

# Math 2200 Test 2 Spring 2014

March 4, 2014

Student No.

Name:

Instruction:

1. There are 25 multiple choice questions, each worth 4 points.
2. PRINT your name and RECORD student number on the SCANTRON.
3. RECORD your answers on the SCANTRON.
4. You may use a graphic calculator with statistics functions, such as TI83, TI84 or TI89. No other aids are allowed.
5. When you look for the correct answer, keep it in mind that it may have been rounded off.
6. There are two blank pages at the end of the test.
7. Good luck!

1. Over the past decade a farmer has been able to increase his wheat production by about the same number of bushels each year. His most useful predictive model is probably...

- A. logarithmic
- B. power
- C. quadratic
- D. exponential
- E. linear

2. Another farmer has increased his wheat production by about the same percentage each year. His most useful predictive model is probably...

- A. logarithmic
- B. power
- C. quadratic
- D. exponential
- E. linear

3. A regression analysis of students' college grade point averages (GPAs) and their high school GPAs found  $R^2 = 0.311$ . Which of the following statements is true?
- I. High school GPA accounts for 31.1% of college GPA.
  - II. 31.1% of college GPAs can be correctly predicted with this model.
  - III. 31.1% of the variance in college GPA can be accounted for by the model
- A. I only
  - B. II only
  - C. III only
  - D. I and II
  - E. none of these
4. The correlation coefficient between high school grade point average (GPA) and college GPA is 0.560. For a student with a high school GPA that is 2.5 standard deviations above the mean, we would expect that student to have a college GPA that is \_\_\_\_\_ the mean.
- A. equal to
  - B. 0.56 standard deviation above
  - C. 1.4 standard deviation above
  - D. 2.5 standard deviation above
  - E. 4.46 standard deviation above

5. **Height and weight**

Suppose that both height and weight of adult men can be described with Normal models, and that the correlation between these variables is 0.65. If a man's height places him at the 60th percentile, at what percentile would you expect his weight to be?

- A. the 47th percentile
- B. the 50th percentile
- C. the 56th percentile
- D. the 60th percentile
- E. the 65th percentile

### Problems 6 and 7: Studying for exams

A philosophy professor has found a correlation of 0.80 between the number of hours students study for his exams and their exam performance. During the time he collected the data, students studied an average of 10 hours with a standard deviation of 2.5 hours, and scored an average of 80 points with a standard deviation of 7.5 points.

6. Create a linear model to estimate the number of points a student will score on the next exam from the number of hours the student studies.
- A.  $\hat{y} = 2.4x + 56$
  - B.  $\hat{y} = 3x + 50$
  - C.  $\hat{y} = 2.4x + 80$
  - D.  $\hat{y} = 3x + 56$
  - E.  $\hat{y} = 2.4x + 50$
7. If a student studies for 15 hours, what score should the student expect on the next exam?
- A. 78.8
  - B. 80
  - C. 86
  - D. 92
  - E. 95

### Problems 8 through 10: Penicillin assimilation

Doctors studying how the human body assimilates medication inject a patient with penicillin, and then monitor the concentration of the drug in the patient's blood for several hours. The data are shown in the table.

Time elapsed (hrs)	Concentration (units/cc)
1	42
2	28
3	19
4	13
5	9
6	6
7	4

8. What is the  $R^2$  value of the data?
- A. -0.95
  - B. 0
  - C. 0.84
  - D. 0.90
  - E. 1
9. If we re-express the data of Concentration by taking the logarithm, what is the new  $R^2$  value of the data?
- A. -0.95
  - B. 0
  - C. 0.84
  - D. 0.90
  - E. 1
10. Now create an appropriate model based on the results you obtained from the previous two problems. Use your model to estimate what the concentration of penicillin will be after 8 hours.
- A. 3.14
  - B. 2.93
  - C. 2.74
  - D. 2.42
  - E. 1

11. Military funding A college group is investigating student opinions about funding of the military. They phone a random sample of students at the college, asking each person one of these questions (randomly chosen):
- (i) "Do you think that funding of the military should be increased so that the United States can better protect its citizens?"
  - (ii) "Do you think that funding of the military should be increased?"

We expect that the first question will elicit greater support for increased military funding. What kind of bias is this?

- A. voluntary response bias
- B. non-response bias
- C. response bias
- D. undercoverage
- E. none of these

### Problems 12 through 16: Property taxes

Administrators of the fire department are concerned about the possibility of implementing a new property tax to raise moneys needed to replace old equipment. They decide to check on public opinion by having a random sample of the city's population. Several plans for choosing the sample are proposed. Match each plan with the corresponding sampling strategy.

12. The city has five property classifications: single family homes, apartments, condominiums, temporary housing (hotel and campgrounds), and retail property. Randomly select ten residents from each category.
  - A. convenience
  - B. stratified
  - C. simple
  - D. cluster
  - E. systematic
  
13. Each property owner has a 5-digit ID number. Use a random number table to choose forty numbers.
  - A. convenience
  - B. stratified
  - C. simple
  - D. cluster
  - E. systematic
  
14. Sort property owner by their 5-digit ID numbers. Survey every twentieth person.
  - A. convenience
  - B. stratified
  - C. simple
  - D. cluster
  - E. systematic

15. Randomly select a housing classification (say, apartments) and survey all the people who live in that property classification.
- A. convenience
  - B. stratified
  - C. simple
  - D. cluster
  - E. systematic
16. Have each firefighter survey 10 of his/her neighbors.
- A. convenience
  - B. stratified
  - C. simple
  - D. cluster
  - E. systematic

17. Which of the following is not required in an experimental design?
- A. blocking
  - B. control
  - C. randomization
  - D. replication
  - E. All of these are required in an experimental design.
18. Can watching a movie temporarily raise your pulse rate? Researchers have 50 volunteers check their pulse rates. Then they watch an action film, after which they check their pulse rates once more. As described, which aspect of experimentation is present in this research?
- A. a placebo
  - B. blinding
  - C. randomization
  - D. a control group
  - E. none of these

19. To check the effect of cold temperatures on the battery's ability to start a car, researchers purchased a battery from Sears and one from NAPA. They disabled a car so it would not start, put the car in a warm garage, and installed the Sears battery. They tried to start the car repeatedly, keeping track of the total time that elapsed before the battery could no longer turn the engine over. Then they moved the car outdoors where the temperature was below zero. After the car had chilled there for several hours the researchers installed the NAPA battery and repeated the test. Is this a good experimental design?
- A. Yes
  - B. No, because the car and the batteries were not chosen at random.
  - C. No, because they should have tested other brands of batteries, too.
  - D. No, because they should have tested more temperatures.
  - E. No, because temperature is confounded by brand.
20. Twenty dogs and twenty cats were subjects in an experiment to test the effectiveness of a new flea control chemical. Ten of the dogs were randomly assigned to an experimental group that wore a collar containing the chemical, while the others wore a similar collar without the chemical. The same was done with the cats. After 30 days veterinarians were asked to inspect the animals for fleas and evidence of flea bites. This experiment is...
- A. completely randomized with one factor: the type of collar
  - B. completely randomized with one factor: the species of animal
  - C. randomized block, blocked by species
  - D. randomized block, blocked by type of collar
  - E. completely randomized with two factors

21. Passing the test Assume that 70% of teenagers who go to take the written drivers license test have studied for the test. Of those who study for the test, 95% pass; of those who do not study for the test, 60% pass. What is the probability that a teenager who passes the written drivers license test did not study for the test?
- A. 21.3%
  - B. 30%
  - C. 60%
  - D. 78.7%
  - E. It cannot be determined.
22. Six Republicans and four Democrats have applied for two open positions on a planning committee. Since all the applicants are qualified to serve, the City Council decides to pick the two new members randomly. What is the probability that both come from the same party?
- A.  $\frac{66}{90}$
  - B.  $\frac{52}{90}$
  - C.  $\frac{52}{100}$
  - D.  $\frac{42}{90}$
  - E.  $\frac{42}{100}$
23. Some marathons allow two runners to "split" the marathon by each running a half marathon. Alice and Sharon plan to split a marathon. Alice's half-marathon times average 92 minutes with a standard deviation of 4 minutes, and Sharon's half-marathon times average 96 minutes with a standard deviation of 2 minutes. Assume that the women's half-marathon times are independent. The expected time for Alice and Sharon to complete a full marathon is  $92 + 96 = 188$  minutes. What is the standard deviation of their total time?
- A. 2 minutes
  - B. 4.5 minutes
  - C. 6 minutes
  - D. 20 minutes
  - E. It cannot be determined.

### Problems 24 and 25: Dice rolls

Two players compete against each other by rolling dice - not the traditional dice, though. One face of Alex's die has an 8 and the other five faces are all 2's. Bella's die has four 3's and two 1's on the six faces.

24. They each roll their die, and the player with the highest score wins. If Alex wins, Bella pays Alex \$10. How much should Alex pay Bella if she wins in order to make the game fair?
- A. \$8
  - B. \$9
  - C. \$10
  - D. \$11
  - E. \$12
25. They decide to change the rules. They will each roll, and the winner will collect the number of dollars shown on his or her die. For example, If Alex rolls a 2 and Bella rolls a 3, Alex will pay Bella \$3. Find the expected value of Alex's winnings each time they play the game.
- A. \$-0.16
  - B. \$0
  - C. \$0.22
  - D. \$0.48
  - E. \$1.2

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