Set Concepts

A set is a collection of objects, which are called elements or members of the set.

Example:
Each student in this class is a member of Math 120 Section 1087.

A set is well defined if its contents can be clearly determined.

Examples: Tell whether each set is well defined.

1. The set of states that have a common border with Tennessee.

   The set is well defined because we can name the states satisfying these conditions.

2. The set of most interesting students in this class.

   The set is NOT well defined because "most interesting" may not be the same for every person. A well defined set can NOT be interpreted differently for different readers.

There are three methods used to indicate a set. They are:

1. description

2. roster form

3. set-builder notation

Description of Sets

We use a brief sentence ore two to describe the set.

Example: D = { 4, 8, 12, 16, 20, 24, ... }

D is the set of numbers that are multiples of 4.

Roster Form of Sets

Listing the elements of a set inside a pair of braces { } is called the roster form. The braces are important, because they inform the reader that the elements are part of a set. Sets are usually named with a capital letter.

Examples: Express each set in roster form.

1. The set of odd numbers greater than 15.

   { 17, 19, 21, 23, 25, 27, ...}

2. The set of continents of the world.

   {North America, South America, Europe, Asia, Africa, Australia, Antartica}

3. The set of vowels.

   { A, E, I, O, U }

4. The set of prime numbers less than 2.

   { } or ∅ (the null or empty set)

The symbol $\in$, read "is an element of," is used to indicate membership in a set. The symbol $\notin$, read "is not an element of," is used to indicate that an element does not belong to a set.

Examples:
Let A = { 2, 4, 6, 8, 10 } and B = { 1, 3, 5, 7, 9 }

1. $6 \in A$

2. $5 \in B$

3. $6 \notin B$

4. $5 \notin A$

Set-Builder Notation

Set-builder notation (sometimes called set-generator notation) may be used to symbolize a set. Set-builder notation is frequently used in algebra.

Set-builder notation takes the following form:

D	=	{	X	|	Condition(s)	}
Set D	Is	The set of	All elements x	Such that	The conditions x must meet in order to be a set	

Examples:

1. Consider the set $E = \{x \mid x \in N \text{ and } x > 12\}$
   Read: "Set E is the set of all the elements x such that x is a natural number and x is greater than 12."
   Write set E in roster notation.

   $E = \{ 13, 14, 15, 16, 17, \ldots\ldots \}$

2. Write set $B = \{ 4, 5, 6, 7, 8 \}$ in set-builder notation.

   $B = \{ x \mid x \in N \text{ and } 3 < x < 9\}$

3. Write, in words, how you would read set B in set-builder notation.

   Set B is the set of all elements x such that x is a natural number and x is greater than 3 and less than 9.

A set is said to be finite if it either contains no elements or the number of elements in the set is a natural number.
(in other words, you can actually count the set)

A set that is not finite is said to be infinite. The set of counting numbers is one example of an infinite set.
(in other words, it is not possible to count all of the members of the set.)

Set A is equal to set B, symbolized by $A = B$, if and only if set A and set B contain exactly the same elements.

The cardinal number of set A, symbolized by n(A), is the number of elements in set A.

Set A is equivalent to set B if and only if n(A) = n(B).

The set that contains no elements is called the empty set or null set and is symbolized by { } or ∅.

A universal set, symbolized by U, is a set that contains all the elements for any specific discussion.