Factorial: $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

Factorial is usually used if you are arranging ALL of the available items.

There are six people at a meeting. How many ways can you arrange these six people around a table?

$\underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$

$= 6! = 720$

There are six people at a meeting. If there are only five seats at a table, how many ways can you arrange five of these people around the table?

$\underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2}$

$= 720$

Permutation:

Selecting a number of items when order DOES matter.

Permutation Formula:

Ways to arrange n items r at a time.

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

n= total # items

r = # arranging at a time

Multiplication Counting Principle can also be used.

There are six people at a meeting. How many ways can you arrange these six people around a table?

$_6P_6 = 720$

There are six people at a meeting. If there are only five seats at a table, how many ways can you arrange five of these people around the table?

$_6P_5 = 720$

You have 10 trophies that you've won over the years. You want to display them on a shelf but the shelf can only hold seven trophies. How many ways can seven trophies be arranged on this shelf?

$_{10}P_7 = 604,800$

$\underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4}$

Combination:

Selecting a number of items when order DOESN'T matter.

Combination Formula:

Ways to choose n items r at a time.

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

n= total # items

r = # selecting at a time

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.

You are making a fruit punch for a party. You have a large bowl that can hold three gallons. You have one gallon jugs of five different juices. How many different punches can be made using three different juices?

$_5C_3 = 10$

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?

$\underline{8} \cdot \underline{6} \cdot \underline{5} = 240$

2. You are packing for a trip. How many ways can you pack 5 shirts, 3 pairs of pants, and 2 sweatshirts?

$\underset{\text{SHIRTS}}{\underline{_8C_5}} \cdot \underset{\text{PANTS}}{\underline{_6C_3}} \cdot \underset{\text{SW}}{\underline{_5C_2}}$

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

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

$_{10}P_3 = 720$

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

$_{10}C_3 = 120$

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?

Because the order you enter the numbers IS important.

This is actually a Permutation Lock!

Find all possible "combos".

$${}_{40}P_3 = 59280$$

this assumes numbers can't repeat.

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.

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

$$({}_{56}C_5) \cdot ({}_{46}C_1)$$

\# ways to pick 1 of 46 numbers

$$3,819,816 \cdot 46 = 175,711,536$$

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.

$${}_{12}C_5 = 792$$

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

$${}_5P_5 \text{ or } 5! = 120$$

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

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

$${}_8P_8 \text{ or } 8! = 40,320$$

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

$$6720 = {}_8P_5 = \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4}$$

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?

$_{8}C_{3} = 56$

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?

$_{18}C_{2} = 153$

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?

$_{18}C_{3} = 816$

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

$153 + 816 = 969$

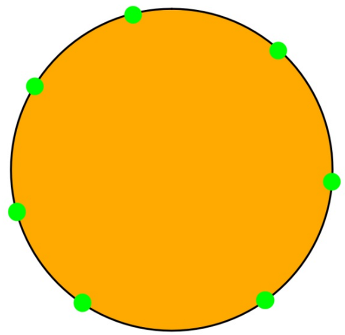
This is a garage door opener keypad.
If the code consists of 4 digits how many codes are possible if:

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?

$_{7}C_{2} = 21$

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

$_{7}C_{4} = 35$

You can now finish Hwk #28

Sec 6-7

Due Tomorrow

Pages 348

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