## Section 2.5/2.6: Combinations

***Combination***

↳ ***arranging all or part of a set of distinguishable objects where ORDER does NOT matter***

Think about: Students choose two letters from the list A, B, C

# of arrangments: AB BA AC CA BC CB

Verify using permutations: ${}_3P_2 =$

order in which the letters are chosen is not important:

AB is same as BA
AC is same as CA
BC is same as CB

} each group of 2 permutations is just _____

# of combinations:

---

In general, given a set of 'n' objects, taken 'r' at a time, the number of possible combinations is:

$${}_nC_r = \frac{n!}{r!(n-r)!}$$ or $${}_nC_r = \frac{{}_nP_r}{r!}$$

This may be denoted as $\binom{n}{r}$ read as "n choose r"

## Example 1:

Identify each of the following as a permutation or a combination.

a) A fruit salad consisting of apples, grapes and strawberries.

b) The combination to a safe is 4-7-2.

## Example 2:

In a lottery, 6 numbers from 1 to 49 are selected.

Compare the number of possibilities whether order matters (permutation) or whether order does not matter (combination).

NOTE: The # of combinations is LESS than the # of permutations.

### Example 3:

There are 10 members of student council. How many ways can 4 of the members be chosen to serve on the dance committee?

### Example 4:

An ice cream parlour serves 10 flavours of ice cream. A large sundae has 3 scoops of ice cream. How many different ice-cream combinations are there if each scoop in the sundae is a different flavour?

### Example 5:

A team consists of 9 players: 5 male and 4 female.

a) How many different 4-person teams does the coach have to choose from for an all-male competition?

b) How many different 4-person teams does the coach have to choose from, with 2 males and 2 females, for a mixed competition?

## Example 6:

The student council decides to form a sub-committee of 5 members to plan their Christmas Concert. There are a total of 11 student members: 5 males and 6 females.

a) Determine how many different ways the sub-committee can consist of exactly three females.

b) Determine how many different ways the sub-committee can consist of at least three females.

c) Determine how many different ways the sub-committee can consist of at least one female.

Example 7:

Solve:

a) $_{n-2}C_2 = 36$

b) $_{n+1}C_1 = 20$

Practice Questions: p.110, #1abcd

p.118-120, #4acdf, 5, 10, 11abcde, 12, 15a