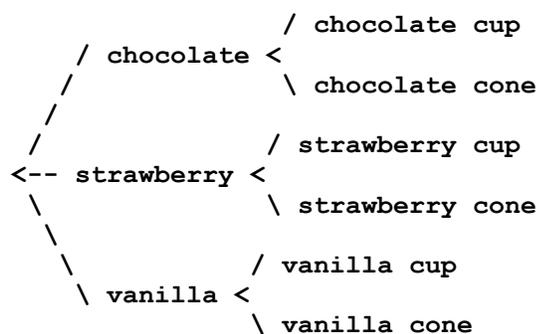


## Notes: Fundamental Counting Principle

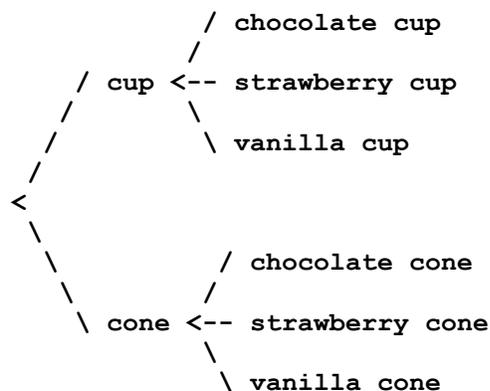
The Basic or Fundamental Counting Principle can be used to find the number of possibilities when given several groups.

How? Multiply the number of elements in each group together.

**Example:** Ice cream comes in either a cup or a cone and the flavors available are chocolate, strawberry and vanilla.



The diagram above is called a tree diagram and shows all of the possibilities. The tree diagram could also be arranged in another way. Both diagrams have 6 total outcomes.



To determine the total number of outcomes, multiply the number of possibilities of the first characteristic times the number of possibilities of the second characteristic. In the example above, multiply 3 times 2 to get 6 possible outcomes.

If there are more than two outcomes, continue to multiply the possibilities together to determine the total outcomes.

**Example: How many different license plates are there altogether? Look at what's used to make a plate:**

LETTER LETTER LETTER NUMBER NUMBER NUMBER  
For each of the letters we have 26 choices. For each of the numbers we have 10 choices.

The number of ways to pick the first letter	The number of ways to pick the second letter	The number of ways to pick the third letter	The number of ways to pick the first number	The number of ways to pick the second number	The number of ways to pick the third number
26	26	26	10	10	10

The Fundamental Counting Principle says that:  
*The total number of ways to fill the six spaces on a license plate is*  
 **$26 \times 26 \times 26 \times 10 \times 10 \times 10$**   
*which equals 17,576,000*

**NOTE:** If you have a problem where you can repeat objects, then you must use the Fundamental Counting Principle; you cannot use Permutations or Combinations.

## Fundamental Counting Principle Worksheet

1. Suppose most of your clothes are dirty and you are left with 2 pants and 3 shirts. How many choices do you have or how many different ways can you dress?
2. You go a restaurant to get some breakfast. The menu says pancakes, waffles, or home fries. And for drink, coffee, juice, hot chocolate, and tea. How many different choices of food and drink do you have?

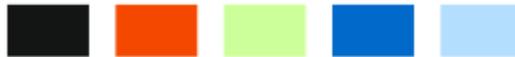
### 3. You are buying a new car.

There are 2 body styles:



sedan or hatchback

There are 5 colors available:



There are 3 models:

GL (standard model),  
SS (sports model with bigger engine)  
SL (luxury model with leather seats)

### How many total choices?

4. You are assigned a computer-generated 4 digit password to access your new voice mail account. If the digits can be repeated, how many possible passwords are there?