CS 206 - Introduction to Discrete Structures II

September 21, 2016

Homework: 1	Instructor: Morteza Monemizadeh
Due Date: Wednesday, September 21 (1:20pm)	Teaching Assistant: Hareesh Ravi

Assignment 1:

In how many ways can 8 people be seated in a row if

1. there are no restrictions on the seating arrangement?
   Solutions: $8!$.

2. persons A and B must sit next to each other?
   Solution: $2! \times 7!$.

3. there are 4 men and 4 women and no 2 men or 2 women can sit next to each other?
   Solution: $2! \times 4! \times 4!$.

4. there are 5 men and they must sit next to each other?
   Solution: $5! \times 4!$.

5. there are 4 married couples and each couple must sit together?
   Solution: $2^4 \times 4!$.

Assignment 2:

Suppose we have the word "Mississippi". Let $S = \{M, i, s, s, i, s, s, i, p, p, i\}$ be a multiset of the letters in the word "Mississippi". Recall that in the multiset S we can have repetitions of the same letter, but the order of the letters in S are not important.

1. How many arrangements using the letters in S are possible?
   Solution: $11!$.

2. How many different arrangements using the letters in S are possible? Here we say two arrangements A and B are alike (i.e., not different) if one arrangement, say A can be transformed to the other, say B if we permute the instances of the same letter.
   Solution: $\frac{11!}{4! \times 4! \times 2!}$.

3. Suppose we choose a multiset of 5 letters in S. How many choices do we have?
   Solution: $\binom{11}{5}$.

4. Suppose we choose a multiset of 5 letters in S. How many choices do we have if the two p letters must be in the set at the same time?
   Solution: $\binom{9}{3} + \binom{9}{5}$.

5. Suppose we choose a multiset of 5 letters in S. How many choices do we have if the two p letters cannot be in the set at the same time?

Solution: $\binom{9}{5} + 2\binom{9}{4}$.