

Please . . .

L

F

A

R

N

English

中文

Set

集合

Element

元素

Subset

子集

Universal Set

全集

Finite Set

有限集合

Infinite Set

无限集合

Roster Notation

列举法

Set-Builder Notation

描述法 / 构造法

## **"What's in the Bag?"**

Display a collection of objects (or images) such as:

- Pens
- Books
- Phones
- Water bottles
- Keys

Ask students:

- How could we organize these objects?
- Which objects belong together?
- What rules could we use to group them?

### **1. How could we organize these objects?**

- By purpose
- By material
- By location
- By size

### **2. Which objects belong together?**

- School items: Pens, Books
- Personal items: Phones, Keys, Water bottles
- Electronic devices: Phones

### **3. What rules could we use to group them?**

- Same use
- Same material
- Same location
- Same characteristics

A **set** is a well-defined collection of objects.

Examples:

- $A = \{1, 2, 3, 4, 5\}$
- $B = \{\text{red}, \text{blue}, \text{green}\}$

Explain:

- Objects in a set are called **elements** or **members**.
- Elements are enclosed in **curly brackets**  $\{ \}$ .

### Key Symbols

| Symbol    | Meaning                     |
|-----------|-----------------------------|
| $\{ \}$   | Set brackets                |
| $\in$     | Is an element of            |
| $\notin$  | Is not an element of        |
| $n(A)$    | Number of elements in set A |
| $U$       | Universal set               |
| $\subset$ | Subset                      |

Examples:

- $3 \in A$
- $7 \notin A$



## Guided Practice (10 minutes)

### Activity: Which Belong?

Let:

$$C = \{2, 4, 6, 8, 10\}$$

Ask:

1. Is  $4 \in C$ ?
2. Is  $5 \in C$ ?
3. How many elements are in  $C$ ?
4. Is  $C$  a finite or infinite set?

## Representing Sets (10 minutes)

### 1. Listing (Roster) Method

$$D = \{1, 2, 3, 4, 5\}$$

### 2. Set-Builder Notation

$$D = \{x : x \text{ is a positive integer less than } 6\}$$

Discuss advantages of each method.

## Roster (Listing)

Easy to understand

Shows every element

Good for small finite sets

Easy to check elements

No special mathematical language needed

Easy to compare individual elements

Useful for simple numerical sets

## Set-Builder



Clearly shows the rule

More concise

Good for large sets

Useful for infinite sets

Shows mathematical relationships

Avoids writing many elements

Can describe complex conditions

## **Group Activity (10 minutes)**

### **Real-Life Sets**

In groups, students create:

- 1.** A set of sports.
- 2.** A set of countries in Asia.
- 3.** A set of prime numbers less than 20.

For each set, students write:

- Roster notation
- Set-builder notation

| Set             | Roster Notation                               | Set-Builder Notation                         |
|-----------------|-----------------------------------------------|----------------------------------------------|
| Sports          | $S = \{\text{football, tennis, basketball}\}$ | $S = \{x : x \text{ is a sport}\}$           |
| Asian Countries | $A = \{\text{China, Japan, India}\}$          | $A = \{x : x \text{ is a country in Asia}\}$ |
| Primes < 20     | $P = \{2, 3, 5, 7, 11, 13, 17, 19\}$          | $P = \{x : x \text{ is prime, } x < 20\}$    |

## Introducing Subsets (5 minutes)

Example:

$$A = \{1, 2, 3, 4\}$$

$$B = \{1, 2\}$$

Explain:

Every element in B is also in A.

Therefore:

$$B \subset A$$

Ask students:

Is  $\{2, 4\}$  a subset of A?

## Stretch and Challenge

Let:

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$E = \{2, 4, 6, 8, 10\}$$

$$P = \{2, 3, 5, 7\}$$

Questions:

1. List all elements in  $E$ .
2. Which numbers belong to both  $E$  and  $P$ ?
3. Is  $P$  a subset of  $U$ ?
4. Is  $9 \in P$ ?

# TRUE or FALSE

: If  $A = \{1, 2, 3, 4\}$ , then  $3 \in A$ .

TRUE or FALSE

If  $A = \{1, 2, 3\}$ , then  $\{2\} \in A$ .

# TRUE or FALSE

If  $A = \{1, 2, 3\}$  and  $B = \{1, 2\}$ , then  $B \subset A$ .

# TRUE or FALSE

If  $A = \{1, \{2, 3\}, 4\}$ , then  $\{2, 3\} \in A$ .

# TRUE or FALSE

The sets  $\{a, b, c\}$  and  $\{a, a, b, c\}$  are equal.