Math1313
Chapter 6 – Section 6.1
Part I – Set Notation and Terminology

A **set** is a collection of objects.

An **element** is an object of a set.

Notation: $\in$ means "element of"

$\notin$ means "not an element of"

Set-builder notation:

Let B = {1, 2, 3, 4, 5}. The set B in set-builder notation is $B = \{x \mid 1 \le x \le 5\}$.

Example 1: Let A = {a, b, c, d} and $B = \{x \mid 1 \le x \le 5\}$.

Answer True or False:

$a \in A$

$b \notin B$

$4 \notin A$

$2 \in A$

Equal sets are sets that have exactly the same elements.

A is a **subset** of B if every element of A is also in B.

Notation: $\subseteq$ means "a subset of"

$\subseteq$ means "not a subset of"

Note: Two sets are equal if and only if each is a subset of the other.

Example 2: Let C = {1, 2, 3, 4, 5, 6}, D = {2, 4, 6} and E = {2, 1, 4, 3, 6, 5}.

Answer True or False:

$$D \subseteq C$$

$$E \subseteq D$$

$$E \not\subseteq C$$

If $A \subseteq B$ and $A \neq B$, then A is a **proper subset** of B.

In other words: A is a **proper subset** of B if the following two conditions hold.

1. A is a subset of B.
2. There exist at least one element in B that is not in A.

If A is a proper subset of B then we write $A \subset B$.

Example 3: Let G = {1, 2, 3, 4, 5, 6, 7}, H = {3, 5, 6, 7}, I = {2, 4, 7, 8}, and J = {5, 7}.

Answer True or False:

$H \subset G$

$I \not\subset G$

$J \subset H$

$J \subset I$

The **empty set** is a set that contains no elements.

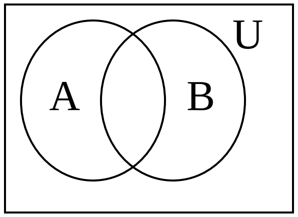
Note: $\varnothing$ denotes the empty set. It is a subset of every set.

Example 4: Let A = {1, 2, 3}. List all subsets of the set A.

The **universal set** is the set of all elements of interest in a particular discussion.

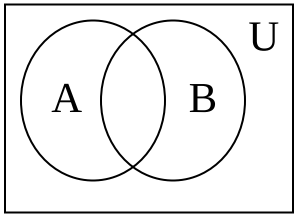
A **Venn diagram** is a visual representation of sets.

Some Venn diagrams can look like:



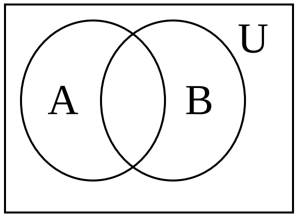
Given two sets A and B, the **union** of A and B, denoted $A \cup B$, is the set of all elements that belong to either A or B or both.

An example of set union using a Venn diagram looks like:



Given two sets A and B, the **intersection** of A and B, denoted $A \cap B$, is the set of all elements in common with both A and B.

An example of set intersection using a Venn diagram looks like:



If A ∩ B = Ø, then we say the intersection is the **null intersection** and that A and B are **disjoint**.

Let U be a universal set and A ⊆ U, then the set of all elements in U that are not in A is the **complement** of A.

An example of set complementation using a Venn diagram looks like: