

Sets

Two sets are equal (the same set) if they have the same elements.

$$(x \in A) \leftrightarrow (x \in B)$$

In order to know a set A , it is necessary and sufficient to know the ~~the~~ truth value of the statement $x \in A$, for each possible element x .

Subsets

$B \subseteq A$ means $\forall x (x \in B) \rightarrow (x \in A)$.

Subsets of $\{1, 2, 3\}$?

The empty set, \emptyset

The set with no elements,

$$\forall x \neg (x \in \emptyset)$$

(There is no set of Everything,)

Sets can be elements of other sets

What are the elements?

\emptyset

$\{\emptyset\}$

$\{1, 2, 3\}$

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

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

Which are equal?

Operations on Sets

Intersection:

$$\forall x (x \in A \cap B) \leftrightarrow ((x \in A) \wedge (x \in B)).$$

Union:

$$\forall x (x \in A \cup B) \leftrightarrow (x \in A) \vee (x \in B).$$

Set difference:

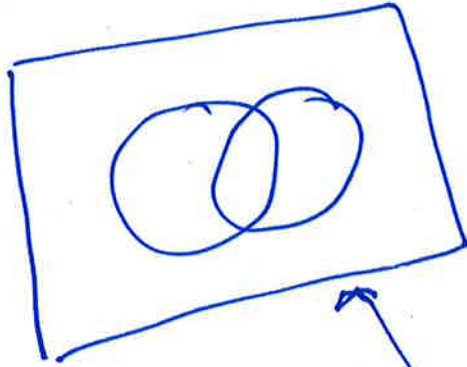
$$\forall x (x \in A \setminus B) \leftrightarrow (x \in A) \wedge \neg (x \in B).$$

The power set: $\mathcal{P}(A) = \{B \mid B \subseteq A\}$.

The Cartesian product:

$$A \times B = \{(a, b) \mid a \in A \text{ and } b \in B\}.$$

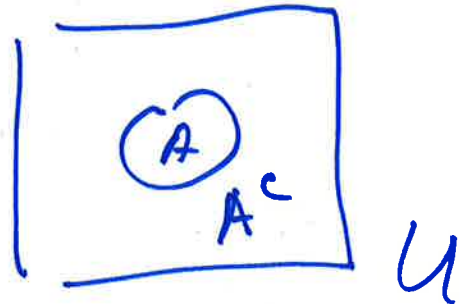
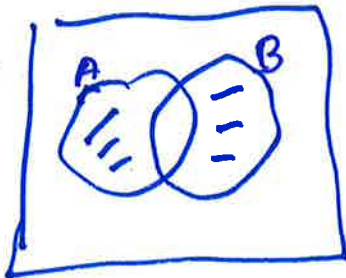
Venn Diagrams



a Universal set U

$$A^c = U \setminus A \quad (\text{if } A \subseteq U)$$

$A \oplus B$



Homework

2.1: T-F questions. Exercises 1-9;

2.2: T-F, and exercises 1, 3, 5, 7, 8, 10, 15.