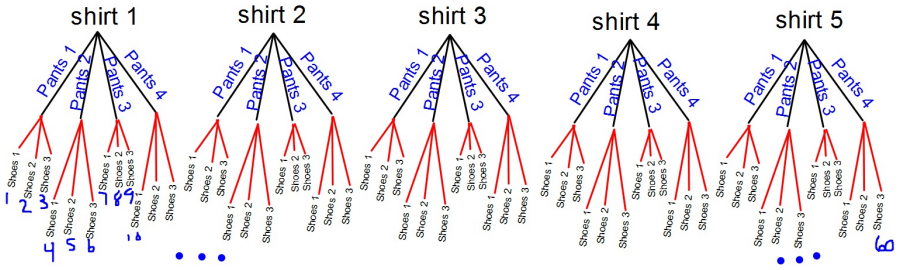
Outcomes, Probability, and Statistics

Each morning you must decide what to wear.
An outfit consists of a pair of shoes, a pair of pants, and a shirt.
You have the following to choose from:

3 pairs of shoes
4 pairs of pants
5 shirts

How many different outfits are possible?

Tree Diagram:



If you add up all the ends of the branches it will represents the total number of outfits.

60 different outfits.

Multiplication Counting Principle:

multiplying the number of choices for each step

$$\underset{\text{\# shirt choice}}{5} \cdot \underset{\text{\# of pants choices}}{4} \cdot \underset{\text{\# of shoes choices}}{3} = 60 \text{ outfits}$$

A restaurant has the following menu choices:

Appetizers	Wings, Potato Skins, Onion Rings, Cheese Sticks
Entrées	Chicken, Lamb, Steak, Burgers, Ham, Ribs
Desserts	Ice Cream Cone, Cake, Pie, Cupcake, Brownie, Ice Cream Sundae

$$\frac{4}{\text{app}} \cdot \frac{6}{\text{ent}} \cdot \frac{6}{\text{des}} = 144 \text{ diff. dinners}$$

A dinner consists of one Appetizer, one Entrée, and one Dessert. Find the number of different dinners that are possible.

There are 5 people running a race. How many different ways can 1st through 5th place be awarded?

$$\underbrace{5}_{\substack{\#\text{ of people}\\ \text{that can}\\ \text{come in 1st}}} \cdot \underbrace{4}_{\substack{\#\text{ of people}\\ \text{remaining}\\ \text{that can}\\ \text{come in 2nd}}} \cdot \underbrace{3}_{\substack{\#\text{ of people}\\ \text{remaining}\\ \text{that can}\\ \text{come in 3rd}}} \cdot \underbrace{2}_{\substack{\#\text{ of people}\\ \text{remaining}\\ \text{that can}\\ \text{come in 4th}}} \cdot \underbrace{1}_{\substack{\#\text{ of people}\\ \text{remaining}\\ \text{that can}\\ \text{come in 5th}}} = 120$$

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

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