# Section 6.4 Notes

# Permutations:

Definition:
Given a set of distinct objects, a **permutation** of the set is an arrangement of these objects in a *definite order*.

The number of permutations of $n$ distinct objects taken $r$ at a time is:

$$P(n,r) = \frac{n!}{(n-r)!}$$

Permutations of $n$ Objects, not all distinct:
Given a set of $n$ objects in which $k_1$ objects are all alike, $k_2$ objects are all alike, … and $k_r$ objects are all alike such that: $k_1 + k_2 + \ldots + k_r = n$,
then the number of permutations of these $n$ objects taken $n$ at a time is given by:

$$\frac{n!}{k_1!k_2!...k_r!}$$

Circular Arrangements:
The number of (different) circular arrangements of $n$ distinct objects is $(n - 1)!$

# Combinations:

Definition:
The number of ways of selecting $r$ objects from a set of $n$ objects *without regard* to the order in which they are selected is a **combination** of the set.

The number of combinations of $n$ objects taken $r$ at a time is denoted:

$C(n, r)$ or $\binom{n}{r}$

Either way, $C(n, r) = \binom{n}{r} = \frac{n!}{r!(n-r)!}$

Combination example:
How many poker hands of 5 cards can be dealt from a standard deck of 52 cards?

Notice order does not matter.

$$C(52, 5) = \frac{52!}{5!(52-5)!} = \frac{52!}{5!47!} = 2{,}598{,}960$$