Set theory (Mängdlära)

Some symbols

$A = \{a, b, c\}$	A is a set (mängd) containing elements (element) a,b and c
$x \in \{a, b, c\}$	x belongs to (tillhör) the set $\{a, b, c\}$, i.e. $x = a$ or $x = b$ or $x = c$.
$x \notin A$	x does not belong to A.
$A \cap B$	Intersection (snitt). $x \in A \cap B$ if $x \in A$ and $x \in B$.
$A \cup B$	Union (union). $x \in A \cup B$ if $x \in A$ or $x \in B$.
$A \setminus B$	Minus. $x \in A \setminus B$ if $x \in A$ and $x \notin B$.
A^c or A'	Complement (komplement). A^c contains all elements that are not in A. (This assumes that the set of all possible elements is known – it is sometimes called the universe).
$A \subset B$	A is a subset (delmängd) of B, i.e. if $x \in A$ then $x \in B$.
$A \supset B$	A contains B, A is a superset of B, i.e. $B \subset A$.

Some special sets

$\emptyset$	The empty set (tomma mängden). The set that contains no elements.
$\mathbb{N}$	The set of all natural numbers (naturliga tal): 1,2,3,...
$\mathbb{Z}$	The set of all whole numbers (heltal): ...,-2,-1,0,1,2,...
$\mathbb{Q}$	The set of all rational numbers (rationella tal): $\frac{2}{3}, 2, -\frac{5}{12}, \ldots$
$\mathbb{R}$	The set of all real numbers (reella tal): $-\sqrt{2}, \frac{4}{5}, \pi, \ldots$
$\mathbb{C}$	The set of all complex numbers (komplexa tal): $(a + bi),\ a, b \in \mathbb{R}$
$\mathbb{R}^+$	The set of all positive real numbers.
(a, b)	Open interval. The set of all real numbers x such that $x > a$ and $x < b$. This can be written in set language as $\{x \in \mathbb{R} \mid a < x < b\}$.
$[a, b]$	Closed interval. $\{x \in \mathbb{R} \mid a \leq x \leq b\}$
$[a, b)$	$\{x \in \mathbb{R} \mid a \leq x < b\}$
$[a, \infty)$	$\{x \in \mathbb{R} \mid x \geq a\}$
$(-\infty, a)$	$\{x \in \mathbb{R} \mid x < a\}$

In the notation $\{x \in \mathbb{R} \mid x \geq a\}$, the left part specifies the universe, i.e. the set from which x may be taken. The "|" reads "such that" and the right part specifies which x that belong to this particular set.

Some Examples
— check that you understand what they mean (the statements are all true).

$\{a,b,c\} \cap \{a,b\} = \{a,b\}$
$\{a,b\} \cup \{b,c\} = \{a,b,c\}$
$\{a,b\} \cap \{c,d\} = \emptyset$
$\{a,b,c\} \setminus \{c\} = \{a,b\}$
$A = \{x \in \mathbb{R} \mid x > 2\} \Rightarrow A^c = \{x \in \mathbb{R} \mid x \leq 2\}$ ($\Rightarrow$ means "implies" (medför))
$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$
$(-\infty, \infty) = \mathbb{R}$
$\mathbb{R}^+ = (0, \infty)$
$A \subset A \cup B$
$A \cap B \subset B$
$\{n \in \mathbb{Z} \mid n \geq 1\} = \mathbb{N} = \mathbb{Z}^+$
$\{n \in \mathbb{Z} \mid n = 2k,\ k \in \mathbb{N}\} = \{2, 4, 6, \ldots\}$
$\{x \in \mathbb{R} \mid x^2 = 2\} = \{\sqrt{2}, -\sqrt{2}\}$
$\mathbb{Q} = \{(p,q) \mid p, q \in \mathbb{Z},\ q \neq 0\}$
$R_f = \{f(x) \mid x \in D_f\}$

$(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$
$(A \cap B) \cup C = (A \cup C) \cap (B \cup C)$
$(A \cup B)^c = A^c \cap B^c$
$(A \cap B)^c = A^c \cup B^c$

$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$
$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$
$A^c = \{x \in U \mid x \notin A\}$ (U is the universe)

$[a,b)^c = (-\infty, a) \cup [b, \infty)$