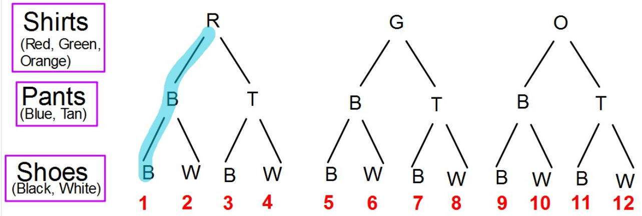
Monday, May 18, 2020

Begin: Outcomes, Probability, and Statistics

You are packing for weekend trip and decide to take 2 pairs of pants(blue & tan), 2 pairs of shoes(black & white), and 3 shirts(red, green & orange). If an outfit consists of one of each, how many different outfits could be created using what you've packed?

One way to answer this question is to create a tree diagram:



There are 12 possible outfits

Another way to answer this question is to apply the Multiplication Counting Principle.

<u>Multiplication Counting Principle</u>:

Stated simply, it is the idea that if there are M ways of doing something and N ways of doing another thing, then there are M•N ways of performing both things.

For our example:

You are packing for weekend trip and decide to take 2 pairs of pants(blue & tan), 2 pairs of shoes(black & white), and 3 shirts(red, green & orange). If an outfit consists of one of each, how many different outfits could be created using what you've packed?

$\underset{\text{\# shirts}}{\underline{\ 3\ }} \times \underset{\text{\# pair of pants}}{\underline{\ 2\ }} \times \underset{\text{\# pair of shoes}}{\underline{\ 2\ }} = 12$ outfits

You want to order a 1-topping pizza and have the following to choose from:

- 3 sizes
- 4 different kinds of crust
- 8 different toppings

How many different 1-topping pizzas are possible?

$\underset{\text{size}}{\underline{\ 3\ }} \times \underset{\text{crust}}{\underline{\ 4\ }} \times \underset{\text{topping}}{\underline{\ 8\ }} = 96$ 1-topping pizzas

For access to your rewards points at a local store you have to come up with a password. This password must have the following requirements:

- 5 characters long.
- the first 2 characters must be a single digit from 0-9 but you CAN'T repeat a digit. (this is **10** different digits!)
- the last 3 characters must a be a single letter but you CAN repeat a letter.

Find the number of possible passwords.

$\underset{\text{digit}}{\underline{\ 10\ }} \times \underset{\text{digit}}{\underline{\ 9\ }} \times \underset{\text{letter}}{\underline{\ 26\ }} \times \underset{\text{letter}}{\underline{\ 26\ }} \times \underset{\text{letter}}{\underline{\ 26\ }}$

= 1,581,840 different passwords

Eight people entered a contest for which the following prizes are awarded:

- $100 1st place
- $50 2nd place
- $25 3rd place

How many different ways could these prizes be awarded?

8 x 7 x 6 = 336 different ways to award these prizes

8	x	7	x	6
# of people that could come in 1st		remaining # of people that could come in 2nd		remaining # of people that could come in 3rd

There are five children in a drawing contest. The judges will award five different prizes to these children. How many ways could the judges award these prizes?

5 x 4 x 3 x 2 x 1 = 120 different ways to award all 5 prizes

5	x	4	x	3	x	2	x	1
# who could get first prize		# left for next prize		# left for next prize		# left for next prize		# left for last prize

The previous problem introduces another concept.

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

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

Most scientific calculators can do factorial. I've also posted a link to an online factorial calculator on my blog under "Helpful Math Resources and Math Links".

There are 12 people on a basketball team and only 12 uniforms to pass out.

How many different ways can all 12 uniforms be passed out to the players?

12 x 11 x 10 x __ x __ x __ x __ x __ x __ x __ x 2 x 1

12! = 479,001,600

If there were 12 uniforms but only 8 players, how many ways could the uniforms be passed out?

12 x 11 x 10 x 9 x 8 x 7 x 6 x 5

= 19,958,400 ways to pass out uniforms

There are 7 people running a race.

What if prizes are only awarded to the top three finishers?

In other words, how many ways can 1st, 2nd, and 3rd places be awarded to the 7 people running in the race?

Multiplication Counting Principle:

7 x 6 x 5 = 210 ways to award 1st, 2nd, & 3rd place

There are 7 people running a race.

Suppose everybody who runs the race wins a prize. How many ways can the prizes be awarded now?

You could still use the Multiplication Counting Principle but since ALL 7 racers will be awarded a prize you could use Factorial.

7! = 5040 ways to award 7 prizes to 7 racers.

You can now finish the first part of Practice #28.

Due date for this practice is still to be determined.