Inspiring Greatness

ISD

INDEPENDENCE SCHOOL DISTRICT

## Math Virtual Learning

# Probability and Statistics

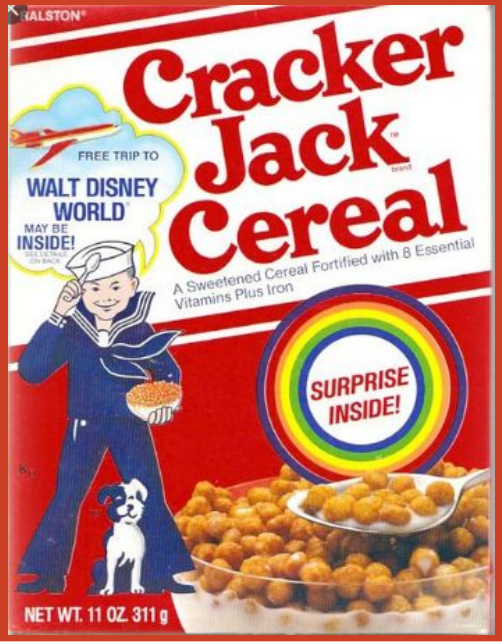
May 12, 2020

Probability and Statistics
Lesson: May 12, 2020

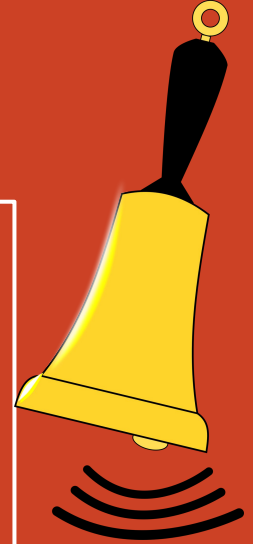
**Objective/Learning Target:**
Students will be able to answer probability questions using the Fundamental Counting Principle

# Let's Get Started!

Cereal companies used to advertise prizes inside of their cereal boxes. The makers of Cracker Jack Cereal had this promotion….Every box got a free Looney Tunes Character Spoke Reflector (for a bicycle) and that if yours had a picture of a bicycle on it, you won a real BMX bike!!!

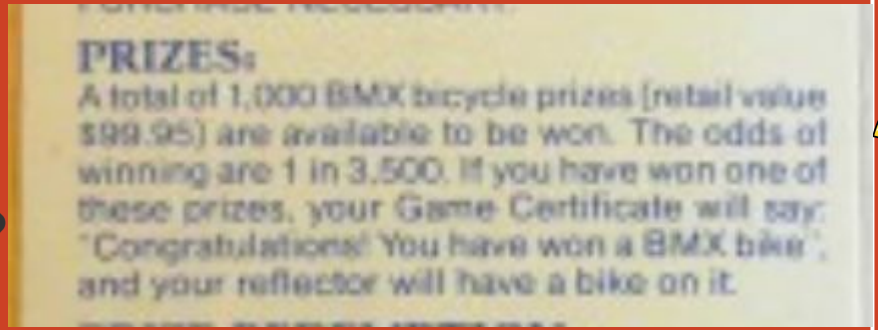






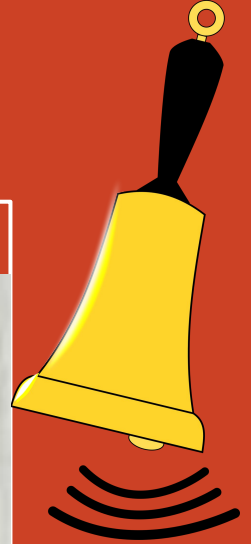
# Let's Get Started!

If you look closer at the fine print, you will see that the Odds of winning are 1 in 3,500

**PRIZES:**
A total of 1,000 BMX bicycle prizes (retail value $99.95) are available to be won. The odds of winning are 1 in 3,500. If you have won one of these prizes, your Game Certificate will say "Congratulations! You have won a BMX bike", and your reflector will have a bike on it.

- What is the probability that you will win a BMX bike?
- What does that mean in reality?
- Why do they list odds instead of probability?
- How many boxes do they need to produce before all 1,000 bike pieces are put into a box of cereal?
- Do you think they really gave away all 1,000 bikes? Why or Why not?



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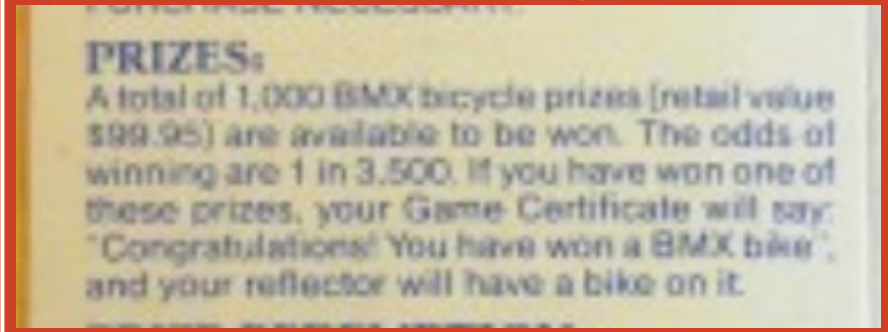
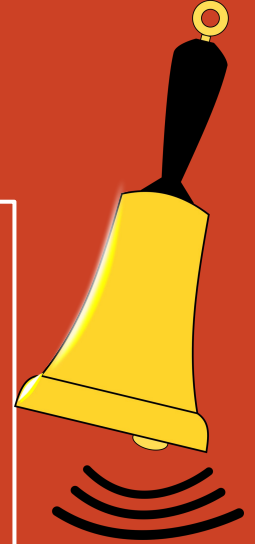

PRIZES:
A total of 1,000 BMX bicycle prizes (retail value $99.95) are available to be won. The odds of winning are 1 in 3,500. If you have won one of these prizes, your Game Certificate will say "Congratulations! You have won a BMX bike", and your reflector will have a bike on it.



- What is the probability that you will win a BMX bike? **1/3501**
- What does that mean in reality? **Your chances are slim. Even if you buy 3,501 boxes there might not be a winner in the store you are buying from. It's not false advertising because they really do put a winner in every 3,501st box but who knows where that 3,501st box is at? There could be 2 in one store and none in your store. It is a ploy to get you to keep buying more boxes. They know that kids will beg and beg their parents to keep buying the boxes in hopes that they win the bike.**

# Let's Get Started!

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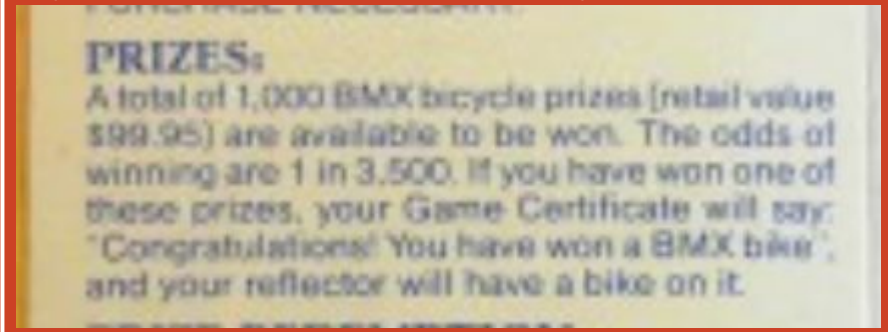
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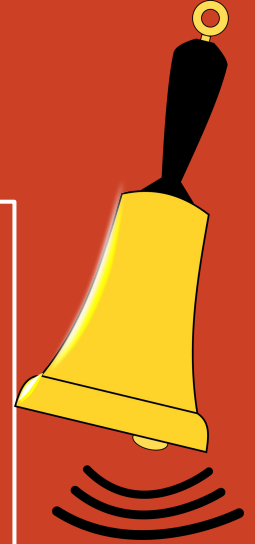


- Why do they list odds instead of probability? **It looks like you have a better chance of winning**
- How many boxes do they need to produce before all 1,000 bike pieces are put into a box of cereal? **3,501 * 1,000 = 3,501,000**
- Do you think they really gave away all 1,000 bikes? **NO**
  Why or Why not? **Because some of the boxes get outdated before they are sold and so they are destroyed and never found. Some are simply never bought. Some kids lose the piece before it can be redeemed.**

# Fundamental Counting Principle Review

- ★ The **Fundamental Counting Principle** was used when you are asked to make a series of choices
- ★ To find the total number of possible combinations you multiply the number of options for each choice together.
- ★ You may have to draw a tree diagram if it is important to know the specific details of the combinations. But this is tedious so only do so if you need to know specifics.

# Fundamental Counting Principle Practice #1

The cafeteria is putting together grab and go lunches for a field trip. You will be assigned a lunch at random. The staff has 3 different sandwich options (turkey, ham and bologna), 2 chip choices (Doritos and Hot Cheetos) and 3 drink options (water, juice and Gatorade).

How many different combinations for lunch are possible?

What is the probability that you will get a lunch that has Turkey, Doritos and Gatorade?

# Practice #1 ANSWERS

The cafeteria is putting together grab and go lunches for a field trip. You will be assigned a lunch at random. The staff has 3 different sandwich options (turkey, ham and bologna), 2 chip choices (Doritos and Hot Cheetos) and 3 drink options (water, juice and Gatorade).

How many different combinations for lunch are possible?

Choice 1 (Sandwiches) has 3 options

Choice 2 (Chips) has 2 options

Choice 3 (Drinks) has 3 options

Total Possibilities: 3 * 2 * 3 = 18 different possibilities for lunch combinations

What is the probability that you will get a lunch that has Turkey, Doritos and Gatorade?

Only one combination would have all three of these choices so the probability is 1/18

# Fundamental Counting Principle Practice #2

A man set up a 5 digit password for his account. The first and third digits are letters and the second, fourth and fifth digits are numbers?

You are trying to hack his account...what is the probability that you will guess his password correctly on the first try?

# Practice #2 ANSWERS

A man set up a 5 digit password for his account. The first and third digits are letters and the second, fourth and fifth digits are numbers?

You are trying to hack his account...what is the probability that you will guess his password correctly on the first try?

Choice 1: 26 options (A - Z)
Choice 2: 10 options (0 - 9)
Choice 3: 26 options (A - Z)
Choice 4: 10 options (0 - 9)
Choice 5: 10 options (0 - 9)
Total Possibilities:  676,000 (26*10*26*10*10) possible password
Probability of guessing it on the first try:  1/676000 = 0.0001% chance

# Fundamental Counting Principle Practice #3

A men's department store is setting up a display to advertise their new line of suits. The new line includes 3 styles of jackets, 6 different colors of shirts, 8 different tie patterns, and 4 different cuts of pants.

How many different ways could the mannequin be dressed to display the new line?

# Practice #3 ANSWERS

A men's department store is setting up a display to advertise their new line of suits. The new line includes 3 styles of jackets, 6 different colors of shirts, 8 different tie patterns, and 4 different cuts of pants.

How many different ways could the mannequin be dressed to display the new line?

Choice 1 (jackets): 3 options
Choice 2 (shirts): 6 options
Choice 3 (ties): 8 options
Choice 4 (pants): 4 options

Total Possibilities: 3*6*8*4 = 576 ways the mannequin could be dressed

# Fundamental Counting Principle Practice #4

You go to a snack bar after working out to order a bagel and a protein shake.  The cashier starts asking which bagel you'd like (blueberry, plain or whole grain) and which flavor of protein shake you would like (power fruit or green machine).  You are too exhausted to think so you tell her to surprise you.

How many different snack combinations could you get?

What is the probability that your combination will include a blueberry bagel?

# Practice #4 ANSWERS

You go to a snack bar after working out to order a bagel and a protein shake. The cashier starts asking which bagel you'd like (blueberry, plain or whole grain) and which flavor of protein shake you would like (power fruit or green machine). You are too exhausted to think so you tell her to surprise you.

How many different snack combinations could you get?
Choice 1 (bagels): 3 options
Choice 2 (shakes): 2 options
Total combinations: 3*2 = 6 ways she could surprise you with a snack

What is the probability that your combination will include a blueberry bagel?
Because there are 3 types of bagels, 1 out of every 3 combinations will contain a blueberry bagel. So the chances of getting a blueberry bagel is ⅓.

# Fundamental Counting Principle Practice #5

A restaurant offers a build your own pizza option.  There are 4 size options and for each size you have the option of 2 types of crust and 8 topping options.

If the store wanted to have one of every 1 topping pizza option prepped for baking, how many different pizzas would be in their cooler?

# Practice #5 ANSWERS

A restaurant offers a build your own pizza option.  There are 4 size options and for each size you have the option of 2 types of crust and 8 topping options.

If the store wanted to have one of every 1 topping pizza option prepped for baking, how many different pizzas would be in their cooler?

Choice 1 (sizes): 4 options
Choice 2 (crust): 2 options
Choice 3 (toppings): 8 options
Total Possibilities:  4*2*8 = They would have 64 prepped pizzas in the cooler.

# Fundamental Counting Principle Practice #6

Grace loves to eat salad!  How many different salads can she make out of 2 types of lettuce, 4 vegetable options and 7 different dressings (assuming she only picks one from each category)?

What is the probability that she will choose a salad made from romaine lettuce topped with tomatoes using ranch dressing?

# Practice #6 ANSWERS

Grace loves to eat salad!  How many different salads can she make out of 2 types of lettuce, 4 vegetable options and 7 different dressings (assuming she only picks one from each category)?

What is the probability that she will choose a salad made from romaine lettuce topped with tomatoes using ranch dressing?

In order to find probability, we need to know the total number of possible outcomes

Choice 1 (Lettuce):  2 options
Choice 2 (Veggies): 4 options
Choice 3 (Dressing): 7 options
Total Possibilities:  2*4*7 = 56 salad combinations

Only one of those would be the combination stated so the Probability = 1/56

# Fundamental Counting Principle Practice #7

An elementary teacher is on a committee to choose new books for the 4th grade classroom. The committee is examining 4 Science books, 3 History books, 5 Math books and 2 Art books.

How many different combinations of curriculum could be chosen?

What is the probability that the combination chosen will include the one math book considered by the company I work for?

# Practice #7 ANSWERS

An elementary teacher is on a committee to choose new books for the 4th grade classroom. The committee is examining 4 Science books, 3 History books, 5 Math books and 2 Art books.

How many different combinations of curriculum could be chosen?
Choice 1 (Science): 4 options
Choice 2 (History): 3 options
Choice 3 (Math): 5 options
Choice 4 (Art): 2 options
Total combinations: 4*3*5*2 = 120 different curriculum combinations

What is the probability that the combination chosen will include the one math book considered by the company I work for?
Note the question said my company had ONE math book in consideration. There were 5 total math book considerations. So 1 out of every 5 combinations will include my company's book. Therefore the probability my company's book is chosen is ⅕ = 20%

# Fundamental Counting Principle Practice #8

Martha needs to get from Pythagorasville to Quartiletown. Unfortunately there is no road to goes directly between the two towns. There are, however, 4 roads that lead from Pythagorasville to Algebraville and 3 roads that go from Algebraville to Quartiletown.

I live on one of the roads between Pythagorasville and Algebraville and my sister lives on one of the roads between Algebraville and Quartiletown. What is the probability that Martha will pass both of our homes on her trip?

# Practice #8 ANSWERS

Martha needs to get from Pythagorasville to Quartiletown. Unfortunately there is no road to goes directly between the two towns. There are, however, 4 roads that lead from Pythagorasville to Algebraville and 3 roads that go from Algebraville to Quartiletown.

I live on one of the roads between Pythagorasville and Algebraville and my sister lives on one of the roads between Algebraville and Quartiletown. What is the probability that Martha will pass both of our homes on her trip?

We first need to find the total number of routes that Martha has an option of taking.

Choice 1: 4 roads
Choice 2: 3 roads
Total possibilities: There are 12 different routes Martha could take.
Only one of those routes would have both my and my sister's houses on them
So the probability Martha passes both houses is 1/12.

# Fundamental Counting Principle Practice #9

An old time soda shoppe carries 4 different flavors of ice cream sodas (Chocolate, Strawberry Vanilla and Banana) available in 3 sizes (small, medium and large). Each flavor and size combination has a different code. How many different codes does the shoppe have in their system?

What is the probability that a random customer will walk in and place an order for any one of these combinations: a Medium Strawberry soda, any size Chocolate soda or any flavor Large soda?

# Practice #9 ANSWERS

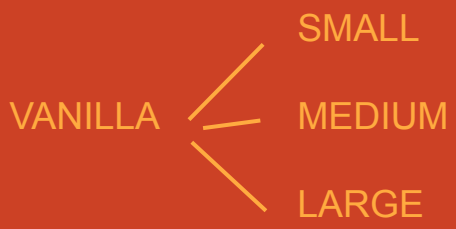
An old time soda shoppe carries 4 different flavors of ice cream sodas (Chocolate, Strawberry, Vanilla and Banana) available in 3 sizes (small, medium and large). Each flavor and size combination has a different code. How many different codes does the shoppe have in their system?
Choice 1 (Flavors): 4 options
Choice 2 (Sizes): 3 options
Total Possibilities: 4*3 = 12 different codes in the system

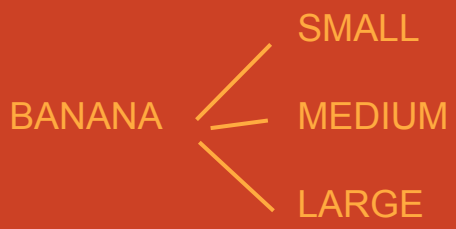
What is the probability that a random customer will walk in place an order for a Medium Strawberry soda, any size Chocolate soda or any flavor Large soda?
**NOTE: It might be handy to make a tree diagram for this one. The number of options is small enough and you have to look at some specific combinations for probability **
One is drawn on the next slide for reference.

- There is 1 soda that is a Medium Strawberry
- There are 3 Chocolate sodas (small, medium and large)
- There are 4 large sodas (one for each flavor) - but we have already counted the Large Chocolate in bullet point 2 - so only add 3 more to your count
- Probability is 7/12

# Practice #9 Tree Diagram





# Fundamental Counting Principle Practice #10

A doctor has 5 patients waiting in the ER for similar injuries. They all came in at the same time so the order they will get seen in is a random selection. How many different ways can the patients be seen?

One of the patient's name is Ursela. What is the probability that Ursela will be seen first?

# Practice #10 ANSWERS

A doctor has 5 patients waiting in the ER for similar injuries. They all came in at the same time so they will get seen in a lottery. How many different ways can the patients be seen?

Choice 1 (1st Patient): 5 choices
Choice 2 (2nd Patient): 4 choices (one patient has already been seen)
Choice 3 (3rd Patient): 3 choices (two patients have already been seen)
Choice 4 (4th Patient): 2 choices (three patients have already been seen)
Choice 5 (5th Patient) 1 choice (all other patients have been seen)
Total Possibilities: 120 ways the patients could be seen

One of the patient's name is Ursela. What is the probability that Ursela will be seen first?

Since it is at random and there are 5 patients, Ursela has a ⅕ chance of being seen first = 20%