

## Section 2.1

### Set and Set Operators

#### Definition of a set

A **set** is a collection of objects, things or numbers.

#### Examples

$\{1,2,3,4,5\}$

$\{Ron, John, Mark, Phil\}$

$\{Virginia, West Virginia, Maryland, Tennessee, Kentucky, North Carolina\}$

**Roster Method:** In roster method, the elements of the set are listed in brackets and separated by commas. The sets in the above examples are in roster form.

Elements are the members of a given set.

$\in$  represents is an element of

$\notin$  represents is not an element of

$3 \in \{1,2,3,4,5\}$

$a \in \{a,b,c,d,e\}$

#### Builder Set Notation

$\{x \mid x \text{ is a vowel}\}$

$\{x \mid x \text{ is a great lake}\}$

$\{x \mid x \text{ is an even natural number}\}$

A set is **well defined** if the elements of the sets are clearly defined.

If a set is well defined, then there should not be any confusion of what the elements are in the set

#### Examples of well defined sets

$\{1,3,5\}$

$\{m,n,o,p\}$

$\{x \mid x \text{ is a whole number}\}$

## Examples of set that are not well defined

$\{x \mid x \text{ is something cool}\}$

$\{x \mid x \text{ is a small dog}\}$

## Basic Number Sets

**Natural Numbers or Counting Numbers:**  $N = \{1, 2, 3, 4, 5, 6, \dots\}$

**Whole Numbers:**  $W = \{0, 1, 2, 3, 4, 5, 6, \dots\}$

**Integers**  $I = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

**Rational Numbers:**  $Q = \{x \mid x \text{ is a terminating number or repeating decimal}\}$

**Irrational Numbers:**  $J = \{x \mid x \text{ is not a terminating number or repeating decimal}\}$

**Real Numbers:**  $R = \{x \mid x \text{ is a rational number or irrational number}\}$

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## Practice Problems

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### Example 1

Write the following set in roster form.

The set of the seven dwarfs

**Solution:**  $\{Dopey, Sleepy, Grumpy, Sneezzy, Happy, Droopy, Doc\}$

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### Example 2

Write the following set in roster form.

The set of the five great lakes

**Solution:**  $\{Huron, Ontario, Michigan, Erie, Superior\}$

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### Example 3

Write the following set in roster form.

The set of all integers

$\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

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**Example 4**

**Write the following set in Builder Set Notation.**

$\{10,15,20,25,30,35\}$

$\{x \mid x \text{ is multiple of five between } 10 \text{ and } 35\}$

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**Example 5**

**Write the following set in Builder Set Notation.**

$\{\text{Ohio, Utah, Iowa}\}$

$\{x \mid x \text{ is a state with four letters}\}$

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**Equivalent Sets**

Two sets are equivalent if they have the same number of elements.

Two equivalent sets A and B are denoted by  $A \sim B$

**Examples of equivalent sets**

$\{1,2,3,4\}$

*and*

$\{a,b,c,d\}$

$\{\text{john, luke, mark, mathew}\}$

*and*

$\{a,b,c,d\}$

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**Equal Sets**

Two sets are equal if their elements are identical.

Two equal sets A and B are denoted by  $A = B$

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**Example of two equal sets**

$\{a, b, c\}$  and  $\{c, a, b\}$

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