**Applications of College Algebra**

**Chapter 2 Set Theory**

**Unit 2.1 Basic Set Concepts**

A **set** is a collection of objects whose contents can be clearly determined. The objects in a set are called the **elements**, or **members**, of the set. A set must also be well defined

**Methods for Representing Sets**

**Word description**: Describes the set.

**Roster method**: List the elements of a set inside a pair of braces {}.

**Set-builder notation**: S = {x| x is the \_\_\_\_\_}

**Example 1 Word Description and Roster Method**

P = {Washington, Adams, Jefferson, Madison, Monroe}

Set P is the set of the first 5 presidents of the United States.

L = {a, b, c, d, e, f}

Set L is the set of the first six lowercase letters of the alphabet.

Set C is the set of U.S coins with the value of less than 1 dollar.

C = {penny, nickel, dime, quarter, half-dollar}

Set M is the set of the first 6 months in the year.

M = {Jan, Feb, March, April, May, June}

|  |  |  |
| --- | --- | --- |
| **Word Description** | **Roster Method** | **Set-Builder Notation** |
| B is the set of members of the Beatles in 1963. | B = {George Harrison, John Lennon, Paul McCartney, Ringo Starr} | B = {x|x was the member of the Beatles in 1963} |
| S is the set of states who names begin with the letter A. | S = {Alabama, Alaska, Arizona, Arkansas} | S = {x|x is the U.S state whose names begin with letter A} |

**Example 2 Converting from Set-Builder to Roster Method**

A = {x| x is a month that begins with the letter M}

A = {March, May}

O = {x| x is a positive odd number less than 10}

O = {1,3,5,7,9}

L = {x| x is the lowercase letter of the English alphabet}

L = {a,b,c,d,e……z}

**The Empty Set**

The **empty set**, also called the **null set**, is the set that contains no elements. The empty set represented by { } or $∅$.

**Example 3 Recognizing the Empty Set**

Which one of the following is the empty set?

1. {0}
2. 0
3. {x| x is a number less than 4 or greater than 10}
4. {x| x is a square with exactly three sides}

Which one of the following is the empty set?

1. {x| x is a number less than 3 or greater than 5}
2. {x| x is a number less than 3 and greater than 5}
3. Nothing
4. $\{∅\}$

**Notation for Set Membership**

The symbol $\in $ is used to indicate that an object is an element of a set.

The symbol ∉ is used to indicate that an object is not an element of a set.

Example 4

Determine whether each statement is true or false.

1. r ∈ {a, b, c, d, …z}
2. 7 ∉ {1, 2, 3, 4, 5}
3. {a} ∈ {a, b}

Determine whether each statement is true or false

1. 8 ∈ {1, 2, 3, … 10}
2. r ∉ {a, b, c, z}
3. {Monday} ∈ {x| is a day of the week}.

**Set of Natural Numbers**

**N** = {1, 2, 3, 4, 5, …}

Express each of the following sets using the roster method:

1. Set A is the set of natural numbers less than 5.
2. Set B is the set of natural numbers greater than or equal to 25.
3. E = {x| x $\in $ **N** and x is even}

**Inequality Notation and Sets**: <, >, $\leq , \geq $

**Cardinality and Equivalent Sets**

The number of elements in a set is called **cardinal numbers**, or **cardinality**, of the set. The **cardinal number** of set A, represented by *n*(A), is the number of distinct elements in set A. The symbol *n*(A) is read “**n** of A.”

Set A is equivalent to set B means that set A and set B contain the same number of elements. For equivalent sets, *n*(A) = *n*(B).

**Finite, Infinite, and Equal Sets**

**Homework: 1-95 every other odd, 105, 107, 109, 111.**