08/30/2024

Sets

Def A set is an unordered collection of distinct objects (elements).

We denote sets using capital letters.

$D = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ has 10 elements

$bits = \{0, 1\}$ has 2 elements

$\mathbb{Z}$ = set of integers

$\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, 3, \ldots\}$ has infinite number of elements.

$\mathbb{Q}$ = set of all rational numbers.

$\mathbb{R}$ = set of all real numbers.

$T = \{\text{"Apple"}, \square, 2, \pi\}$ ✓

$C = \{0, 1, 0\}$ ← not a set.

Def Two sets A and B are equal ~~(denoted~~ as $A = B$), if A and B contains exactly the same elements.

$A = \{0, 1, 2\}$ $B = \{1, 2, 3\}$ $A \neq B$

$\{0, 1\} = \{1, 0\}$ ✓

Def Set Membership

For a set S and an object x, the expression $x \in S$ is true when x is one of the objects contained in set S.

$x \in S$

"x is an element of S"

$x \notin S$

"x is not an element of S"

$0 \in \{0, 1\}$ ✓

$2 \notin \{1, 0\}$

$\pi \notin \mathbb{Z}$

Def Cardinality ~~of~~ or Size of the set S, is the number of distinct elements in S.

$|S|$

bits $= \{0, 1\}$

$|\text{bits}| = 2$

$|\{2, \text{"Apple"}, \{2, 3\}\}| = 3$

Question: can we have a set such that $|S| = 0$? Yes, the empty set