

Name: _____

Date: _____

Combinations vs. Permutations

Sometimes it is necessary to find out how many ways an event can occur in order to determine a specific probability.

For example: If there are 10 kids in a pre-school class, how many ways could they line up to go to lunch?

To figure this out, consider each of the 10 spots in line.

How many children could go in the first space? Then in the second? Then in the third, etc....

10 9 8 _____

Now just multiply all of the numbers. This is how many ways the students could line up. _____

A shortcut to writing 10 times all the numbers below it - down to 1 is called "factorial". This is written "!".

What is 5! _____

What is 4! _____

What is 7! _____

What is 15! _____

It is also important to be able to find out how many smaller samples you can take from a large sample. There are two ways to do this.

1. Order matters – when the order matters, such as coming in 1st, 2nd, or 3rd place, you use a **permutation**

To find out how many groups of size "r" you can take from a sample of size "n" when order matters, use the formula:

$${}_n P_r = \frac{n!}{(n-r)!}$$

What do you think P stands for? _____

Example: There are 10 runners in the 100-meter dash. In how many ways could the 1st, 2nd, and 3rd place prizes be awarded?

2. Order does **NOT** matter – when the order does not matter, such as choosing a few people to go to the library during class, you use a **combination**

To find out how many groups of size "r" you can take from a sample of size "n" when order does not matter, use the formula:

$${}_n C_r = \frac{n!}{r!(n-r)!}$$

What do you think C stands for? _____

Example: There are 20 people in a class. In how many ways could 2 representatives be chosen to attend a student council meeting?

Practice – decide if the following should be a permutation or combination and use the correct formula to answer the question.

1. Coach Richt has 10 players to choose from to put in 6 positions on his team. How many different arrangements of players are possible?

2. How many different 6-player starting squads can be formed from a volleyball team of 15 players?

3. The school board has 7 members. How many ways could a committee of 3 members be formed?

4. If gold, silver, and bronze medals are awarded to the first three finishers in a 6-person race, how many ways can the medals be awarded?

5. The Riverside High School Orchestra has been invited to play 3 songs at the Summer Music Festival. If they have 8 pieces that are ready for performance, how many different programs can be made?

6. A florist has 12 different flowers from which floral arrangements can be made. If a centerpiece is to be made using 5 different flowers, how many different centerpieces can be made?

7. You are choosing your favorite songs to load into your I-pod. If you have 300 songs on your computer, how many 20-song playlists could you make?

8. You and your 2 friends are buying concert tickets. How many ways could you line up if there are 100 people waiting in line?

9. If there are 15 toppings offered at *Slices Pizza*, how many different pizzas can be made with 4 toppings?

10. If there are 30 entries in a poetry contest, in how many ways can 1st, 2nd, and 3rd place be awarded?