

Name: 2/24/20

## Algebra 2 Probability Unit: Combinations

Just the other day, we just looked at situations in which order matters - *Permutations*. What if order does not matter? Suppose you have a younger brother or sister and your family goes out to a restaurant. There is a children's menu with activities at the restaurant that all the kids get. The owner of the restaurant has decided that each child will receive two different colored crayons to use on their menu. The restaurant happens to carry five colors of crayons: orange, yellow, blue, green, and red. This is a situation in which the order that the child gets his two color-crayons does not matter. If you gave a child a red crayon and then a blue crayon, it would be the same as if you gave the child a blue crayon followed by a red crayon. As with permutations, the first question to ask is "Does Order Matter?" When the order does not matter, you are dealing with a situation that involves combinations.

**Example 1** Consider the color crayon problem in the previous situation. Make a list showing all of the different color crayon combinations that might occur. Be organized so as not to repeat any combinations.

OY, OB, OG, OR, YB, YG, YR, BG, BR, RG = 10 combinations

**Example 2** Consider the color crayon problem once again. Use the formula to find out the number of different color crayon combinations that are possible.

$${}_nC_r = \frac{n!}{r!(n-r)!} \rightarrow {}_5C_2 = \frac{5!}{2!(3!)} = \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1 \times 3 \times 2 \times 1} = \frac{20}{2} = 10$$

**Example 3** Suppose that there are 12 employees in an office. The boss needs to select 4 of the employees to go on a business trip to California. In how many ways can she do this?

$${}_{12}C_4 = \frac{12!}{4!(8!)} = 495$$

\* Can use Calc  
 (MATH) → → → (PRB)  
 ↓  
 ${}_nC_r$

### Problem Set 1.4 Exercises

- 1) Use a calculator to verify each answer. a)  ${}_5C_5$  b)  ${}_6C_4$  c)  ${}_3C_0$  d)  ${}_7C_3$
- 2) In how many ways can 3 cards be selected from a standard deck of 52 cards?
- 3) In how many ways can three bracelets be selected from a box of ten bracelets?
- 4) In how many ways can a student select five questions to answer from an exam containing nine questions?