Definition. A set is an unordered collection of objects (with no repeats), written in braces, like:

Students = {Ayo, Ian, Elon}   Faculty = {Man, Elon}   Staff = {Neil, Elon}

An object x is an element or member of a set S, written x∈S, if x is listed within the outer curly braces of S:

$$\text{Elon} \in \text{Students}, \quad \text{Man} \notin \text{Students}$$

A set S is subset of a set T, written S⊆T, if x∈S satisfies x∈T.

Application. Sets model group permissions:

Students ∪ Staff = {Ayo, Ian, Elon} get gym access

Faculty ∪ Staff = {Man, Neil, Elon} get weekend building access

Students ∩ Faculty ∩ Staff = {Elon} lists suspicious users (too much access)

Definition.

The empty set, written as $\varnothing$ or {} has no elements. This set is unique.

$\mathbb{N} = \{0, 1, 2, 3, 4, \dots\}$

$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$

$\mathbb{Q}$ = the set of rational numbers, whose elements are quotients $\dfrac{n}{m}$ of integers n and m with $m \neq 0$

$\mathbb{R}$ = the set of real numbers

Know: $\dfrac{2}{5} = 0.4 \in \mathbb{Q}, \quad \sqrt{2} \notin \mathbb{Q}, \quad \sqrt{2} \in \mathbb{R}, \quad \mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R}$

Definition. (Set-roster notation.)

Examples.

①

②

Examples. List all elements of the following sets; graph the sets on the number line.

① $\{x \in \mathbb{Q} : 2x + 5 = 0\}$

② $\{x \in \mathbb{Z} : 2x + 5 = 0\}$