Math 321 – Summer 2019

additional practice for chapter 2, counting

1. Explain the difference between a combination and permutation.

2. Consider an experiment where a coin is flipped 100 times. How many ways are there to get 47 heads?

3. Consider a contest where there are 100 people entered and there are 5 prizes. Assume that once a person wins a prize they are no longer eligible for the other prizes. How many ways are there to award the prizes?

4. Consider a class of 25 students. A group of 5 students is to be selected for a project.

   (a) Out of the class of 25, how many ways are there to select the group of 5?
   (b) Assume that a particular group of 5 has been selected. How many ways are there to assign 5 specific roles, e.g. leader, note taker, data recorder, calculator, materials gatherer?
   (c) Out of the entire class of 25, how many ways are there to select the group of 5 where each group member will be assigned a specific role?
   (d) Out of the class of 25, how many ways are there to select the group of 5 where only two group members will be assigned specific roles, e.g. leader and secretary, and the other group members will all be assigned the same role, e.g. regular member?

5. A restaurant menu has 5 choices for appetizer, 2 choices for main course, 4 choices for dessert, and 6 choices for drink. How many distinct complete meals are possible?

6. We have 3 balls (labeled 1 to 3) and 5 bins (labeled 1 to 5). Each ball is to be placed into a bin. We do not care the order the balls are placed into the bins, but we do care about which specific ball is in which specific bin. Assume each bin can hold any number of balls.

   (a) How many ways can all balls be placed into the same bin?
   (b) How many ways can each ball be placed into a different bin?
   (c) How many ways can all balls be placed into two bins?

7. Consider a standard 52 card deck.

   (a) If 5 cards are drawn without replacement, how many ways can they all have the same suit?
   (b) Continuing the above part, how many ways can we pick 5 cards that are all teh same suit and for a straight (consecutive face values)?
   (c) How many ways can we pick 5 cards where two of them are red and three are black?

8. Consider an urn that contains 15 red balls, 5 green balls, and 10 blue balls.

   (a) If we draw 3 balls without replacement, how many ways can they all be red?
   (b) If we draw 3 balls without replacement, how many ways can they be all the same color?
   (c) If we draw 3 balls without replacement, how many ways is it possible to have 1 ball of each color?
   (d) If we draw 3 balls with replacement, and we care about the order they were drawn in, how many total possible outcomes are there? Treat each ball as distinct. You might imagine that even though many are the same color, that they are labeled with letters or numbers to tell them apart.