Math 166 Week in Review 5  
Sections 2.3, 2.4, & 3.1

1. Suppose in a group of 100 people, it is known that 5 are left-handed. If a group of 15 people is selected at random, what is the probability that exactly 3 of them are left-handed?

2. In a grocery store, you see 300 boxes of cereal on the shelves. You had a secret tip that 9 of these boxes have a prize in them. However, you only have enough money to buy 20 boxes of cereal. What is the probability that you will get at least 1 prize?

3. A 5-card hand is dealt from a standard deck of cards. Find the probability that at least 2 cards are hearts.

4. A jar has 6 red, 9 blue, and 4 white marbles. If 8 marbles are selected at random, what is the probability that
   (a) exactly 5 are the same color?
   (b) exactly 3 white or exactly 4 blue are selected?

5. Suppose a family of 5 and a family of 4 go to the movies. If these 9 people are randomly assigned to sit in a row of 9 seats, what is the probability that each family is seated together?

6. In order to pick a 4-digit pin number you roll a fair 6-sided die four times. What is the probability that the first three numbers are odd?

7. Determine whether the following experiments are binomial (repeated Bernoulli trials).
   (a) Picking 3 cards one at a time with replacement from a deck of cards and observing if the card is a king or not.
   (b) Tossing a coin until a head is tossed.
   (c) Rolling a pair of dice 5 times and recording the sum.
   (d) Picking 4 marbles one at a time without replacement from a jar of 3 red and 5 blue marbles and observing the color of the marble.

8. A certain medicine is known to cause nausea in 35% of those who take it. In a group of 15 people who are taking this medicine, what is the probability that:
   (a) Exactly 7 of them will have nausea?
   (b) At most 5 of them will have nausea?
   (c) At least 9 will have nausea?
   (d) More than 6 but at most 10 will have nausea?

9. Suppose a biased coin is tossed 400 times. The coin is biased such that the probability of tossing a head is 0.70. What is the probability that
   (a) Exactly 275 or exactly 300 heads are tossed?
   (b) More than 300 heads are tossed?
   (c) Fewer than 123 tails are tossed?
   (d) At least 107 but fewer than 205 tails are tossed?
10. For the following random variables, list the values that $X$ can assume and state whether it is finite discrete, infinite discrete, or continuous.

(a) Let $X$ be the number of times it takes for you to hit the bull’s eye while playing darts.
(b) Let $X$ be the amount of coffee (in ounces) that a person drinks each week.
(c) Cards are drawn one at a time from a standard deck of cards with replacement until a king is drawn. Let $X$ be the number of draws needed.
(d) 5 marbles are pulled one at a time with replacement from a jar containing 4 red, 6 blue, and 10 green. Let $X$ be the number of times a red marble is pulled.
(e) Marbles are pulled one at a time without replacement from a jar containing 4 red, 6 blue, and 10 green until a blue marble is pulled. Let $X$ be the number of pulls needed.
(f) Let $X$ be the amount of time (in hours) a person sleeps in one week.
(g) 6 cards are drawn one at a time from a standard deck of cards without replacement.
   i. Let $X$ be the number of hearts drawn.
   ii. Let $X$ be the number of Jacks drawn.

11. Two fair 5-sided dice are rolled and the numbers rolled are observed. Let $X$ be the positive difference of the numbers rolled.

(a) Find the sample space for this experiment.
(b) Find the probability distribution for $X$.
(c) Draw a histogram of this distribution.
(d) What is $P(1 \leq X < 4)$?

12. In a bag of 20 Starbursts, it is known that 7 are orange. A sample of 3 Starbursts is selected at random from the bag. Let $X$ be the number of oranges selected. Find the probability distribution of $X$.

13. The probability that a baseball player gets a hit is 0.22. Suppose this player comes to bat 4 times in a game. Let $X$ be the number of times he gets a hit. Find the probability distribution for $X$. 

2