

# Math 263

## Exam II

March 3rd 2015

The University of Arizona

Name: \_\_\_\_\_

**Answers without adequate justification will not receive full credit, including multiple choice. Include units with your answer when appropriate, and box all answers unless an answer line is provided. By signing below I am agreeing to abide by the University of Arizona academic integrity policies and that all work done on this test is my own.**

Signature: \_\_\_\_\_

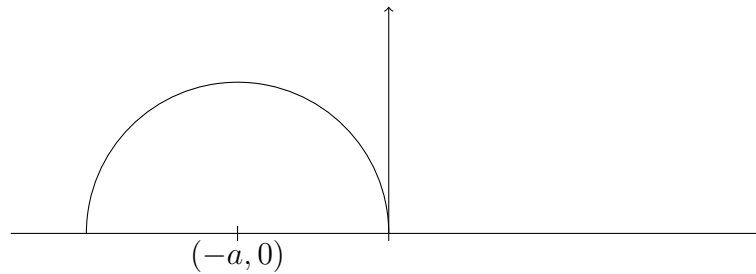
### **Tips for Success:**

- Look through the entire test before starting to prioritize questions.
- If you get stuck on a question, move on and come back to it later.
- Do a quick reality check after each question: does my answer make sense? Did I include units? Did I show all my work?
- Read over the entire test at the end to make sure you didn't miss anything.
- For each question: take a deep breath, think slowly and deliberately at first, then work quickly once you see what to do.

### **Special notes for 263 exams:**

- **If you use a calculator to compute statistical quantities such as a 5 number summary, linear regression, normal proportion etc, please indicate which function you used i.e. 1-Var Stats, LinReg(ax+b), normalcdf().**
- **Round all numerical answers to 2 decimal places unless otherwise specified.**

1. The graph below shows the probability density function of a continuous random variable  $X$ . The graph is a semi-circle with radius  $a$ .



- (a) What must  $a$  be in order for this to be a valid PDF? Leave your answer exact.
- (b) What is  $P(-a < X < 0)$ ? Leave your answer exact.
2. Suppose that a scratch ticket claims that you have a 1 in 10 chance of winning. What is a valid interpretation of this?
- \_\_\_ If you play the game 10 times, you will win exactly once
- \_\_\_ If you play the game 1000, you will win approximately 100 times
- \_\_\_ If you play the game once, you will win 1/10 of the maximum amount
- \_\_\_ If you play the game 10 times, you will win \$1.
3. Suppose we roll a 6-sided die and flip a coin.
- (a) List all the outcomes of this experiment
- (b) What is the probability that either the coin shows tails or the die is *not* a 4?
- (c) Are the following events disjoint?  $A$  = the die shows a 3, 4 or 5 and  $B$  = the coin is heads.
- (d) What is the probability that the die shows a 3 *given* that the coin shows heads?
4. Suppose that the heights of every student on the UA campus are normally distributed. For the males, the mean is 68 inches and the standard deviation is 5 inches. For the females, the mean is 63 inches and the standard deviation is 4 inches.
- (a) What is the probability that a randomly selected male student has a height greater than 62 inches? Hint:  $z$ -scores.
- (b) What is the probability that a randomly selected female has a height between 48 and 53 inches?
- (c) What is the mean and standard deviation of the *sum* of the heights of males and females? I.e. if  $X$  is the height of a male,  $Y$  is the height of a female, then find the mean and standard deviation of  $Z = X + Y$ .

5. Consider a game where you roll two 4-sided dice. Each die is labeled with the numbers 1 to 4. Define a random variable  $X$  to be the sum of the two numbers on the dice.

$X$								
$P(X = x)$								

- (a) Using the first row in the table above, list all the possible scores in this game. *Note: I may or may not have provided more boxes than necessary!*
- (b) Fill in the second row with the *probability* of getting each score. Hint: list all the possible pairs of rolls and compute the score for each one.
- (c) Compute the *expected value* of  $X$ , your score in the game. Show your work/formula used.
- (d) Compute the *variance* of  $X$ . If you were unable to find the expected value, you can use the symbol  $\mu$  in its place and leave your formula unsimplified.
6. In an experiment on a new drug, subjects were randomly assigned to either a placebo or the active drug. In addition, the method of delivery of the drug (pill, skin patch, or nasal mist) was considered. In this experiment, there were how many factors?
7. A researcher is interested in the cholesterol levels of adults in the city in which she lives. A cholesterol screening program is set up in the downtown area during the lunch hour. Individuals can walk in and have their cholesterol determined for free. The service is used by 173 people, and their average cholesterol is 217.8. Mention some possible issues with this sampling procedure.
8. Consider a study performed by a medical center to determine which of two heart surgeries is most effective: angioplasty (running plastic tubes through the arteries) or bypass (rerouting arteries). The purpose of either procedure is to prolong the life of the patient. The study records the survival time of each patient (measured from the time of the surgery). What are the response and explanatory variables in this study?