Algebra 2, Probability Unit: **The Fundamental Counting Principle**

Brainstorm: For #A2Pio breakfast, you're given a choice of drink: Orange Juice or Milk.
And then given a choice of meal: French Toast Stix, Bagel, or Cereal.

How many distinct meals can be ordered for breakfast?

$$\underset{\text{Drink}}{\boxed{2}} \times \underset{\text{entree}}{\boxed{3}} = \underset{\text{meals}}{6}$$

The **Fundamental Counting Principle** states that if you wish to find the number of outcomes for a given situation, simply multiply the number of outcomes for each individual event.

For example, using the opening Brainstorm example, you could just say $2 \times 3 = 6$ Meals.

Let's look at some examples, shall we?

Example 1: If Mr. Hansen has 18 solid-colored dress shirts, 5 different pairs of pants, and two different pairs of shoes, how many unique outfits could he assemble?

$$\underset{\text{Shirt}}{\boxed{18}} \times \underset{\text{Pants}}{\boxed{5}} \times \underset{\text{Shoes}}{\boxed{2}} = \underset{\text{outfits}}{180}$$

Example 2: You're trying to decide on a 4-letter random password for work, but the first letter MUST be "P." How many different passwords are possible?

26 LTR Alphabet

$$\underset{P}{\boxed{1}} \times \boxed{26} \times \boxed{26} \times \boxed{26} = 17,576 \text{ unique pwords}$$

Example 3: Suppose you are dealt two cards from a standard deck of 52 playing cards. How many different outcomes are possible?

$$\boxed{52} \times \boxed{51} = 2,652 \text{ ways}$$

Example 4: How many different 7-digit phone numbers are possible if no phone number may begin with a zero?

0 1, 2, 3, 4, 5, 6, 7, 8, 9 Choices

$$\boxed{9} \times \boxed{10} \times \boxed{10} \times \boxed{10} \times \boxed{10} \times \boxed{10} \times \boxed{10} = 9,000,000$$

Example 5: A teenager is given 5 different jobs that she must do prior to going out with friends. The jobs are: washing Mom's car, starting a load of laundry, vacuuming the family room, taking out the garbage, and putting away the dishes. In how many different orders could the teenager complete these jobs?

$$\boxed{5} \times \boxed{4} \times \boxed{3} \times \boxed{2} \times \boxed{1} = 120$$

$$5!$$