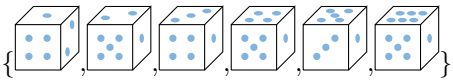
SET THEORY

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: $E = \{1, 2, 3, 4, 5, 6\} = \{$  $\}$.

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 CARDINALITY

Definition Cardinality

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

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

C 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:

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