11-3 Combinations and Permutations

11-3a I can determine the difference between combinations and permutations

11-3b I can use combinations and permutations in real world scenarios

How many ways can you pick a team of 3 people from a group of 5 people?

How many ways can you pick a President, Vice President and Waterboy from a group of 5 people?

How many ways can you pick a team of 3 people from a group of 5 people?

Combination!

How many ways can you pick a President, Vice President and Waterboy from a group of 5 people?

Permutation!

Factorial

$$8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

$$\frac{8!}{5!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 8 \cdot 7 \cdot 6$$

Combination - order doesn't matter

Picking Dave, Bob and Harry for my team is the same as picking Harry, Bob and Dave

$$C(n,k) = \frac{n!}{(n-k)!k!}$$

Find all the ways to pick k things from a group of n, and divide by the k! variants (redundancies)

You have 15 friends and you need to pick 9 of them to help you T.P a house. How many ways can you do it?

Is this a combination? Does order matter?

$$C(n,k) = \frac{n!}{(n-k)!k!}$$

Permutation - order matters

How many ways can we award a gold, silver and bronze medal to 8 competitors?

Picking a person for each position (President, VP and Waterboy)

Is this a permutation? Does order matter?

$$P(n, k) = \frac{n!}{(n-k)!}$$

You have n items to choose from and want to find the number of ways k items can be ordered

$$P(n, k) = \frac{n!}{(n-k)!}$$

Which method will probably have a larger outcome? Combination or permutation?

How many ways could you pick your top 5 favorite books out of 15 books?

How many ways could you pick 5 books to take on vacation out of 15 books?