

## Sets, pt.2

**Equal sets** - two sets A and B that have the same elements are said to be equal, which we denote by writing  $A=B$ .

Ex.

$$A = \{1,2,3\}, B=\{3,1,2\}, A=B.$$

$$A = \{1,2,3,1,2,3,1,2,3\}, B = \{1,2,3\}, A=B.$$

$$A = \{1,2\}, B = \{1,2,3\}, A \neq B$$

**Subsets** - any set C whose elements are also the elements of another set are said to be a subset of the other set. We denote a subset with the symbol  $\subseteq$ .

$$\text{Ex. } A = \{1,2\}, B = \{1,2,3,4,5\}, A \subseteq B.$$

$$C = \{1,2,3,4,5\}, C \subseteq B.$$

$$D = \{1,2,3,4,6\}, D \not\subseteq B.$$

Note: two equal sets are both subsets of each other.  $C \subseteq B, B \subseteq C$ .

Given two sets, there may or may not be an overlap of elements. We call the overlap of elements in the two sets the *intersection* of the sets. We represent the intersection of two sets A and B as  $A \cap B$ .

$$\text{Ex. } A=\{1,2\}, B=\{2,3\}, A \cap B = \{2\}$$

The *union* of two sets is the set containing all the elements of both sets. We represent the union of two sets A and B as  $A \cup B$ .

$$\text{Ex. } A=\{1,2\}, B=\{2,3\}, A \cup B = \{1,2,3\}$$

The *universal set* is the set that contains all subsets being considered.

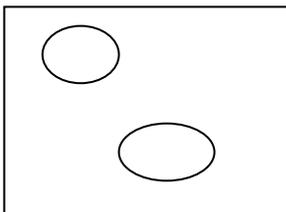
The *empty set* is the set with no elements, also called the null set and represented by the symbol  $\emptyset$ .

The *complement* of a subset is the set of elements contained in the larger set but not in the subset in question.

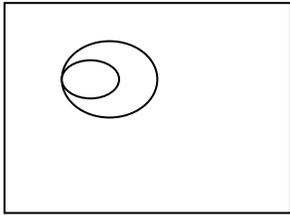
$$\text{Ex. } A=\{1,2\}, B=\{1,2,3\}, A \subseteq B, A' = \{3\}.$$

### **Venn Diagrams**

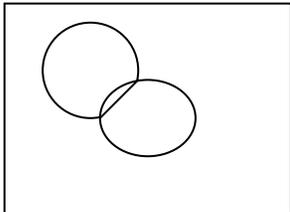
It is common to represent sets with Venn diagrams where a set is represented by an oval, and it can be seen whether sets are disjoint, or disjoint, subsets, or intersecting sets.



A and B are disjoint.  $A \cap B = \emptyset$



$A \subset B$



A and B are conjoint.  $A \cap B \neq \emptyset$

Exercises:

Identify all subsets, intersections, and unions of sets.

- 1.)  $A=\{1,2\}$ ,  $B=\{1,2,3,4,5\}$
- 2.)  $A=\{1,2\}$ ,  $B=\{1,2,3,4,5\}$
- 3.)  $A'=\{1,2\}$ ,  $B=\{1,2,3,4,5\}$
- 4.)  $A=\{1,2,3\}$ ,  $B=\{3,4,5\}$ ,  $C=\{2,4\}$
- 5.)  $A'=\{1,2\}$ ,  $B=\{1,2,3,4,5\}$ ,  $C'=\{2,4\}$