The Bright Side of Mathematics

Start Learning Sets – Part 2

1 is an even number — false logical statement

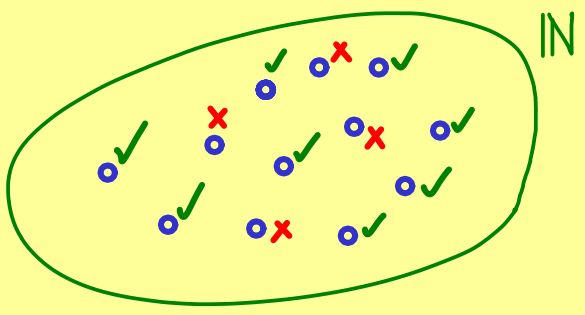
1 is an animal — false logical statement

$1 + 8 = 9$ — true logical statement

predicates

Predicate: An expression with undetermined variables that ascribes a property to objects filled in for the variables.

Form new sets: $\{ x \in \mathbb{N} \mid x \text{ is an even number} \}$



$\{ y \in \mathbb{Z} \mid y \in \mathbb{N} \}$

For $A := \{$Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune$\}$

form: $\{ p \in A \mid p \text{ has at least 1 confirmed moon} \}$

Quantifiers: $\forall x$ for all x $\exists x$ it exists x

Predicate: x is a planet

$\forall x$: x is a planet ⇝ logical statement

false

$\exists x$: x is a planet ⇝ logical statement

true

Equality for sets: Two sets A, B are the same, written as $A = B$ if

$\forall x : \quad x \in A \leftrightarrow x \in B$ is true.

Example: $C := \{1, 3, 5\} = \{3, 5, 1\} =: D$

$1 \in C \leftrightarrow 1 \in D$ true

$2 \in C \leftrightarrow 2 \in D$ true

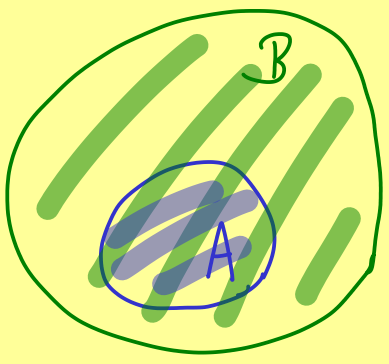
⋮

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

Subsets: For two sets A, B, we write $A \subseteq B$ if

$\forall x : \quad x \in A \to x \in B$ is true.

Short notation: $\forall x \in A : x \in B$



We call A a subset of B. (We can also write $B \supseteq A$)