Math 10
Spring 99
Practice Exam II

Disclaimer: This set of problems is meant neither to indicate the length nor composition of the actual exam. Many are taken from earlier exams or practice exams. However, they may give an indication of the type of problems which will appear on the exam.

For problems 1-10, circle the letter of the correct response

1. There are approximately 4400 students at Dartmouth, with about 1100 in each of the four consecutive classes. The mean number of students at Dartmouth with February 29th birthdays is
   (a) approximately 3
   (b) approximately 12
   (c) a number that increases in a regular way once every four years
   (d) not possible to determine from the given
   (e) a number that decreases in a regular way once every four years.

2. In a study of the effects of acid rain, a random sample of 100 trees from a particular forest are examined. Forty percent of these show some signs of damage. Which of the following statements are correct?
   (a) The sampling distribution of the proportion of damaged trees is approximately normal.
   (b) If we took another random sample of trees, we would find that 40% of these would show some signs of damage.
   (c) The mean of the sampling distribution of the proportion of damaged trees is close to 0.40.
   (d) If a sample of 1000 trees was examined, the variability of the sample proportion would be larger than for a sample of 100 trees.
   (e) 40% of the trees in this forest will show some damage.

3. A randomly selected student is asked to respond yes, no, or maybe to the question: "Do you intend to vote in the next presidential election?" The sample space is {yes, no, maybe}. Which of the following represent a legitimate assignment of probabilities for this sample space?
   (a) .4,.4,.2
   (a) .4,.2,.2
   (c) .4,−.2,.8
   (d) a and c
   (e) a and b

4. You play tennis regularly with a friend, and from past experience you believe that the outcome of each match is independent of the outcomes of your other matches. Your experience also suggests that you have probability .6 of winning a match. The probability that you win the next two matches is

(a) .16

(b) .6

(c) .4

(d) .24

(e) .36

5. In the tennis matches described above, the mean number of matches you win in the next 10 matches is

(a) .6

(b) 4

(c) 8

(d) $\sqrt{10 \cdot (.6) \cdot (.4)}$

(e) none of the above

6. In the tennis matches described above, the standard deviation of your next 8 matches is

(a) $.8\sqrt{3}$

(b) $\sqrt{.24}$

(c) $\sqrt{3}$

(d) $\sqrt{.03}$

(e) none of the above

7. If a population has standard deviation σ, then the standard deviation of a mean of 100 randomly selected items from this population is

(a) σ

(b) 10σ.

(c) 100σ

(d) $.1\sigma$

(e) $.01\sigma$

8. In a table of random digits, the probability that the next 5 digits do not include a two is

(a) 2/5

(b) 0.1

(c) 0.5

(d) 0.00001

(e) 0.59049

9. The number of calories in a one ounce serving of Frosted Oatios breakfast cereal is a random variable with mean 160 calories. The number of calories in a cup of milk is a random variable with mean 140 calories. You have an ounce and a half of Frosted Oatios and a half-cup of milk for breakfast. The mean number of calories in your breakfast is
(a) not possible to calculate since we don't know if the distributions are normal.
(b) 300 calories
(c) 380 calories
(d) 150 calories
(e) 310 calories

10. The probability that 9 items in a row are on the same side of the centerline in an $\bar{x}$-chart is
(a) Exactly the same as the probability that one item is three standard deviations below the centerline.
(b) $(\frac{1}{2})^9$
(c) $(\frac{1}{2})^8$
(d) 99.7%
(e) 68%

11. A garden center advertises that 90% of its dogwood seedlings will survive when given normal garden care. The survival of a seedlings given normal garden care is independent of the survival of other seedlings.
(a) If someone buys n seedlings, what is the mean number of seeedlings that survive?

(b) If a homeowner buys 10 such seedlings, what is the probability that at least 9 will survive?

(c) If an apartment complex plants 100 of these seedlings, what is the probability that at least 92 survive?

12. You read an article that describes a study of the voting patterns of various groups in society based on a large sample survey. The article says, "Persons who identified themselves as evangelicals were significantly $(P < .01)$ more likely to favor Republican presidential candidates than were other white Protestants." Explain to someone who knows no statistics what "significantly $(P < .01)$" means here.

13. The diastolic blood pressure for American women aged 18 to 44 has the normal distribution with mean $\mu = 75$ millimeteres of mercury (mm Hg) and standard deviation $\sigma = 10$ mm Hg. We suspect that regular exercise will lower the blood pressure. A sample of 35 women who jog at least 5 miles a week gives sample mean blood pressure $\bar{x} = 71$ mm Hg. In this question we will answer the question "is this good evidence that the mean blood diastolic blood pressure for the population of regular exercisers is lower than 75 mm Hg?"
   (a) Find a 95% confidence interval for the mean diastolic blood pressure of a woman who jogs at least 5 miles per week, assuming this population has the same standard deviation as the population of all women.

(b) State the hypotheses H_0 and H_a for testing whether we have "good evidence that the mean blood diastolic blood pressure for the population of regular exercisers (among women) is lower than 75 mm Hg?"

(c) Carry out a test of significance, assuming that $\sigma = 10$ is true. What is the P-value?

(d) Is the result of your test significant at the 5 % level?

(e) Is the result of your test significant at the 1 % level?

14. A student is taking a 100 question true-false test. The student knows 80% of the material in the course. Assume that if the student knows the correct answer to a question, then the student gives that answer. Assume further that if the student does not know the answer to a question, the student guesses. Finally assume that the questions are independent of one another and a simple random sample of the material in the course.

   (a) What is the probability that, on a given question, the student knows the answer and gives it correctly?

   (b) What is the probability that, on a given question, the student does not know the answer and gives it correctly?

   (c) What is the probability that, on a given question, the student does not know the answer and gives it incorrectly?

   .

   (d) Suppose that the grade on the test is the number of correct answers. What is the mean grade such a student would receive on the test?

(e) Suppose that the grade on the test is the number correct minus the number incorrect. What is the mean grade such a student would receive on the test?

15. You are advising a political candidate on opinion polls. Two organizations have submitted bids to do a survey to estimate the extent of hthe candidate's support. Both will use nationwide probaility samples of 2500 people. Both charge the same price. One organization only states that it has a 95% chance to get the estimate right to within 3%. The other absolutely guarantees that its estimate will be right to within 3%. Other things being equal,which bid should be accepted?

16. I propose you a new game. You roll 2 dice. If the sum of the numbers showing is either 6, or 7, or 8, I win. If it is 2, 3, 4, 5, 9, 10, 11, 12, you win. Since you have lots more possible winning combinations that I do, the rules are that you pay me $2 when I win and I pay you $1 when you win. If we play this game 30 times, how much do you think you will win or lose? (I will be in my office this afternoon for anyone who feels like playing.)

17. One hospital has 218 live birth during the month of January. Another has 536. Which is liklier to have 55% or more male births? Or is it equaly likely? Explain. (There is about a 52% chance for a live-born infant to be male.)