

Notations & Languages

* Sets. (Non-rigorous intro.)

A class of elements satisfying certain properties (very dangerous definition)

$$A = \{x \mid x \text{ satisfies } \dots\} \leftarrow \text{!! Dangerous! (Actually False)}$$

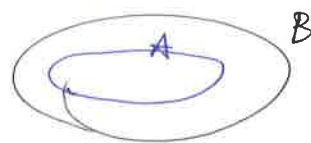
Some basic sets, relations, operations

\emptyset : empty set, set with no element.

$x \in A$ (x belongs to A) if x satisfies the condition to be in A

$A \subseteq B$ (A is a subset of B)

$$x \in A \Rightarrow x \in B \quad \{x \mid 4 \mid x\} \subseteq \{x \mid 2 \mid x\}$$

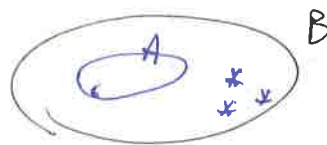


$A = B$ (A coincides B)

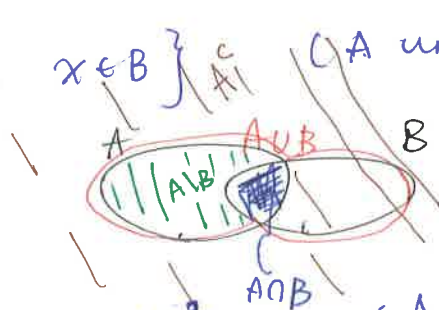
$$A \subseteq B \text{ and } B \subseteq A.$$

$A \subsetneq B$ (A is a proper subset of B)

$$A \subseteq B \text{ and } A \neq B$$



$$A \cup B = \{x \mid x \in A \text{ OR } x \in B\} \quad (A \text{ union } B)$$



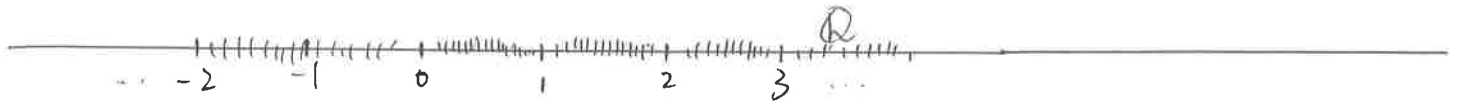
$$A \cap B = \{x \mid x \in A \text{ AND } x \in B\} \quad (A \text{ intersects } B)$$

$$A^c = \{x \mid x \notin A\} \quad (\text{complement of } A)$$

$$A \setminus B = \{x \mid x \in A \text{ AND } x \notin B\} = A \cap B^c \quad (A \text{ minus } B)$$

$$P(A) = \{B \mid B \subseteq A\} \quad (\text{powerset of } A)$$

* Numbers (Informal)



\mathbb{N} : Natural Numbers $0, 1, 2, \dots$, the smallest.

"set of infinity"

\hookrightarrow it has a smallest element and
 if $x \in I \Rightarrow$ "Next element" is in I

eg: $\{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}, \dots\}$

\cap } algebraic structure
 of inverse
 \downarrow

\mathbb{Z} : integers $0, \pm 1, \pm 2, \pm 3 \dots$

\cap } algebraic structure
 of $+, -, \cdot, /$
 \downarrow

\mathbb{Q} : rational Numbers

$$\mathbb{Q} = \left\{ \frac{a}{b} \mid a, b \in \mathbb{Z} \right\}$$

Needs to be careful.

\mathbb{Q} is "dense"
 (no gap)

\cap } geometric
 "completion"
 \downarrow

\mathbb{R} : real numbers

Not "countable"
 anymore

\cap } algebraic
 "completion"
 \downarrow

\mathbb{C} : complex numbers

$$\mathbb{C} = \{a + bi \mid a, b \in \mathbb{R}\}$$

all poly. has roots