Your task for this discussion is as follows:

1. **In your own words, explain how to tell when a counting problem involves a permutation or a combination**.
2. **Write two examples of counting problems without specifying whether a permutation or combination must be found**.

3. In your responses to peers, **solve at least two different problems posed by your classmates and make sure to specify whether you are finding a permutation or combination in each case**.
4. Also, **reply to peers who solve your examples and discuss whether or not you agree with their responses**. Finally, contrast your answer to part (a) with those of your peers, and **note any differences in the understanding of how to determine when permutation or combination formulas should be used**.

Sample Initial Post:

1. A counting problem involves a permutation when order matters. Each ordering of, for example, A, B, and C that is unique would count as a permutation. In a combination, the order does not matter, it focuses on the actual groupings of the particular sets. An example of a combination would be AB or BA, which would be considered the same because they contain the same sets.

2. The two word problems:

A) Jim works as a car salesman and dealership receives 10 brand new Ferraris. Jim wants to put all of the cars at the front of the lot, but can only choose his favorite 6. How many options does Jim have to place his favorite Ferraris?

B) The NFL playoffs are fast approaching, and of 4 teams possibly securing playoff spots, only 2 will actually advance. How many ways can these teams be ranked?

Hello everyone,

Given set A, we know set B, B = {&, %, @}, is a subset of A. The set of all subsets of B is the power set of B (Levin, 2020). P(B) = {∅, {&}, {%}, {@}, {&, %}, {&, @}, {%, @}, {&, %, @}}. The size of set B or cardinality of B is |B| = 3. The cardinality of the set is the sum of its unique elements (Levin, 2020). We can expect P(B) to intersect A with 3 elements. Furthermore, we know all elements of the power set of B exist in the power set of A. Thus, P(B) is a subset of P(A).

Thanks,

Lauren Alexandra

References:

Levin, O. (2020). *Discrete Mathematics: An Open Introduction*. http://discrete.openmathbooks.org/dmoi3/frontmatter.html

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Hello everyone,

1. A counting problem involves a combination if we are choosing k options from n total options, (n k), without regard to order in the selection. For example, if we need to choose 7 outfits from our closet to wear during the week, the order does not matter. In contrast, a problem involving a permutation requires choosing in (n k) ways and arranging in k! ways. This is represented as $P(n, k)$ = (n k) · k! (Levin, 2020). If we wanted to select 7 outfits from our closet to wear during a given week in accordance with our preference, starting with our first favorite outfit, the order matters.

2. Problems:

A) The Kentucky Derby takes place on the first Saturday in May every year with 20 contenders competing. Amy can only bet on 4 horses for the upcoming race. How many ways does she have to bet?

B) Janet is a horse racing aficionado but she doesn't want to put up money to bet on any contenders for the Kentucky Derby. Instead she hosts a watch party for the race and asks attendees to guess, of the twenty contenders, which horses she thinks will win first, second, and third place. How many options does Janet have to pick first, second, and third place winners?

Thanks,

Lauren Alexandra

References:

Levin, O. (2020). *Discrete Mathematics: An Open Introduction*.
http://discrete.openmathbooks.org/dmoi3/frontmatter.html

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5. In your responses to peers, **solve at least two different problems posed by your classmates and make sure to specify whether you are finding a permutation or combination in each case**.
6. Also, **reply to peers who solve your examples and discuss whether or not you agree with their responses**. Finally, contrast your answer to part (a) with those of your peers, and **note any differences in the understanding of how to determine when permutation or combination formulas should be used**.

2 discussion responses.

Combinations:

$C(n,r)=n!/(n-r)!r!$

$20!/(16!*4!) = 4845$

Permutations:

$P(n,r)=n!/(n-r)!$

$20!/(20-3)! = 6840$

Hi Jacob,

1. Daily, you must select 2 PPE items from your collection of 5 items to wear in public locations to help prevent contracting Covid-19. All of the 5 PPE items have the same efficacy rate of prevention and any single PPE item can be work with another with no loss in efficacy rate. You want to determine the total number of ways you can select the 2 PPE items.

We are finding a combination, C(5, 2).

$C(5, 2) = 5! / (2! * (5 - 2)!) = 10$

2. Daily, upon returning home from trips to public locations, you must perform 3 sanitizing activities from your researched list of 7 effective activities to help prevent infection with Covid-19. Each combination of sanitizing activities has its own efficacy rate, depending on the activity order. You want to determine the total number of ways you can select the 3 sanitizing activities to perform so that you can assign each combination its own efficacy rate.

We are finding a permutation, P(7, 3).

$P(7, 3) = 7! / (7 - 3)! = 210$

Lauren

Jacob

1. Daily, you must select 2 PPE items from your collection of 5 items to wear in public locations to help prevent contracting Covid-19. All of the 5 PPE items have the same efficacy rate of prevention and any single PPE item can be work with another with no

loss in efficacy rate. You want to determine the total number of ways you can select the 2 PPE items.

2. Daily, upon returning home from trips to public locations, you must perform 3 sanitizing activities from your researched list of 7 effective activities to help prevent infection with Covid-19. Each combination of sanitizing activities has its own efficacy rate, depending on the activity order. You want to determine the total number of ways you can select the 3 sanitizing activities to perform so that you can assign each combination its own efficacy rate.

Question 1: Combinations

$5!/(3!*2!) = 120 / (6 * 2) = 10$

Question 2: Permutations

$7!/(7-3)! = 5040 / 24 = 210$

Also you need to respond to differences in understanding if there are any.