

Math 1324
Section 5.1 Part 1
Set Notation and Terminology

The videos corresponding to this worksheet can be found at

<https://online.math.uh.edu/Math1324/>.

UH students can also view the videos within the Math 1324 textbook.

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 $B = \{x \mid 1 \leq x \leq 5\}$.

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

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"

$\not\subseteq$ 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.

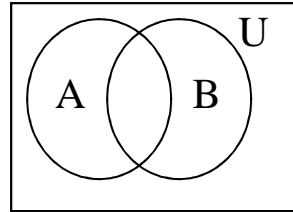
Note: \emptyset denotes the empty set. It is a subset of every set.

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.

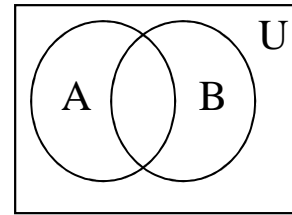
A **Venn diagram** is a visual representation of sets.

Some Venn diagrams can look like:



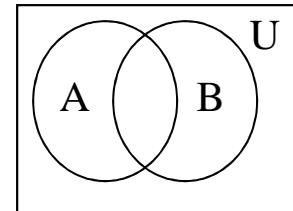
Given two sets A and B, the **union** of A and B, denoted $A \cup B$, is the set of all elements that belong to either A or B or both.

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 $A \cap B = \emptyset$, then we say the intersection is the **null intersection** and that A and B are **disjoint**.

Let U be a universal set and $A \subseteq U$, 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:

