Set : unordered collection of objects

$A = \{1, 18, -3\}$

$x \in A$ $\quad 1 \in A$: true $\quad 0.5 \in A$: false, $0.5 \notin A$

Subset : $A \subseteq B$

$x \in A \Rightarrow x \in B$

$\{1\} \subseteq A$

$\{1, 20\} \notin A$

sets of sets : $A = \{\{1,2\}, 3, \{4,5,6\}\}$

$\neq B \{1, 2, 3, 4, 5, 6\}$

$1 \notin A$ $\quad \{1,2\} \in A$

Empty set : $\emptyset$

Set builder notation

$\{\text{expression} \mid \text{condition}\}$

Even numbers : $\{2x \mid x \in \mathbb{Z}\}$ ($\mathbb{Z}$: integers)

Even numbers ≤ 50 :

$\{2x \mid x \in \mathbb{Z}, 2x \leq 50\}$

Positive reals :

$\{x \in \mathbb{R} \mid x \geq 0\}$ ($\mathbb{R}$: real numbers)

Set operations

Union : $A \cup B$

$\{1, 2\} \cup \{3\} = \{1, 2, 3\}$

$\{1, 2\} \cup \{1, 3\} = \{1, 2, 3\}$

Intersection : $A \cap B$

$\{4, 6, 8\} \cap \{4, 7\} = \{4\}$

$\{4, 6, 8\} \cap \{9, 10\} = \emptyset$

Difference : $A - B$ or $A \setminus B$

$\{4, 6, 8\} - \{4, 7\} = \{6, 8\}$

Complement :

Fix a universe U

$\bar{A} = A^c = U \setminus A$

$U = \mathbb{R}$

$A = \{x \in \mathbb{R} \mid 0 \leq x \leq 50\}$

$\bar{A} = ?$

$\{x \in \mathbb{R} \mid x < 0 \text{ or } x > 50\}$

Tuples

ordered collections of fixed size

$x = (1, 2, 1)$

$\neq \{1, 2\}$

$\neq (1, 2)$

$\neq (2, 1, 1)$

Set product

$A \times B = \{(s, t) \mid s \in A, t \in B\}$

$A = \{a, b, c\}$

$B = \{1, 2\}$

$A \times B = \{(a,1), (b,1), (c,1), (a,2), (b,2), (c,2)\}$

Extra questions

Let $S = \{3x \mid x \in \mathbb{Z}\}$ $\quad T = \{x \in \mathbb{R} \mid x < 3\}$

what is $S \setminus T$?

$S = \{3x \mid x \in \mathbb{Z}, 3x \geq 3\}$

True/false :

$2 \in \emptyset$ F

$\emptyset \subseteq \{2\}$ T