I. Set Theory

A set is A collection of items, objects, numbers, words, etc.

- Objects in a set are called elements or members
- Sets can be described in three ways:

1. word description {set of even numbers less than 10}
2. simple list {2,4,6,8} or {Jack, Jill, John}
3. set notation $\{x \mid x \geq 2\}$

- Use Capital letters to name and identify a set.

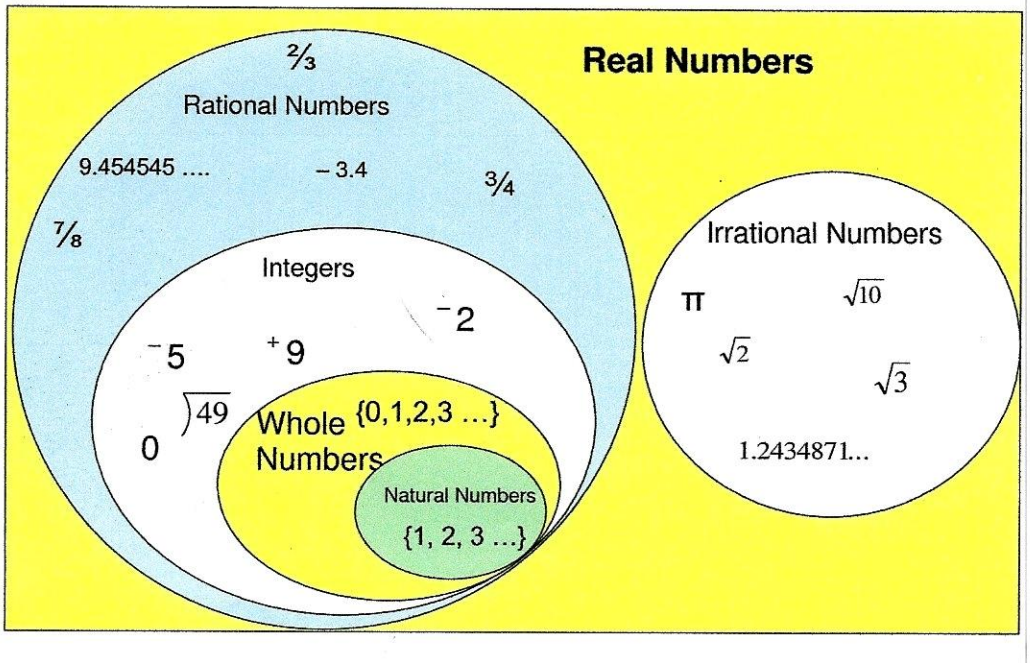
  For example: set **A** = {2, 4, 6, 8}

- A set that contains NO elements (has no members) is called an empty set or a null set

  The correct notation used for this is: $\emptyset$ or $\{\}$ ← empty like a bucket

  The wrong notation is: $\{\emptyset\}$

II. Number Sets: how our number system is organized



- **Natural numbers** (counting numbers): Begin counting with the number 1
- **Whole numbers**: Begin with zero and continue with the counting numbers
- **Integers**: Positive and Negative whole numbers
- **Rational numbers**: Numbers that can be written as a fraction, including terminating decimals and repeating decimals
- **Irrational numbers**: Numbers that cannot be written as a fraction which include infinite, non-repeating decimals
- **Real numbers**: All the numbers on a number line
  All numbers that can be written as a decimal

EXAMPLE: List or complete the list of numbers in each set that is being described.

1. the set of integers between -5 and 3: $\{-4, -3, -2, -1, 0, 1, 2\}$
2. {5, 6, 7, ..., 11} : $\{5, 6, 7, 8, 9, 10, 11\}$
3. {x | x is a counting number between six and seven} : $\varnothing$ or $\{\}$

III. Finite and Infinite sets

Finite Set has An exact number of solutions

Infinite Set has A never ending number of solutions

EXAMPLE: List or complete the list of numbers in each set that is being described and tell which type of set it is.

1. the set of all counting numbers greater than 20 $\{21, 22, 23, \ldots\}$ infinite
2. {x | x is a positive multiple of 5} $\{5, 10, 15, 20, \ldots\}$ infinite
3. the set of America's Great Lakes {Huron, Ontario, Michigan, Erie, Superior} Finite

IV. An element of a set.

To show if an item is an element of a set (member of a set), use this symbol: $\in$

To show if an item is not an element of a set (not a member of a set), use this symbol: $\notin$

EXAMPLE: True or False, is the item an element of the given set?

1. $3 \in \{1, 2, 3, 4, 5\}$ True
2. $0 \in \{9, 10, 11, 12\}$ False
3. $\frac{1}{2} \notin \{1, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\}$ True
4. $b \in \{h, c, d, a, b\}$ True

V. Equality of sets.

Two sets are equal, if and only if (iff), every element in set A is an element in set B AND every element in set B is an element in Set A

EXAMPLE: Are the two sets equal?

1. A = {-4, 3, 2, 5} B = {-4, 0, 3, 2, 5} A = B? NO
2. A = {3} B = { x | x is a counting number between 1 and 5 } (2, 3, 4) A = B? NO
3. A = {k, c, a, r} B = {c, r, k, a} A = B? yes

order does not matter