A set is a collection of objects. The objects are called members or elements.

A set must be well defined. It must be clear what the members of the set are and how they are determined.

### Ways to represent sets

<table>
<thead>
<tr>
<th>Words</th>
<th>Roster</th>
<th>Set Builder</th>
</tr>
</thead>
<tbody>
<tr>
<td>W is the set of the days of the week</td>
<td>W = {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}</td>
<td>W = {x \mid x \text{ is day of the week}}</td>
</tr>
</tbody>
</table>

**Important Notes:**
- We name sets using capital letters.
- We use braces \{ \} in roster and set builder notation.

**Example:** Represent the set of even numbers from 4 to 10 using each method.
The empty set (null set) is the set that contains no elements. It is represented by Ø or {}.
Note: {0} is not the empty set. It is the set containing the element 0.
Ø does not represent the empty set. Use {} or Ø but not both.

Example: Name two sets that are the empty set.

$\in$: is an element of
\(\notin\): is not an element of

Example: Determine whether each statement is true or false.

a) $4 \in \{1, 2, 3, 4, 5\}$
b) $a \in \{a, b\}$
c) $\{a\} \in \{a, b\}$
d) $\{a\} \in \{\{a\}, \{b\}\}$
d) Tuesday $\notin \{d | d \text{ is a day of the week that starts with } T\}$
OBJECTIVE 3
The learner will use apply set notation to the set of natural numbers.
My Math Lab Homework 5–6

Natural Numbers:  \( \mathbb{N} = \{1, 2, 3, 4, 5, \ldots\} \)

Example: Express each set using the roster method
a) Set A is the set of even natural numbers less than 15
b)  \( B = \{x | x \in \mathbb{N} \text{ and } x \leq 9\} \)
c)  \( C = \{x | x \in \mathbb{N} \text{ and } 5 < x \leq 8\} \)

Note: See page 51 for a review of inequality symbols

OBJECTIVE 4
The learner will determine a set’s cardinal number.
My Math Lab Homework 7–8

Cardinal number (cardinality): the number of distinct elements in the set
notation: \( n(A) \) is the cardinal number of set \( A \)

Note: \( \{3, 5, 7, 7, 7\} \) and \( \{3, 5, 7\} \) have the same cardinality. Why?

Example: Find the cardinality of each set.

a)  \( A = \{2, 4, 5, 9\} \)
b)  \( B = \{\text{five}\} \)
c)  \( C = \{x | x \in \mathbb{N} \text{ and } 5 < x \leq 8\} \)
d)  \( D = \{x | x < 7 \text{ and } x > 9\} \)
e)  \( E = \emptyset \)
Example: For each pair of sets, determine if the sets are equivalent and determine if the sets are equal.

1) \( A = \{1, 2, 3, 4, 5\} \) \( B = \{2, 4, 6, 8, 10\} \)

2) \( A = \{0, 1, 1, 2, 2, 2\} \) \( B = \{0, 1, 2\} \)

3) \( A = \{x | x \in \mathbb{N} \text{ and } x \leq 10\} \) \( B = \{x | x \in \mathbb{N} \text{ and } 13 < x \leq 23\} \)

Two final definitions:
finite set: \( A \) is finite if \( A \) is the empty set or \( n(A) \) is a natural number.
   We can count the members of a finite set.
infinite set: \( A \) is infinite if \( A \) has an infinite number of members.
For next time:

<table>
<thead>
<tr>
<th>Textbook Reading</th>
<th>pages 46 – 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>My Math Lab 2.1</td>
</tr>
<tr>
<td>Quiz</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>Important Notes</td>
<td>Definitions are really, really important in this section. Look for the orange boxes in the textbook.</td>
</tr>
</tbody>
</table>