SETS

Building sets

Set builder notation:

$$(0,1] = \{x \in \mathbb{R} \mid 0 < x \text{ and } x \leq 1\}$$

$$= \{x \in \mathbb{R} : 0 < x \text{ and } x \leq 1\}$$

$$E = \{\text{all even numbers}\}$$

$$= \{2n : n \in \mathbb{Z}\}$$

Some common sets (NO: mengde)

$\mathbb{N} = \{1, 2, 3, \dots\}$ natural numbers

$\mathbb{N}_0 = \{0, 1, 2, 3, \dots\}$ nonnegative integers

$\mathbb{Z} = \{\dots, -2, -1, 0, 1, 2, \dots\}$ integers (NO: heltall)

$\mathbb{Q} = \{p/q : p \in \mathbb{Z}, q \in \mathbb{N}\}$ rational numbers

$\mathbb{R} = \{\text{all real numbers}\}$

$\emptyset = \{\}$ the empty set

$\mathbb{R}^n = \{(x_1, \dots, x_n) : x_1, \dots, x_n \in \mathbb{R}\}$ Euclidean space

Comparing sets

We can compare two sets A, B:

$A \subset B$ A is a subset (NO: deelverzameling) of B

Means that $x \in A \Rightarrow x \in B$ (Also written $A \subseteq B$)

$A = B$ A equals B

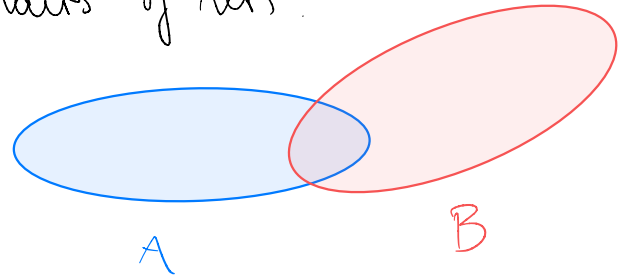
Means that both $A \subset B$ and $B \subset A$

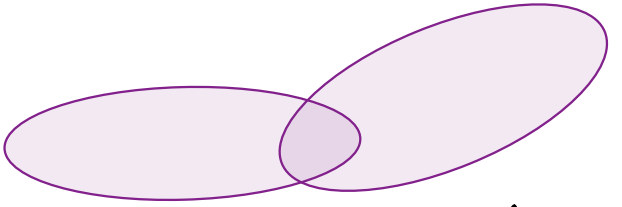
$A \subsetneq B$ A is a proper subset (NO: echte deelverzameling) of B

Means that $A \subset B$, and that $\exists\, x \in B$ such that $x \notin A$

Binary operations

We can perform operations on pairs of sets





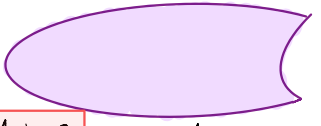
$A \cup B$ = union of A and B

$= \{x : x \in A \text{ or } x \in B\}$



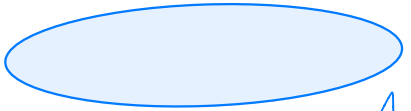
$A \cap B$ = intersection (NO: milk) of A, B

$= \{x : x \in A \text{ and } x \in B\}$



$A \setminus B$ = difference of A and B

$= \{x \in A : x \notin B\}$





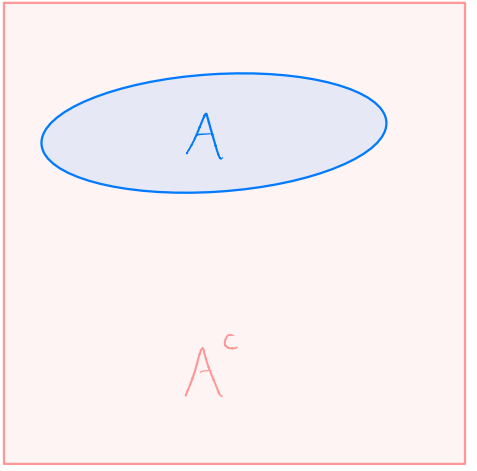
A and B are disjoint (NO: disjunkte) if $A \cap B = \emptyset$

A^c is the complement (NO: komplementet) of A – everything not in A:

$$A^c = \{x : x \notin A\}.$$

A^c is sometimes written as $\overline{A}$.

Note: It is clear from the context what "everything" is. If $A \subset \mathbb{R}$ then also $A^c \subset \mathbb{R}$.



$A \times B$ is the Cartesian product (NO: kartesisk product) of A, B:

$$A \times B = \{(x, y) : x \in A,\ y \in B\}.$$

$A^2 = A \times A$

Thus, $\mathbb{R}^2 = \mathbb{R} \times \mathbb{R}$

$\mathbb{R}^3 = \mathbb{R} \times \mathbb{R} \times \mathbb{R}$

$\vdots$

QUESTIONS ?

COMMENTS ?