Tools to use when finding the number of outcomes:

Multiplication Counting Principle:
The number of outcomes is the product of the number of choices for each step.

Factorial:
Is mostly used when you are using ALL of a given amount of items and order IS important.

Permutation:
The number of outcomes when order DOES matter.

Combination:
The number of outcomes when order DOESN'T matter.

In your closet you have 8 shirts, 6 pairs of pants, and 5 sweatshirts.

1. How many outfits can be created using one of each?

$\underset{\text{SHIRTS}}{8} \cdot \underset{\text{PANTS}}{6} \cdot \underset{\text{SW}}{5} = 240$

2. You are packing for a trip. How many ways can you pack 5 shirts, 3 pairs of pants, and 2 sweatshirts? Use the Multiplication Counting Principle together with Combinations.

order is not important when picking items to pack in a suitcase so finding the number of ways to take the given items is a combination.

$\underset{\text{SH}}{{}_8C_5} \cdot \underset{\text{PANT}}{{}_6C_3} \cdot \underset{\text{SW}}{{}_5C_2}$

$56 \cdot 20 \cdot 10 = 11{,}200$

There are 10 swimmers in a race. How many ways can the gold, silver, and bronze medals be awarded?

$10 \cdot 9 \cdot 8$ OR ${}_{10}P_3 = 720$

Order is important when awarding medals - this is a permuation.

There are 10 swimmers on a team. How many ways can three co-captains be selected?

${}_{10}C_3 = 120$

Order is not important when picking co-captains - this is a combination.

This "combination" lock has the numbers from 0 to 39.

Let's assume a "combo" to this lock is 3 different numbers.

Why is the phrase Combination Lock not a good name?

This is really a permuation because the order you dial the #'s is very important.

Find all possible "combos".

${}_{40}P_3 = 59{,}280$

this assumes numbers can't be repeated.

The lottery game Mega Millions requires you to pick 5 numbers from 1 to 56 then pick the Gold Ball which is a number from 1 to 46.

The order the numbers appear in is not important so this is a Combination situation.

1. If you buy an Easy Pick ticket then the computer picks these numbers for you. How many different Easy Pick tickets are possible?

ways to pick 5 of 56 numbers: $({}_{56}C_5)$ • # ways to pick 1 of 46 numbers: $({}_{46}C_1)$

$3{,}819{,}816 \cdot 46$

= 175,711,536 different possible tickets

2. What is the probability that you get a winning ticket?

$$\frac{1}{175,711,536}$$

There are 12 players on a basketball team. How many ways can I pick 5 players to start the game.

Assume everybody can play every position.

order is not important so this is a Combination

${}_{12}C_5 = 792$

How many different ways can the 5 starting players be announced at the beginning of the game?

order is important so this is a Permutation

$5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

OR

$5!$

OR

${}_5P_5$

} 120

1. You have to reshelve 8 books at the library.

a. How many ways can you arrange all of these books on a shelf?

order is important so this is a Permutation

$40{,}320 = {}_8P_8$ or $8!$ or $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

b. How many ways can you arrange 5 of these books on a shelf?

order is important so this is a Permutation

$= {}_8P_5$ or $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4$

$= 6720$

2. There are 8 books from the library that you want to read but you can only check out a maximum of three books at a time. How many ways can you check out three of these books?

order is not important so this is a Combination

${}_8C_3 = 56$

A class has 18 students and the teacher wants students to work in pairs. How many ways can the teacher have the students work in pairs?

order is not important so this is a Combination

$_{18}C_2 = 153$

Another day the teacher wants them to work in groups of 3. How many ways can the teacher have the students work in groups of 3?

order is not important so this is a Combination

$_{18}C_3 = 816$

How many ways can the teacher make groups of 2 or groups of 3 with this class?

$153 + 816 = 969$

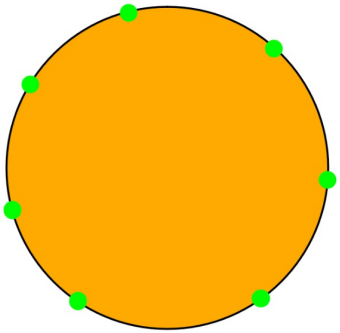
This is a garage door opener keypad. If the code consists of 4 digits how many codes are possible if:

1. A number can't be repeated.

$10 \cdot 9 \cdot 8 \cdot 7$ or $_{10}P_4 = 5040$

2. A number can be repeated.

$10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$



1. How many line segments can be formed using two of the points on the circle?

since the order you select the points doesn't matter this is a combination:

$_7C_2 = 21$

2. How many quadrilaterals can be formed using four of the points on the circle?

since the order you select the points doesn't matter this is a combination:

$_7C_4 = 35$

You can now finish Hwk #28

Sec 6-7

Due Tuesday

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Problems: 9, 18-20, 29, 30, 32, 39, 40, 55