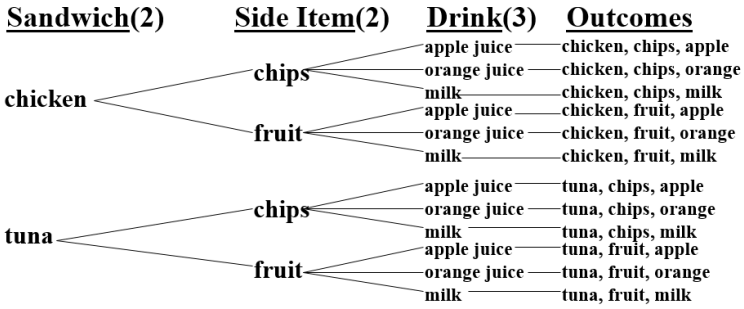
Name _____ Date _____

Day 1 – The Counting Principle, Subsets, and Logic

The Counting Principle

In many real life situations, you may want to count the number of possibilities. Suppose your school cafeteria offers chicken or tuna sandwiches; chips or fruit; and milk, apple juice, or orange juice. If you purchase one sandwich, one side item and one drink, how many different lunches can you choose?

You could make a tree diagram like the following:



Another way to count the number of possible lunches is to use the counting principle. Because you have 2 sandwich choices, 2 side item choices, and 3 drink choices, the total number of choices is $2 \bullet 2 \bullet 3 = 12$.

Practice:

1. At a sporting goods store, skateboards are available in 8 different deck designs. Each deck design is available with 4 different wheel assemblies. How many skateboard choices does the store offer?

2. A father takes his son, Sebastian, to Wendy's for lunch. He tells Sebastian he can get a 5 piece nuggets, a spicy chicken sandwich, or a single for the main entrée. For sides, he can get fries, a side salad, potato, or chili. And for drinks, he can get a frosty, coke, sprite, or an orange drink. How many options for meals does Sebastian have?

Factorials

The **factorial** of a number, denoted by n!, is the product of all positive integers less than or equal to n.

Example:

$$6! = 6 \bullet 5 \bullet 4 \bullet 3 \bullet 2 \bullet 1 = 720$$

Sometimes we use the factorial of a number in probability. Let's see why this makes sense.

Practice:

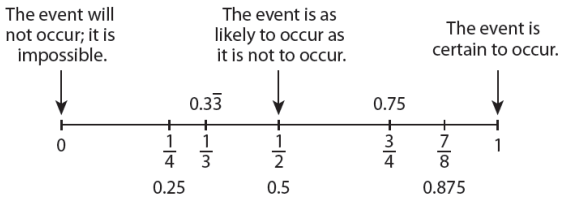
iPods can vary the order in which songs are played. Your iPod currently only contains 8 songs. Find the number of orders in which the songs can be played.

1st Song	2nd	3rd	4th	5th	6th	7th	8th	Outcomes

Songs available to choose:

Probability

- A number from 0 to 1
- As a percent from _____ to _____
- Indicates how likely an _____will occur



In probability, a **sample space** is the set of all possible outcomes. This is also known as the universal set. Any subset from the sample space is an **event.**

A **single event** is an event that describes a single outcome.

Examples:

a. Flipping a coin and landing on heads
b. Rolling a 3 with a die

A **compound event** combines two or more events using the word **and** or the word **or**.

Examples:

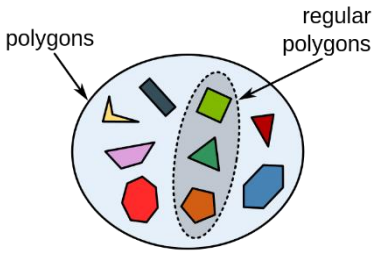
a. Rolling a die two times
b. Flipping a coin four times.

Practice:

Sample Space: all the playing cards in a 52 card deck
Event: drawing a queen of hearts *Event*: drawing a club *Event*: _____

A **subset** is a list or collection of items all contained within another set. Denoted by A⊂B, if all the elements of A are also in B.

Example:



Regular polygons are a subset of polygons.

Practice:

Let A be all multiples of 4 and B be all multiples of 2.

- A = {..., -8, -4, 0, 4, 8, ...}
- B = {..., -8, -6, -4, -2, 0, 2, 4, 6, 8, ...}

Is A a subset of B? And is B a subset of A?

The **empty set** is A set that has NO elements. Also called a **null set**. Denoted by ∅.

Examples:

The set of squares with 5 sides.
The set of cars with 20 doors.