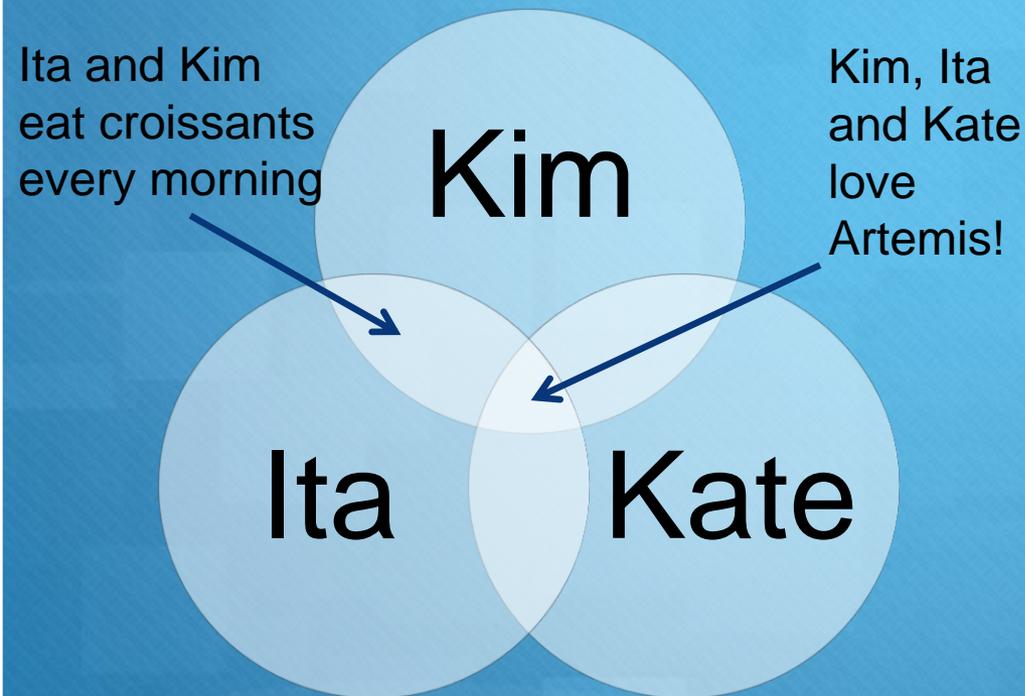




SET THEORY

A Brief Introduction

Let's Begin with an Activity



- Partner up with 2 of your neighbors
- Find out your similarities and differences. (Do you all like chocolate ice cream? Have you read Harry Potter? Etc...)
- Fill in each section of the Venn Diagram



What is a Set?

- A set is a collection of distinct objects.
 - Example: {Book, Chair, Pen}
- In a set, order does not matter
 - Example: {Book, Chair, Pen} = {Pen, Book, Chair}
- Your Venn Diagram is made of 3 sets of words describing you and your partners



Two Important Sets

- Empty (Null) Set: A set with no elements

- Denoted by \emptyset or $\{\}$

- Universal Set: A set that contains all objects in the universe

- Denoted by Ω

Elements

- The objects in a set are called “elements”
- Let $S = \{\text{Emily, Kimerah, Katherine}\}$
- Emily is said to be “an element of” set S because she is part of that set
- The shorthand notation for this is ' \in '
“Emily $\in S$ ” translates to “Emily is an element of set S ”



Basic Operations

- Union: The union of 2 sets is all the elements that are in both sets
 - Denoted by 'U'
 - Example: Let $A=\{1,2,3\}$ and $B=\{1,4,5\}$
 - $A \cup B = \{1, 2, 3, 4, 5\}$



Basic Operations

- Intersection: The intersection of 2 sets is the set of elements they have in common
 - Denoted by ' \cap '
 - Example: Let $A=\{1,2,3\}$ and $B=\{1,4,5\}$
 - $A \cap B = \{1\}$

Basic Operations

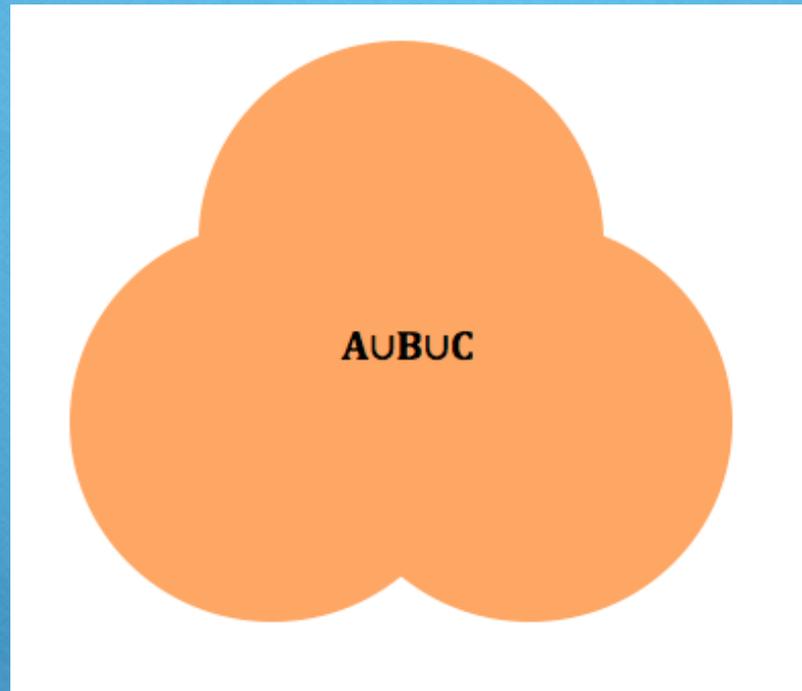
- Set Difference: The set of elements in one set and not the other
 - Denoted by ' \setminus '
 - Example: Let $A=\{1,2,3\}$ and $B=\{1,4,5\}$
 - $A \setminus B = \{2, 3\}$



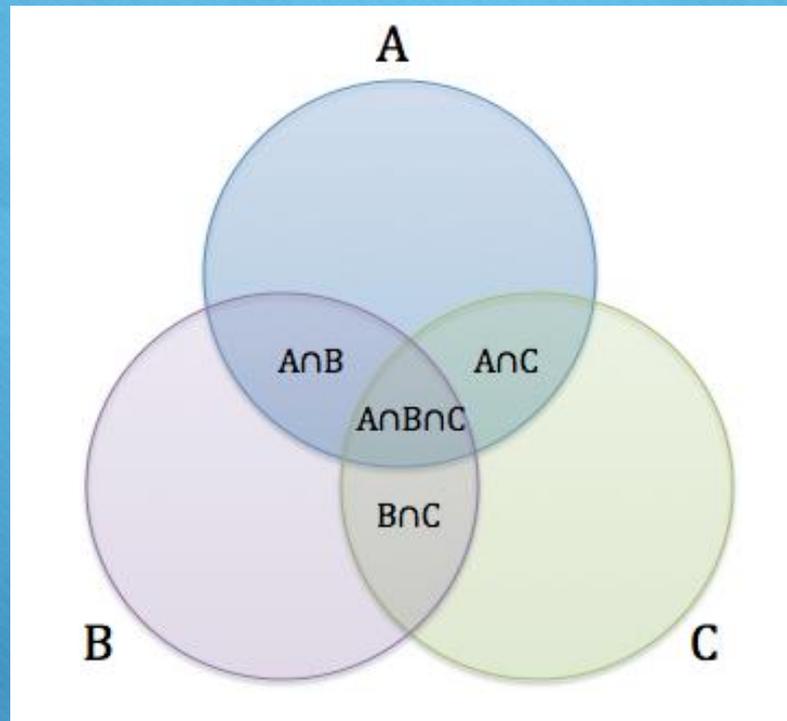
Back to your Venn Diagram

- o Identify ...
 - o the union
 - o the intersection
 - o the set difference

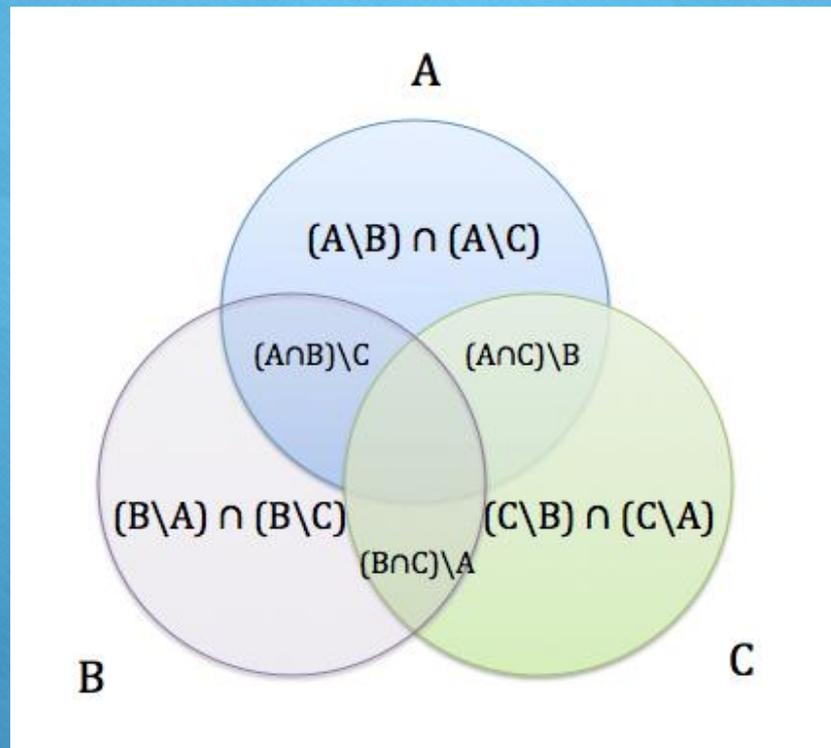
Solutions: Union



Solutions: Intersection



Solutions: Set Difference





Why is Set Theory Important?

- It is a foundational tool in Mathematics
- The idea of grouping objects is really useful

- Examples:

Complexity Theory: Branch in Comp. Sci. that focuses on classifying problems by difficulty.

- I.e. Problems are sorted into different sets based on how hard they are to solve

The formal, mathematical definition of Probability is defined in terms of sets

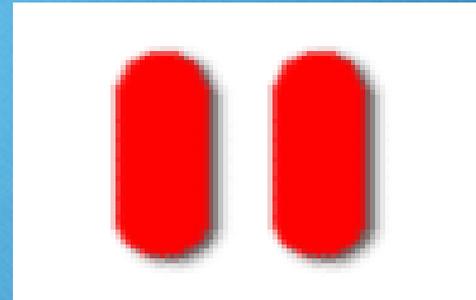
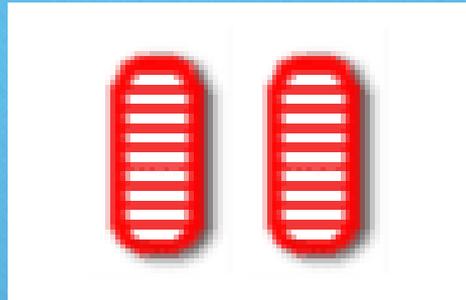
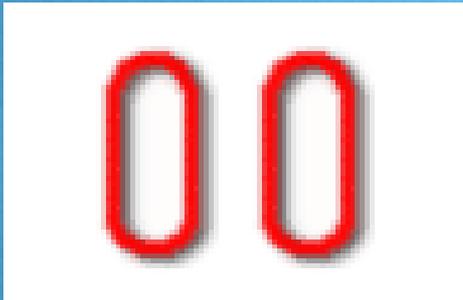


SET: The Game

o Rules

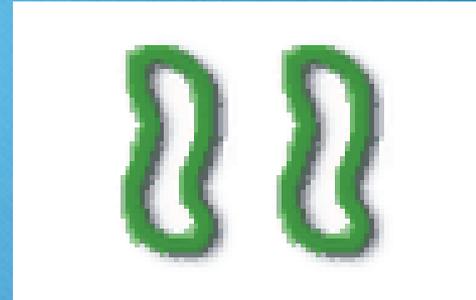
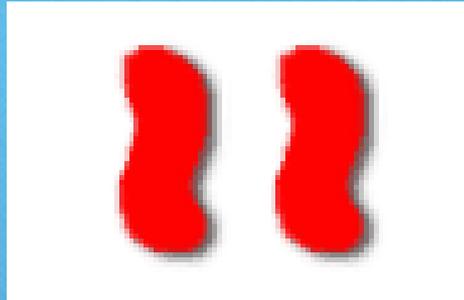
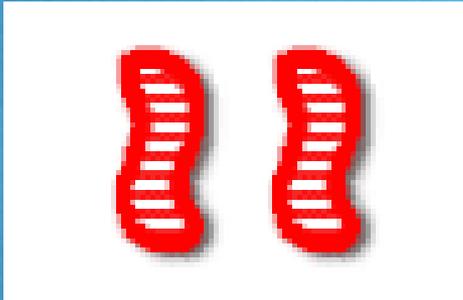
- o Each card is unique in 4 characteristics: color, shape, number, and shading
- o 3 cards form a SET if each characteristic is the same for all cards or different for all cards
- o Yell SET to claim cards
- o Player with the most SETs wins

This is a SET



COLOR: ALL red
SHAPE: ALL ovals
NUMBER: ALL twos
SHADING: ALL different

This is NOT a SET



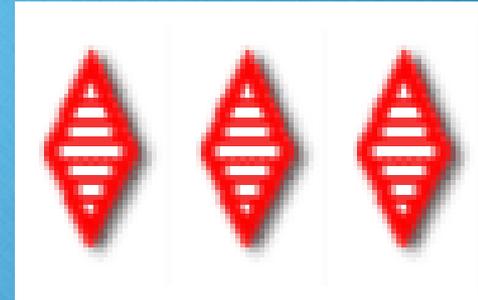
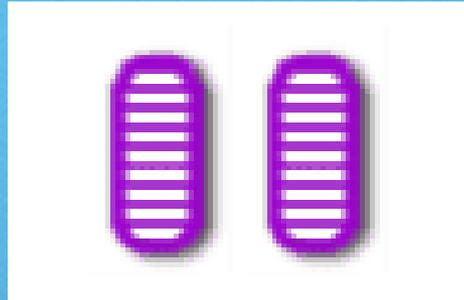
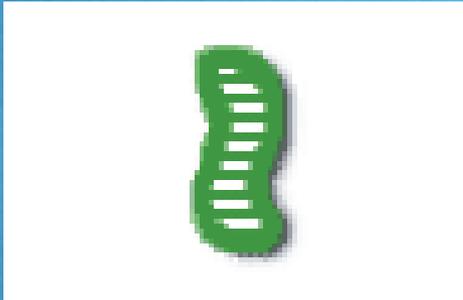
SHAPE: ALL Squiggly

NUMBER: ALL twos

SHADING: ALL different

COLOR: **NOT** ALL red → NOT a SET

Is this a SET? **Yes**

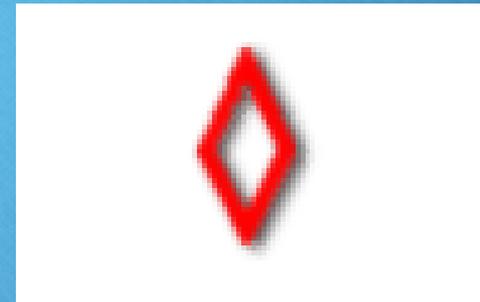
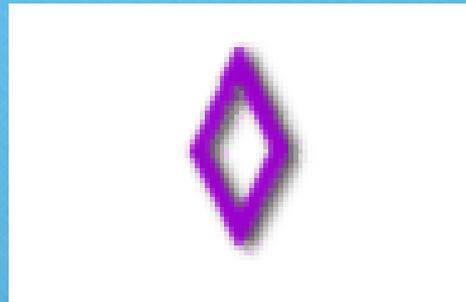


SHAPE: ALL different
NUMBER: ALL different
SHADING: ALL striped
COLOR: ALL different

Is this a SET?

No

Magic Rule: If two are _____ and one is not, then it is not a SET



SHAPE: ALL diamonds

NUMBER: ALL ones

COLOR: ALL different

SHADING: **NOT** ALL hollow

Let's Play!

