

SETS

Set – a collection of objects.

Notation – capitol letters

Examples: N, R, S, A, B

Element – the objects in the set

Notation – normally lower case letters (not always)

a, b, c, x, y,

Representation of Sets

1. Sentence

Example: The set of United States Presidents not buried in the United States.

2. List (or Roster)

Example: {Bush 43, Bush 41, Clinton, Carter, Ford}

Natural Numbers = \mathbb{N} = {1, 2, 3, 4, ... }

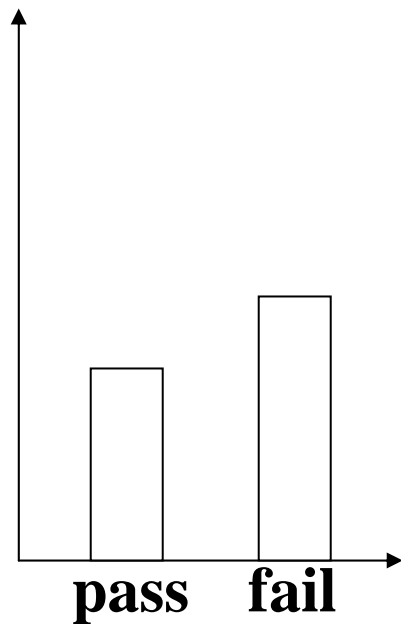
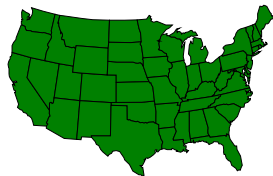
3. Set Builder Notation

$\{x \mid x \text{ is a Natural number less than } 4\}$

List $\{1, 2, 3\}$

4. Picture (or graph)

Passing %



Empty Set – the set that contains no elements

$$\emptyset = \{ \ }$$

The set of all elephants in this room.

Note:

$$\emptyset \neq \{ \emptyset \} \neq \{ 0 \}$$

Symbolism

\in

Read as “is an element of”

$$1 \in N$$

1 is an element of the set of Natural numbers.

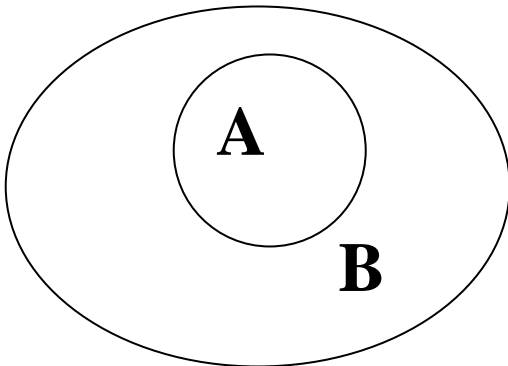
$$-2 \notin N$$

-2 is not an element of the set of Natural Numbers

Subset

A is a subset of B if every element of A is an element of B

Notation: $A \subseteq B$



Example:

$$A = \{1,2\}$$

$$B = \{1,2,3\} \text{ so } A \subseteq B$$

Intersection

Definition of $A \cap B$

The intersection of the sets A and B is the set of those elements that are in both A and B.

Alternate Definition

$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$$

Example 1: $A = \{1,2,3\}$
 $B = \{2,3,4\}$ $A \cap B = \{2,3\}$

Example 2: $A = \{1,2,3\}$
 $B = \{4,5,6\}$ $A \cap B = \{ \}$

Note: If $A \cap B = \emptyset$ then **A**
and B are disjoint sets.

Example 3

$$\mathbf{N} = \{1,2,3,\dots\}$$

$$\mathbf{W} = \{0,1,2,3,\dots\}$$

$$\mathbf{N} \cap \mathbf{W} = \{1,2,3,\dots\} = \mathbf{N}$$

Example 4: $\mathbf{A} = \{1,2,3\}$

$$\mathbf{B} = \{1,2,3,4\} \quad \mathbf{A} \cap \mathbf{B} = \{1,2,3\}$$

Example 5: $\mathbf{N} \cap \mathbf{N} = \mathbf{N}$

Example 6: $\mathbf{N} \cap \emptyset = \emptyset$

Union

Definition of $A \cup B$

The union of set A with set B is the set of all elements that belong to set A or to set B (or to both set A and B).

Alternate

$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$$

Example: $A = \{1,2,3\}$

$B = \{3,4\}$ $A \cup B = \{1,2,3,4\}$

Example: $A = \{1,2,3\}$

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

Example: $N \cup W = W$

Example: $N \cup N = N$

Example: $\{\} \cup \{\} = \{\}$

Reals = R

Rational = Q

Irrational = H

Integer = J

**Whole =
W**

**N
A
T
U
R
A
L
=
N**