# Exam 3

MAT 121, Summer 2016

1. (6 points) Define the sets $A = \{2, 4, 6, 8\}$, $B = \{1, 2, 3, 4, 5\}$, and $C = \{6, 8, 10\}$. Write the following sets.

   (a) $B \cap C$

   (b) $B \cap C'$

   (c) $A \cup B$

   (d) $A \cap B$

2. (6 points) In a sample of parts from a factory, there are 468 functioning parts and 78 defective ones. If a part is chosen at random, what is the probability that it is defective?

3. (6 points) First we flip a coin, and then we roll a die.

   (a) What is the probability of getting tails on the coin?

   (b) What is the probability of rolling an odd number on the die?

   (c) What is the probability of getting tails and rolling an odd number?

   (d) What is the probability of getting tails or rolling an odd number?

4. (12 points) (a) A manufacturer can choose between two different computer chips. There is a 30% probability that chip A is defective. There is a 5% probability that chip B is defective. If the company makes a machine by combining one chip of each type, find the probability that the final product contains one or more defects.

   (b) If the company makes a chip by combining two copies of chip A, find the probability that the final product contains one or more defects.

5. (4 points) The names of 12 different contestants are entered into a drawing. Winners will be chosen for first, second, and third prize. In how many different ways can these prizes be awarded?

6. (4 points) From a club of 10 people, a committee of 3 people is selected to prepare a budget. In how many different ways can the committee be chosen?

7. (8 points) Recall that a deck of cards contains 13 diamonds, and 52 cards total.

   (a) How many ways are there to choose a group of three cards from the deck? Assume that order is not important in this problem.

   (b) How many ways are there to choose three diamonds?

   (c) If you choose three cards at random, what is the probability that you get three diamonds?

8. (20 points) We have a jar with 3 blue chips and 3 white chips. We draw two chips from the jar.

   (a) What is the probability that the first chip is blue?

   (b) If the first chip drawn is blue, what is the probability that the second chip is also blue?

   (c) If the first chip is white, what is the probability that the second chip is blue?

   (d) What is the probability of drawing two blue chips?

   (e) What is the probability that the second chip is white? (In this question, we have no knowledge about the color of the first chip.)

   (f) If the second chip is white, what is the probability that the first chip was white?

9. (12 points) The probability that a person has a certain thyroid disorder is 1.5%. There is a new diagnostic test for this disorder that is 90% accurate. If a randomly-chosen person tests positive for the disorder, what is the probability that they actually have the disease?

10. (6 points) A bag contains one $20 bill, two $5 bills, and seven $1 bills. What is the expected value of drawing a bill from the bag?

11. (16 points) The cost of developing a new product is \$900,000. There is a 35% chance that this product will be successful. If it does succeed, the company will receive \$2.5 million. Would you recommend that the company develop the product?