


# SET THEORY

## A DEFINITIONS

### Definition Set

A **set** is a collection of objects, called elements.  
We list its elements between curly brackets.

**Ex:** List all possible results when rolling a standard die .

*Answer:*  $E = \{1, 2, 3, 4, 5, 6\} = \{\text{die showing 1}, \text{die showing 2}, \text{die showing 3}, \text{die showing 4}, \text{die showing 5}, \text{die showing 6}\}.$

### Definition Element

- An **element** is an object contained in a set.
- $\in$  means "is an element of" or "belongs to".
- $\notin$  means "is not an element of" or "does not belong to".

**Ex:**  $2 \in \{1, 2, 3, 4, 5, 6\}$  and  $7 \notin \{1, 2, 3, 4, 5, 6\}.$

### Definition Equal sets

Two sets are **equal** if they have exactly the same elements.

**Ex:** Determine if the sets  $\{2, 6, 4\}$  and  $\{2, 4, 6\}$  are equal.

*Answer:* Yes, the sets  $\{2, 6, 4\}$  and  $\{2, 4, 6\}$  are equal because they contain the same elements: 2, 4, and 6.

**Ex:** Determine if the sets  $\{1, 2, 3\}$  and  $\{1, 2, 4\}$  are equal.

*Answer:* No, the sets  $\{1, 2, 3\}$  and  $\{1, 2, 4\}$  are not equal because element 3 belongs to  $\{1, 2, 3\}$  but not to  $\{1, 2, 4\}.$

## B ORDERED PAIR

### Definition Ordered Pair

An **ordered pair**, denoted  $(a, b)$  or  $ab$ , is a pair of objects in which their order is significant. The ordered pair  $(1, 2)$  is different from the ordered pair  $(2, 1)$ .

**Ex:** In a sprint relay race, two runners are paired up. Let  $L$  be Louis and  $H$  be Hugo. The ordered pair  $(L, H)$  means Louis runs first, then passes the baton to Hugo. The ordered pair  $(H, L)$  means Hugo runs first, then passes to Louis. These are different races.

## C CARDINALITY

### Definition Cardinality

$n(A)$  denotes the number of elements in the set  $A$ .

**Ex:**  $n(\{1, 2, 3, 4, 5, 6\}) = 6.$

## D COMPLEMENT

### Definition Universal set

A **universal set** is the set of all elements considered.

### Definition Complement

The **complement** of a set  $A$ , denoted  $A'$ , consists of all elements in  $U$  that are not in  $A$ . Sets  $A$  and  $A'$  are said to be **complementary**.

**Ex:** Given the universe  $U = \{1, 2, 3, 4, 5, 6\}$  and the set  $A = \{1, 3, 5\}$ , find the complement  $A'$ .

*Answer:* Start with the universe  $U = \{1, 2, 3, 4, 5, 6\}$ .

The set  $A = \{1, 3, 5\}$  includes 1, 3, and 5.

The complement  $A'$  is all the elements in  $U$  that are not in  $A$ :

$$A' = \{2, 4, 6\}$$