CSE 312: Foundations of Computing II
Quiz Section #2: Counting

1. A license plate has the form AXYZBCD, where A, B, C, and D are integers and X, Y, and Z are upper case letters. What is the number of different license plates that can be created?

2. A chef is preparing desserts for the week, starting on a Sunday. On each day, only one of five desserts (apple pie, cherry pie, strawberry pie, pineapple pie, and cake) may be served. On Thursday there is a birthday, so cake must be served that day. On no two consecutive days can the chef serve the same dessert. How many dessert combinations are there for the week?

3. In Schnapsen, assuming the stock is not closed, no one has exchanged the jack of trumps, and no marriage has been declared, how many possible orderings of the cards face-down in the stock are there, given the cards you have seen ...

   (a) ... before trick 1?

   (b) ... before trick 2?

   (c) ... before trick 3?

   (d) ... before trick 4?

   (e) ... before trick 5?

4. In how many different ways can you arrange seven people around a circle?

5. There are 6 men and 7 women in a ballroom dancing class. If 4 men and 4 women are chosen and paired off, how many pairings are possible?

6. How many ways are there to seat 10 people, consisting of 5 couples, in a row of 10 seats if ...

   (a) ... the seats are assigned arbitrarily?

   (b) ... all couples are to get adjacent seats?

   (c) ... the seats are assigned arbitrarily, except that one couple insists on not sitting in adjacent seats?

7. The game of bridge is played with a deck of 52 cards divided into 4 suits (black ♠, red ♡, black ♣, and red ♢) of 13 cards (2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A) each. A bridge hand consists of 13 cards dealt from a shuffled deck. Given a bridge hand consisting of 5 spades, 2 hearts, 3 diamonds, and 3 clubs, in how many ways can the hand be arranged so that the cards of each suit are together ...

   (a) ... but not necessarily sorted by rank within each suit?

   (b) ... and each suit is sorted in ascending rank order?

(c) . . . and each suit is sorted in ascending rank order and the suits are arranged so that the suit colors alternate?

8. How many bridge hands have a suit distribution of 5, 5, 2, 1? (That is, you have 5 cards of one suit, 5 cards of another suit, 2 of another suit, and 1 of the last suit.)

9. A hand in "draw poker" consists of 5 cards dealt from a shuffled 52-card bridge deck.

   (a) How many different hands are there that form a flush? (A hand is said to form a flush if all 5 cards are from the same suit.)

   (b) How many different hands are there that form a straight? (A hand is said to form a straight if the ranks of all 5 cards form an incrementing sequence. The suits do not matter. The lowest straight is A, 2, 3, 4, 5 and the highest straight is 10, J, Q, K, A.)

   (c) How many different hands are there that form one pair? (This occurs when the cards have ranks a, a, b, c, d, where a, b, c, and d are all distinct. The suits do not matter.)

   (d) How many different hands are there that form two pairs? (This occurs when the cards have ranks a, a, b, b, c, where a, b, and c are all distinct. The suits do not matter.)

   (e) How many different hands are there that form three of a kind? (This occurs when the cards have ranks a, a, a, b, c, where a, b, and c are all distinct. The suits do not matter.)

   (f) How many different hands are there that form a full house? (This occurs when the cards have ranks a, a, a, b, b, where a and b are distinct. The suits do not matter.)

   (g) How many different hands are there that form four of a kind? (This occurs when the cards have ranks a, a, a, a, b. The suit do not matter.)

10. Rabbits Peter and Pauline have three offspring: Flopsie, Mopsie, and Cotton-tail. These five rabbits are to be distributed to four different pet stores so that no store gets both a parent and a child. It is not required that every store gets a rabbit. In how many different ways can this be done?