Math 4190 — Goddard — Fall18

Assignment 2

You may work in pairs, and submit one answer sheet for the pair.

1. Determine the number of anagrams of:
   (a) SASSAFRAS   (b) BOOKKEEPER

2. I have a bag containing 12 numbered balls of which 4 are red, 4 are green, and 4 are blue. In how many ways can I choose an unordered set of:
   (a) 7 balls?
   (b) 6 balls if I must have equal numbers of each color?
   (c) 4 balls if I must have at least one of each color?
   (d) 4 balls if I must have more red than green?

3. Wayne has a pile of 20 books to read.
   (a) In how many orderings can he read them?
   (b) In how many orderings can he read them if the pile includes the 7 Harry Potter books, which must be read in order and consecutively?
   (c) How many orderings if the 7 Harry Potter books must be read in order but not necessarily consecutively?

4. Mabe lives in Manhattan and his office is 5 blocks east and 3 blocks north. He always takes the shortest route to work (that is, he walks exactly 8 blocks), but he likes to vary the route.

   (a) How many different shortest routes can Mabe take between his home and his office?
   (b) How many different shortest routes can Mabe take if he wants to walk along two sides of the central green?
   (c) How many different shortest routes can Mabe take if he wants to avoid the central green completely (even at its corners)?

5. How many different necklaces can be made with 7 beads: 3 red, 2 blue, and 2 white? Note that a necklace has no starting point, and that flipping it over gives the same necklace.

6. Provide a combinatorial proof of the identity:

   \[ n \binom{n-1}{2} = \binom{n}{2} (n-2) \]

   (Hint: Consider a three-person subcommittee with a leader.)

Due: Friday 7 September