Inspiring Greatness

ISD

INDEPENDENCE SCHOOL DISTRICT

Math Virtual Learning

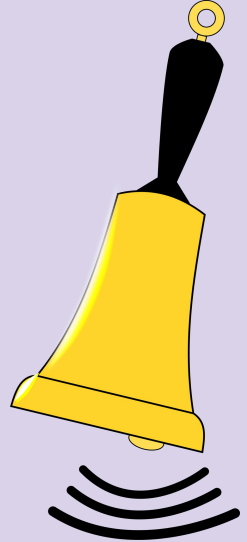
Probability and Statistics

May 18, 2020

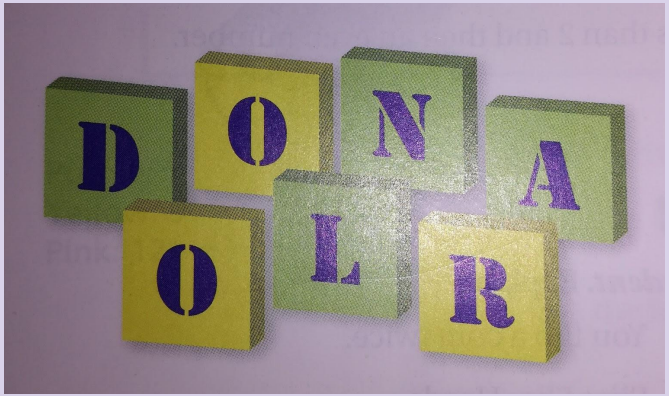
Probability and Statistics
Lesson: May 18, 2020

Objective/Learning Target:
Students will be able to identify if a probability situation is a Counting Principle, Combination or Permutation

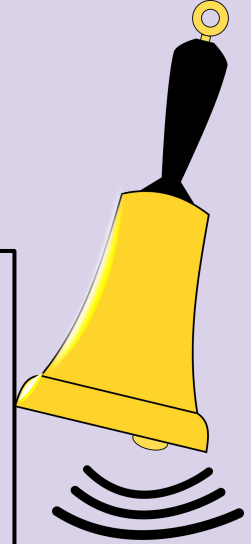
Let's Get Started!



These scrabble letters were put into a bag. What is the chance that you will draw at random, without replacement, the letters in order to spell a popular vacation city in Florida?



Let's Get Started! ANSWERS



These scrabble letters were put into a bag. What is the chance that you will draw at random, without replacement, the letters in order to spell a popular vacation city in Florida?

Destination name: ORLANDO

P(O) = 2/7 P(R) = 1/6 P(L) = 1/5 P(A) = 1/4

P(N) = 1/3 P(D) = 1/2 P(O) = 1/1

$P(O \cap R \cap L \cap A \cap N \cap D \cap O) = 2/7 * 1/6 * 1/5 * 1/4 * 1/3 * 1/2 * 1/1 = 1/2520$

Have you ever wondered????

If the students in your class are randomly grouped into groups of 3, what are the chances you get in a group with your best friend?

How hard it would be to guess someone's pin number?

How many different combinations are there for the lockers?

What are the chances of drawing the cards you need to win a game of poker?

How many different license plates can be made with only 6 characters?

Have you ever wondered????

If the students in your class are randomly grouped into groups of 3, what are the chances you get in a group with your best friend?

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How many different combinations are there for the lockers?

What are the chances of drawing the cards you need to win a game of poker?

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Today we are going to look at how to calculate the number of ways that things can be combined and ordered.

These are called **PERMUTATIONS** and **COMBINATIONS**

Counting Principle vs. Permutations/Combinations

You may be wondering…

Didn't we do this already when we learned the Counting Principle?

Yes and No. The Counting Principle is used when you are making a series of choices and want to see how all the different choices can combine.

Permutations and Combinations are used when you have ONE choice but can pick from that one choice multiple times.

EXAMPLE:
Counting Principle - Make a lunch out of a SANDWICH, CHIPS and a DRINK - three different choices and you pick one from each choice

Combination/Permutation - A basket of a variety chips is on the counter and you pick three bags from the basket - one choice (chips) and you pick it multiple times

Combination vs Permutation in Context

COMBINATION

There are four people in the class Alice, Bob, Carla and David. Three of these students will be chosen to present today. How many ways can the group of three look?

- Alice, Bob and Carla
- Alice, Bob and David
- Alice, Carla and David
- Bob, Carla and David

4 Different Ways

Note: Any other combination in a different order does not need to be listed because it will be a repeated group. Bob, David and Alice are the same three people as group 2 so I don't have to state that group again. I didn't care about the order, just about which three would present today.

PERMUTATION

My friend has a 3 letter padlock with A/B/C/D as the options. What are all the possible combinations?

ABC	BAC	CAB	DAB
ABD	BAD	CAD	DAC
ACB	BCA	CBA	DBA
ACD	BCD	CBD	DBC
ADB	BDA	CDA	DCA
ADC	BDC	CDB	DCB

24 Different Ways

Note: I do need to relist the letters in a different order because rearranging the letters will make a different code. So it is important to know the specific order.

Combination vs Permutation

COMBINATION

- Looking for the number of GROUPS - meaning how many ways can the items be grouped together
- If you switched the order of the list it will NOT make a difference in the outcome
- Example: I will win my poker hand if I draw a three, four and five.

It DOESN'T matter what order you draw these in, as long as you have the right group of numbers

PERMUTATION

- Looking for the number of LINE UPS - meaning how many ways can the items be lined up in order
- If you switched the order of the list it WILL make a difference in the outcome
- Example: I am in the running with 3 other people for a raffle. The first drawn gets a TV the other three get a gift card.

It DOES matter what order you draw these in. If you are drawn first, you win a TV If you are drawn in any other position you only win a GC.

Practice #1: Identifying Types

Below is one Combination, one Permutation and one Counting Principle situation. Identify which one is which.

1. George and Martha are planning a vacation to Washington DC and can't decide which sites to visit. They put all 10 in a hat and will randomly draw 6 and visit those historical sites. How many different groups of 6 sites could they draw?
2. The baseball coach is setting the batting order of the top 9 players for the next game. How many different batting orders could the coach create?
3. There is a technology convention coming up and your company is asking you to attend and pick a seminar from each category: Mobile Technology, Network Security and Innovation. There are 4 different seminars in each category. What are all the different ways combinations of seminars that you can select?

Practice #1 ANSWERS

- George and Martha are planning a vacation to Washington DC and can't decide which sites to visit. They put all 10 in a hat and will randomly draw 6 and visit those historical sites. How many different groups of 6 sites could they draw?
  This is a COMBINATION because it doesn't matter which order they draw the 6 sites out of the hat. The group of sites is what is important, not the order they were drawn.
- The baseball coach is setting the batting order of the top 9 players for the next game. How many different batting orders could the coach create?
  This is a PERMUTATION because it will matter what order the players are picked. There is a difference in whether a player bats first verses ninth. The line up makes a difference.
- There is a technology convention coming up and your company is asking you to attend and pick a seminar from each category: Mobile Technology, Network Security and Innovation. There are 4 different seminars in each category. What are all the different ways combinations of seminars that you can select?
  This is a COUNTING PRINCIPLE because you have 3 different seminar topic choices to make and you are choosing one option from each topic.

Practice #2: Identifying Types

Below is one Combination, one Permutation and one Counting Principle situation. Identify which one is which.

1. Your sister is redecorating her kitchen and has some decisions to make. She is deciding between 4 paint colors, 2 types of countertops and 3 types of flooring. How many different ways could her kitchen look?
2. A local tech company is hiring three computer programming positions. They have 45 applicants to choose from. How many different groups of new employees could be hired?
3. You are trying to guess your friends 3 digit lock out where each digit is between 1 and 5. How many different possible combinations are there?

Practice #2 ANSWERS

- Your sister is redecorating her kitchen and has some decisions to make. She is deciding between 4 paint colors, 2 types of countertops and 3 types of flooring. How many different ways could her kitchen look?
  This is a COUNTING PRINCIPLE because there are three different choices to make for the kitchen and your sister has to pick one choice from each category.
- A local tech company is hiring three computer programming positions. They have 45 applicants to choose from. How many different groups of new employees could be hired?
  This is a COMBINATION because it doesn't matter which order they hire the three applicants in. The important thing is which group of 3 applicants they choose.
- You are trying to guess your friends 3 digit lock out where each digit is between 1 and 5. How many different possible combinations are there?
  This is a PERMUTATION because the order you put the numbers in the pin code will matter. The line-up of numbers makes a difference. Code 521 is different than 215.

Practice #3: Identifying Types

Below is one Combination, one Permutation and one Counting Principle situation. Identify which one is which.

1. Student council needs to elect a president, vice president, treasurer and secretary from their 10 members. How many different ways could the positions be assigned?
2. Carolyn's mother is trying to decide which type of cupcakes to serve at her friend's retirement party. The cupcake company has 20 different options and Carolyn is allowed to choose 4 flavors for her mixed box. How many different flavor assortments could she choose?
3. There is a new restaurant in town that is a build your own pizza place. This pizza place has wheat, white and gluten free crust. Once you choose your crust, there are two sauce options (tomato and alfredo), 5 cheese choices and 8 toppings. How many different types of 1 topping pizzas can you make?

Practice #3 ANSWERS

- Student council needs to elect a president, vice president, treasurer and secretary from their 10 members. How many different ways could the positions be assigned?
  This is a PERMUTATION because the order you list the names in is important. Saying that Mary - Pres, John - VP, Carol - Treas and Carlos - Sec is different than John - Pres, Mary - VP, Carlos - Sec and Carol - Treas.
- Carolyn's mother is trying to decide which type of cupcakes to serve at her friend's retirement party. The cupcake company has 20 different options and Carolyn is allowed to choose 4 flavors for her mixed box. How many different flavor assortments could she choose?
  This is a COMBINATION because there are 20 different flavor options and you get to choose 5 of them. It doesn't matter what order the cupcakes are put in the box, what matters is which flavors are put in the box.
- There is a new restaurant in town that is a build your own pizza place. This pizza place has wheat, white and gluten free crust. Once you choose your crust, there are two sauce options (tomato and alfredo), 5 cheese choices and 8 toppings. How many different types of 1 topping pizzas can you make?
  This is a COUNTING PRINCIPLE because there are four different options for each phase of the pizza and you need to choose one of each option to build your pizza.