







Sets

 \in \subseteq \supseteq \subset \supset \cup \cap \setminus \mathcal{P}

Quantifiers & sets

Set-builder notation

$\forall x. x \in \text{Integers} \rightarrow \text{func works on } x$

$\forall x \in \text{Integers}.$

$\exists x. x \in S \wedge$

$\exists x \in S.$

$\forall x \in S, y, z \in \mathbb{R}.$
 $P(x, y, z)$

$\forall x \in S. \forall y, z \in \mathbb{R}.$
 $P(x, y, z)$

$\forall x, y, z. (x \in S \wedge y \in \mathbb{R} \wedge z \in \mathbb{R}) \rightarrow P(x, y, z)$

$P(x)$

domain: furry animals

$$\forall x, y. f(x, y)$$

$$\forall x. \forall y. f(x, y)$$

$$\forall x \in (S \cup H).$$

H: set of hairless animals
S: set of all furry animals

$$\forall \underline{x} \in S. \forall y \in S. f(x, y)$$



$$\forall x, y \in S.$$

$$\forall x \in S, y \in S.$$

$$\forall x \in S, y \in H. f(x, y)$$

\mathbb{Z}

integers

— num⁺₀ w/ no decimal fraction

\mathbb{R}

real num

— num w/ no imaginary component

\mathbb{Q}

rational num

— $\frac{\text{int}}{\text{int}}$

\mathbb{N}

natural num

— int ≥ 0

\mathbb{Z}^+

> 0

\mathbb{Z}^-

< 0

Set builder notation

$$\left\{ \underbrace{2x}_{\substack{\text{expression} \\ \text{yields a} \\ \text{member}}} \mid \underbrace{x \in \{1, 3, 5\}}_{\substack{\text{predicate / bool exp} \\ \text{T means "include this"}}} \right\} = \{2, 6, 10\}$$

$$\left. \begin{array}{l} \{x \mid x \text{ is a student in this class}\} \\ \{x \mid x\text{'s child is a student in this class}\} \\ \{x\text{'s hair} \mid x \text{ is a student in this class}\} \end{array} \right\} \subset \begin{array}{l} \text{People} \\ \text{Things} \\ \text{Hair} \end{array}$$

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

$$B = \{2x \mid x \in A\}$$

$$|B| = 4$$

{2, 4}

$$C = B \cap A$$

$$|C| = 2$$

$$D = \{x \bmod 3 \mid x \in A\} = \{0, 1, 2\}$$

$$|D| = 3$$

$$E = \{x \mid x \in B \wedge x \in C\}$$

$$|E| = 2$$