14.1 Part II Permutations and 14.2 Permutations with Repetitions & Circular Permutations Notes

1. **Permutation:** A permutation of n differenct elements is an ordering of the elements such that one element is first, one is second, one is third, and so on. **ORDER MATTERS**!!

2. Permutation is an ordered arrangement of items that occurs when
   a. No item is used more than once.
   b. The order of arrangement makes a difference

   Ex: There are 10 finalists in a figure skating competition. How many ways can gold, silver, and bronze medals be awarded?

   Ex: You and 19 friends have decided to form an Internet marketing consulting firm. The group needs to choose three officers-a CEO, an operating manager, and a treasurer. In how many ways can those offices be filled?

3. **Permutation Formula:** $_nP_r = \dfrac{n!}{(n-r)!}$ or $P(n, r) = \dfrac{n!}{(n-r)!}$

4. Eight people enter the Best Pie contest. How many ways can blue, red, and green ribbons be awarded?

5. Suppose you want to rearrange the letters of the word ALGEBRA to see if you can make a different arrangement. If the two A's were not identical, the seven letters in the word could be arranged in P(7,7) or 7! ways. But since the A's are identical, what are we going to do?

6. **Permutations with Repetitions**:

Find the number arrangements for the word:

      A. BANANA   B. BASEBALL   C. MISSISSIPPI

7. How many ways can 4 Math books and 5 English books be put on a shelf if all the math books have to put together?

8. How many ways can 4 Math books and 5 English books be put on a shelf if all the math books and the English books have to be put together?

9. **Circular Permutations:** If n objects are arranged in a circle, then there are $\dfrac{n!}{n}$ or $(n-1)!$ permutations

of the n objects around the circle; they do not have a beginning or an end.

10. On the buffet there are 7 different appetizers from which to choose. The appetizers are arranged on a revolving tray. How many ways can the appetizers be organized?

11. How many ways can 8 people be seated at a square table?

12. How many ways can 5 men and 5 women be seated at a round table if they have to alternate the men and women?

   If n objects on a circle are arranged in relation to a fixed point, then there are $n!$ Permutations.

   If the arrangement can be physically turned over or flipped over, the reflection of the arrangement is possible, divide by 2. (For Example, a key ring can be flipped over but a football team in a huddle cannot)

13. How many ways can 7 beads be placed on a bracelet with no clasp?

14. How many ways can 7 beads be placed on a bracelet that has a clasp?

Homework: Finish Permutation Worksheet from class, pg. 755 #5 – 34, 37 – 40, 46