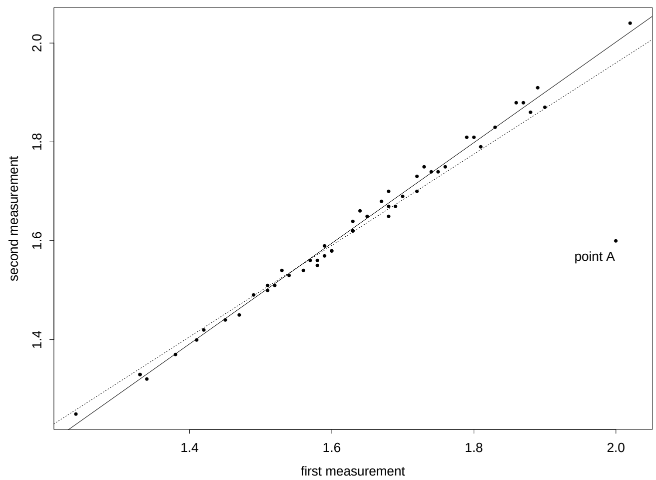
(b) grade point average in freshman year and in senior year

(c) The length and weight of two-by-four boards

In scrambled order, the correlations are: 0.30, 0.60, and 0.95. Match the correlations with the datasets.

3b. Researchers measured the modulus of elasticity for each of 50 strips of wood twice. Below is a scatterplot of the data and two regression lines. One regression line includes point A, the other does not.
a. True or False: The dotted regression line includes point A.

b. Excluding point A, the correlation is closest to $-.99, -.6, -.3, 0, .3, .6$, or $.99$?



3c. As part of a longitudinal study of personality change, 2,500 subjects were given a psychological test twice; once at age 21, and the second time at age 35. At both ages the average score was 50, and the SD was 10. There was a strong positive association between the two scores.

For each of the 2,500 subjects, the investigators used the regression method to predict the score at age 35 from the score at age 21. The predicted score turned out to be within 10 points of the actual score for ___________ of the 2,500 subjects.

Circle the best option below to fill in the blank.

a. more than 68% b. about 68% c. less than 68%

3d. Which is more likely?

i) Exactly 5 heads in 10 coin flips.

ii) Exactly 50 heads in 100 coin flips.

a. (i) b. (ii) c. (i) and (ii) are equally likely.

4a. Consider 1995 and 1996 batting averages for for all players with over 100 at bats in both of those years. The correlation between the two years is about 0.6.

If a player hit in the 95th percentile in 1995, what percentile would you predict for his 1996 batting average?

4b. In a large lecture course, the scores on the final examination followed the normal curve closely. The average score was 60 points and 90% of the class scored over 50 points. The SD of scores was

i. larger than 10 points

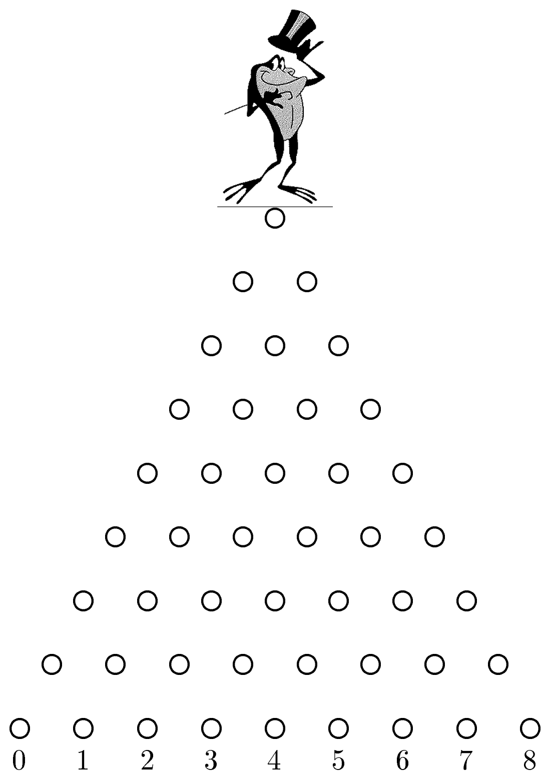
ii. smaller than 10 points

iii. impossible to say with the information given.

Explain your answer.

4c. The heights of male students at Duke University are approximately normal with a average of 69 inches and a SD of 3 inches. If three people are randomly chosen from this population, what is the chance that they are all over 6 feet tall (72 inches)?

5. Michigan H. Frog is hopping down the page towards one of the numbered lilipads shown below. From his current lilipad, he hops down to either the lilipad immediately to his right, or the one immediately to his left. At each stage, he is equally likely to choose right or left, and his choices are all independent of one another.



a. What is the probability the Michigan H. Frog ends up on lilipad 0?

b. Which of the following statements are correct? (Some, none, or all may be correct.)

(i) Michigan H. Frog is more likely to end up on lilipad 2 than lilipad 6.
(ii) Each path Michigan H. Frog may take is equally likely.
(iii) There are 84 different paths that lead to lilipad 3.

c. Michigan H. Frog will eventually end up on lilipad 0,1,2,3,4,5, 6,7, or 8. Can you come up with a box model that captures M.H.Frog's random path?

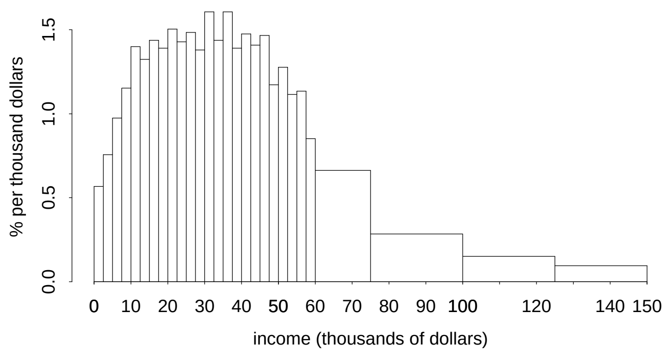
6a. For a group of bicyclists commuting to campus on city streets on a given day, the correlation between *time spent waiting at traffic signals* and *total cycling time* was calculated to be .5. True or false:

a. The average bike rider spent 50% of his cycling time waiting at traffic signals.
b. If a cyclist's total riding time increases by 10 minutes he will spend an additional 5 minutes waiting at traffic signals, on the average.
c. The more time a bike rider (in the group) spends waiting at traffic signals, the longer is his total riding time, on the average.
d. The more time a bike rider (in the group) spends commuting to campus, the more time he spends waiting at traffic signals, on the average.

6b. An investigator wants to study the relationship between physical and intellectual growth of children. He has data which give the size of vocabulary and the height of all children in a large elementary school. Within each of the grades, 1 through 6, the correlation between height and size of vocabulary is about zero. For all students in the school, the correlation is likely to be:

a. about zero b. positive c. negative d. positive e. can't tell

6c. In March, the Current Population Survey asks a large, representative sample of Americans to say what their incomes were during the pervious year. A histogram for family income in 1992 is shown below.



Between \$10,000 and \$60,000 the blocks alternate regularly from high to low. Why is that?