

## Warm - Up

Take five minutes to list as many things you know about probability.

SWBAT find the basic probability of certain events

Agenda:

- Warm - Up

- Basic Probability

- Venn Diagrams

The probability of any outcome of a chance process is a number between 0 and 1 that describes the proportion of times the outcome would occur in a very long series of repetitions

***Probability is a number between 0 and 1 or 0 and 100%***

***\*For any event A,  $0 \leq P(A) \leq 1$ .***

***The sum of the probabilities is 1 or 100%.***

## The myth of law of averages

You are at a casino and watching the Roulette table. You see that a red number has come up 12 straight times, so you decide to bet big on black.

## Creating a Simulation

**State:** What is the question of interest about some chance process?

**Plan:** Describe how to use a chance device to imitate one repetition of the process. Explain clearly how to identify the outcomes of the chance process and what variable to measure

**Do:** Perform many repetitions of the simulation

**Conclude:** Use the results of your simulation to answer the question of interest

The sample space  $S$  of a chance process is the set of all possible outcomes (tree diagrams, lists, etc.)

A probability model is a description of some chance process that consists of two parts; a sample space  $S$  and a probability for each outcome

**Sample Space:**

**\*Coin(s)- Heads or Tails**

**-two coins(HH, HT, TH, TT)**

**\*Die (Dice)- 1, 2, 3, 4, 5, or 6**

**-two dice have 36 possible outcomes**

**\*Deck of Cards- 52 cards, 4 suits(clubs, diamonds, spades, and hearts), 13 in each suit, 2 are red, 2 are black**

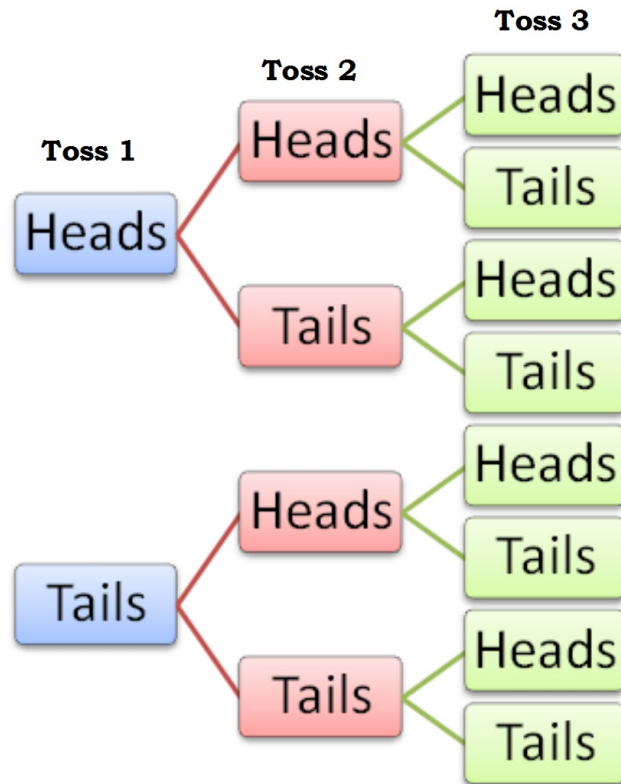
**Sample Space for Two Dice:**

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

**Event: the specific object or result you are looking for.**

$$\text{Probability} = \frac{\begin{array}{c} \text{desired result} \\ \text{(Event)} \end{array}}{\begin{array}{c} \text{all possible outcomes} \\ \text{(Sample Space)} \end{array}}$$

### ***Flipping Three Coins***



***P(red card)-***

***P(spade)-***

***P(Jack or a Queen)-***

***P(Black card and a 4)-***

***P(spade or an ace)-***

***P(diamond and an even number)-***

***P(face card)-***

***P(face card or a heart)-***

An event is any collection of outcomes from some chance process. That is, an event is a subset of the sample space. Events are usually designated by capital letters, like  $A$ ,  $B$ ,  $C$ , and so on.

## Worksheet



**$A^c$  --The set of outcomes that are NOT in the event A.  
Called the complement of A.**

**Complement Rule- the probability of an event occurring is 1 minus the probability that it does not occur.**

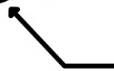
$$P(A) = 1 - P(A^c)$$

### **DISJOINT**

- Events that cannot occur together
- aka mutually exclusive

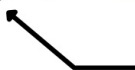
**For two disjoint events A and B, the probability that one or the other occurs is the sum of the probabilities of the two events.**

$$P(A \cup B) = P(A) + P(B) \text{ * A and B must be disjoint}$$



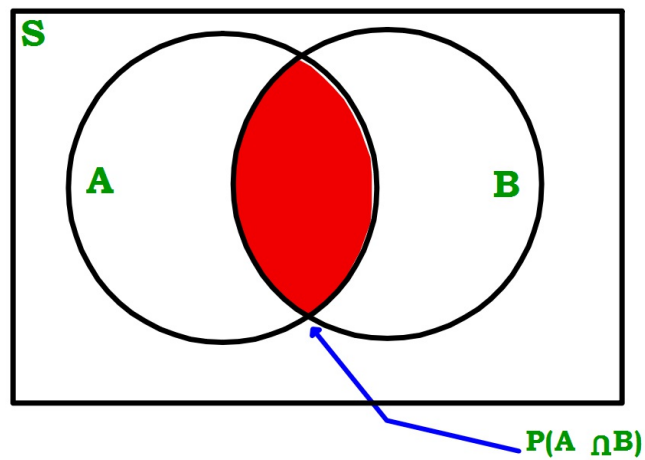
**For two independent events A and B, the probability that both A and B occur is the product of the probabilities of the two events.**

$$P(A \cap B) = P(A) \times P(B) \text{ * A and B must be independent}$$



**$P(A \cap B)$**

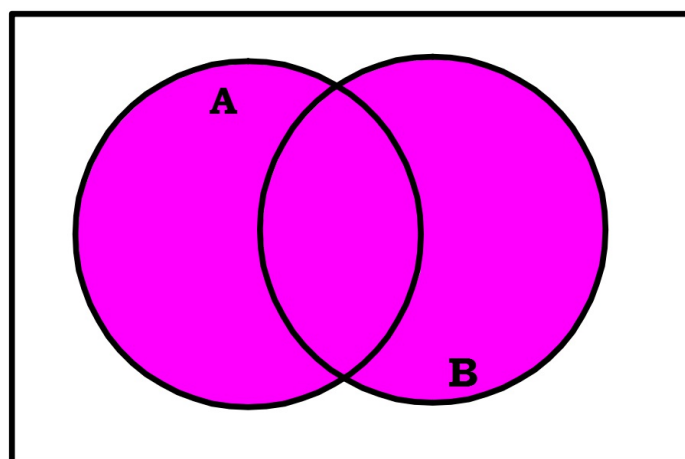
**$\cap$ - intersection also know as and**



**A intersection B- what A and B have in common**

**$P(A \cup B)$**

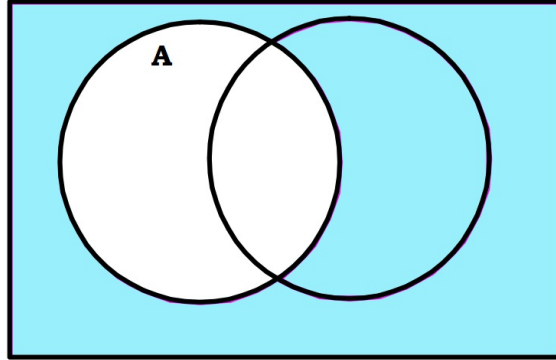
**The union of A and B.**



**$P(A \cup B)$ - what is in both A and B.**

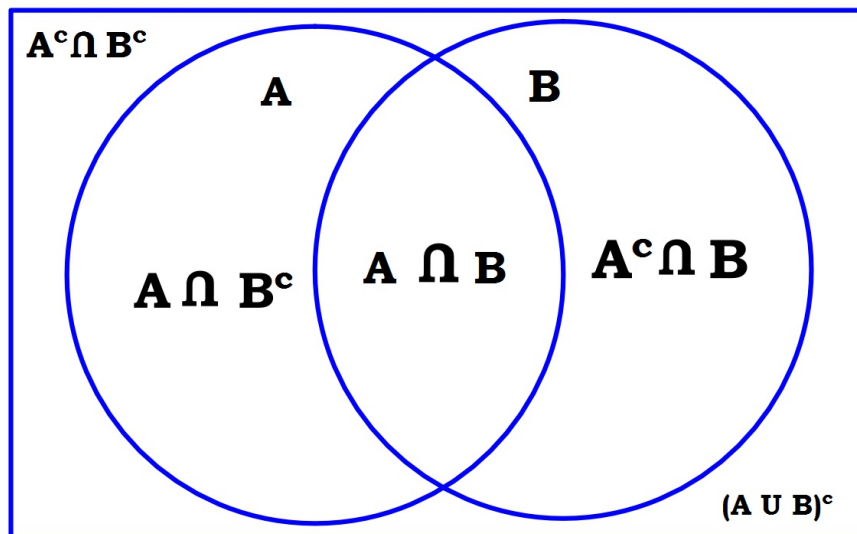


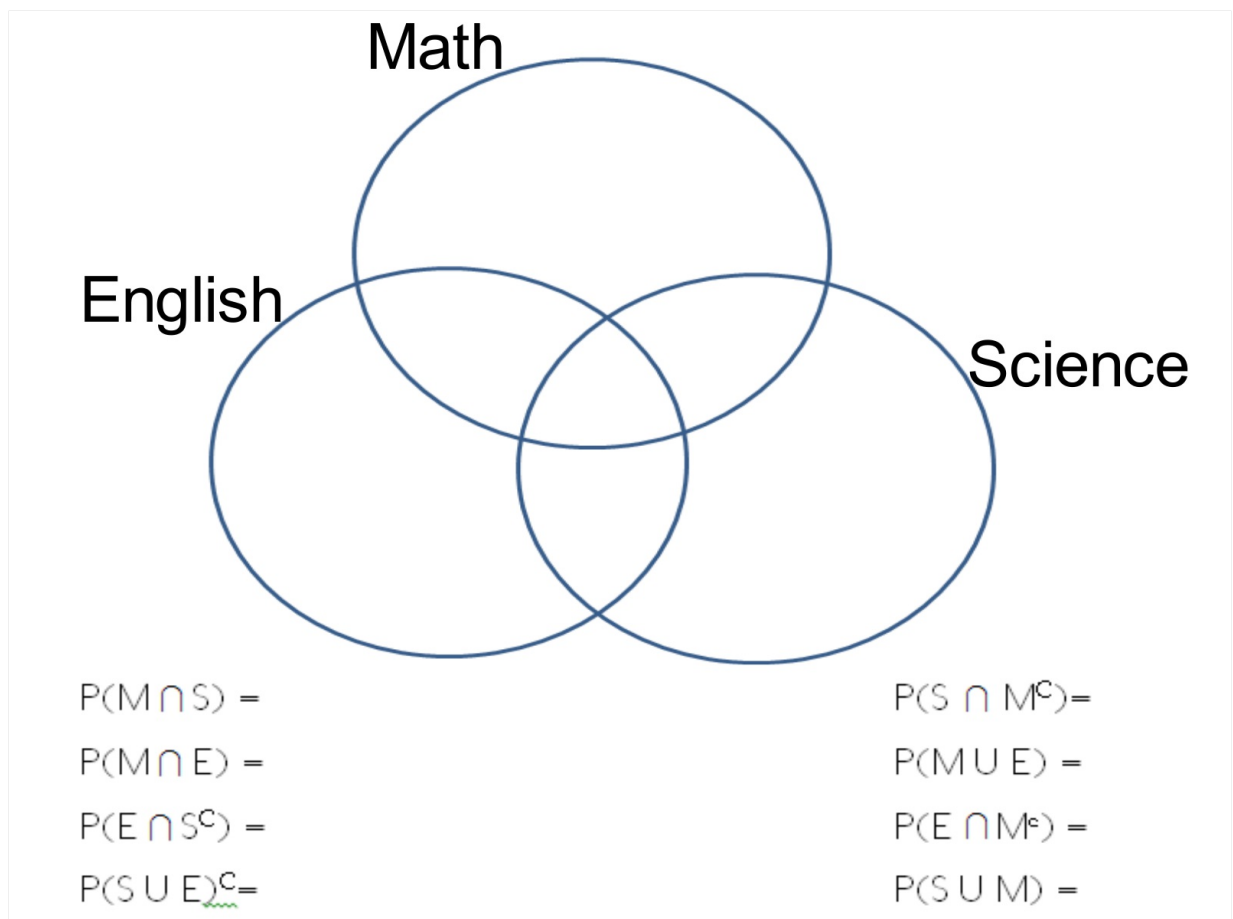
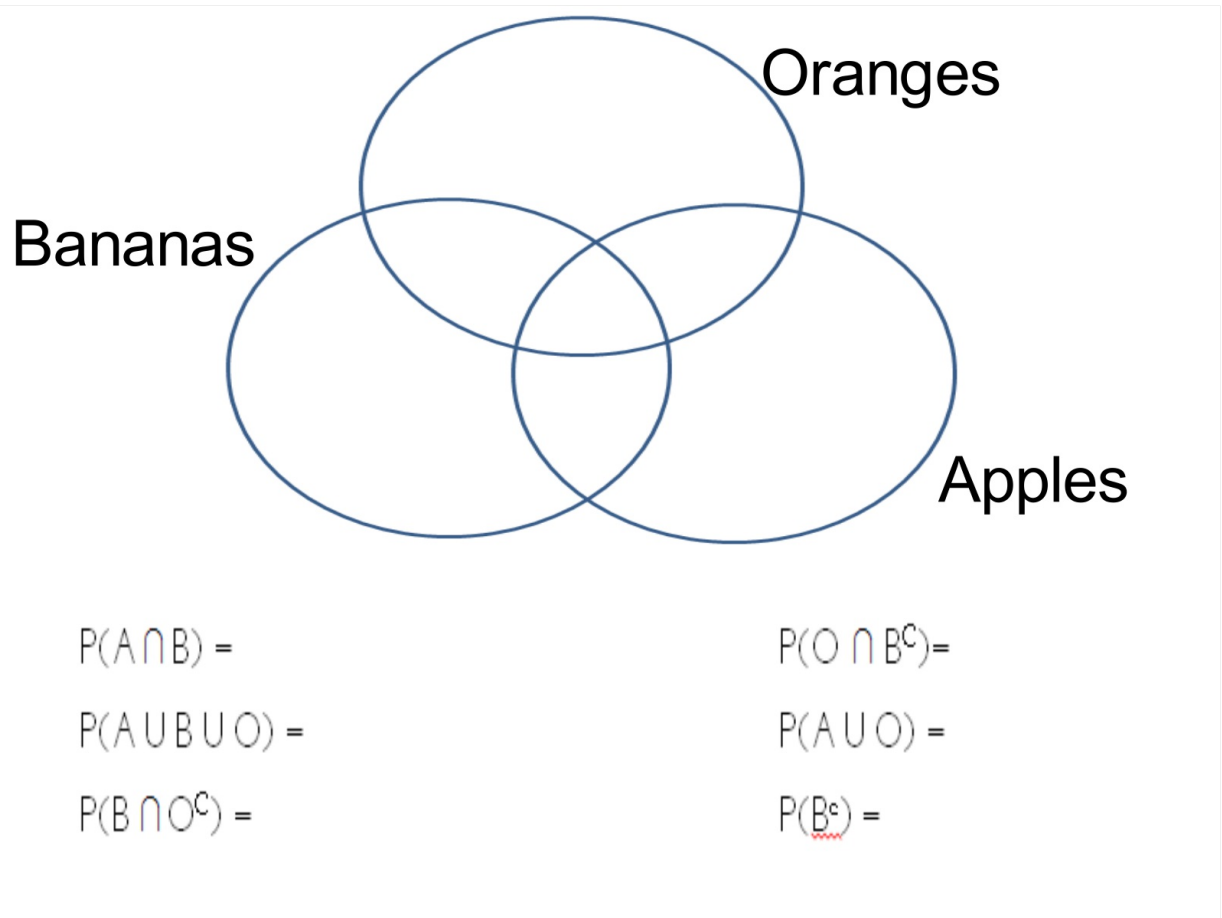
**$A^c$**



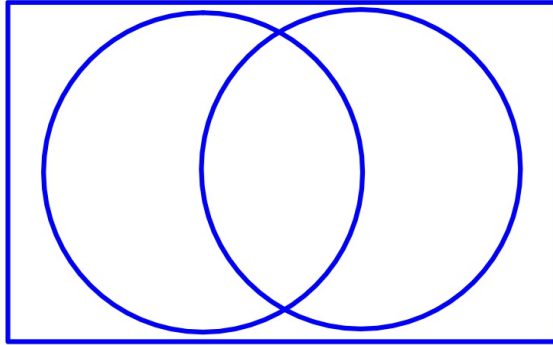
**$A^c$  = Everything not in A.**

**The complement of A**





## Let's Try



**Real estate ads suggest that 64% of homes for sale have garages, 21% have swimming pools, and 17% have both features. What is the probability that a home for sale has**

- A. pool or a garage?**
- B. neither a pool nor a garage?**
- C. a pool but no garage?**