

## HOMEWORK 2

Math 135 Probability  
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**Due:** Monday, September 10, 2007

As always, please give noninteger numerical answers to 4 significant figures and box your answers.

- 1 For this problem, let  $x$  and  $y$  be variables that must lie between 0 and 1. Find the area of the following regions
  - a)  $x \leq .4$
  - b)  $\sqrt{x} \leq .4$
  - c)  $x + y \leq .4$
  - d)  $x^2 + y \leq .4$
  - e)  $2x - y \leq .4$
  
- 2 Suppose a bookshelf has 5 probability textbooks, 3 works by Dickens, and one copy of “The Da Vinci Code”. A book is taken down from the shelf uniformly at random
  - a) What is the probability that the book is a probability text?
  - b) What is the probability that the book is not a probability text?
  
- 3 Wilson Industries produces lightbulbs at three facilities, in Allentown, Boston, and Cincinnati. The probabilities of a defective lightbulb at facility A is 0.07, at B is 0.06, and at C is 0.01.
  - a) Given that 20 lightbulbs are manufactured in a batch at the Allentown plant, what is the probability that none of the lightbulbs in a batch are defective?
  - b) Suppose that one batch of 20 from A, one batch of 20 from B and one batch of 20 from C are shipped to a dealer. What is the probability that none of the 60 lightbulbs are defective?
  
- 4 Two fair 8 sided dice are rolled independently.
  - a) What is the probability that their sum is at least 5?
  - b) What is the probability that their sum is exactly 5?
  - c) What is the probability that the two die rolls equal each other?
  
- 5 Jacob and Emily dine at a restaurant with 4 different appetizers, 16 entrees, and 5 desserts. If both Emily and Jacob choose one appetizer, one entree, and one dessert uniformly at random, what is the probability that they pick the same meal?
  
- 6 Isabella plays American roulette (38 spaces, each space equally likely to be landed in) 5 times. If it lands in any of the 18 red spaces Isabella wins \$1, but otherwise she loses \$1. After 5 plays, what is the probability that she ends up with more money than when she started?
  
- 7 There is one defective gadget in a box of 30. The supervisor selects a group of 10 gadgets uniformly at random from the box, and checks this group to see if they are defective.
  - a) What is the probability that the supervisor finds the defective gadget?
  - b) How many gadgets should the supervisor have drawn in order to find the defective gadget with probability at least  $1/2$ ?
  
- 8 Mark keeps rolling a ten sided die over and over until a 1, 2, or 3 comes up. What is the probability that exactly 5 rolls are needed?

**9** Suppose that  $P(A) = .5$ ,  $P(B) = .3$  and  $P(AB) = .25$ .

- a) Find  $P(A \cup B)$
- b) Find  $P(AB^C)$

**10** Archytas Lighting Company makes light bulbs that are defective independently with probability 2%. There are 100 bulbs in a case.

- a) What is the probability that at least one of the bulbs in a case is defective?
- b) What is the probability that exactly one of the bulbs is defective?
- c) What is the probability that exactly two of the bulbs are defective?

**Readings** Read section 1.1 through 1.6 of Pitman