MATHEMATICS

1 Basics

1.1 Sets

Sets:	$\mathbb{A}, \mathbb{B}, \ldots, \mathbb{U}, \ldots$	
Elements:	$a \in \mathbb{A}$	(element a belongs to the set $\mathbb{A}$)
	$b \notin \mathbb{A}$	(element b does not belong to the set $\mathbb{A}$)
Empty set:	$\mathbb{A} = \{\,\} = \varnothing$	(set $\mathbb{A}$ contains no element)
Subset:	$\mathbb{A} \subset \mathbb{B}$	(all elements of $\mathbb{A}$ belong to $\mathbb{B}$)

Intersection: $\quad \mathbb{A} \cap \mathbb{B} := \{\, x \,|\, x \in \mathbb{A} \text{ and } x \in \mathbb{B}\}$

Union: $\quad \mathbb{A} \cup \mathbb{B} := \{\, x \,|\, x \in \mathbb{A} \text{ or } x \in \mathbb{B}\}$

Symmetric difference: $\quad \mathbb{A} \triangle \mathbb{B} := \{\, x \,|\, \text{either } x \in \mathbb{A} \text{ or } x \in \mathbb{B}\}$

Difference: $\quad \mathbb{A} \setminus \mathbb{B} := \{\, x \,|\, x \in \mathbb{A} \text{ and } x \notin \mathbb{B}\}$

Complement: (in universe $\mathbb{U}$) $\quad \overline{\mathbb{A}} := \mathbb{U} \setminus \mathbb{A} = \{\, x \in \mathbb{U} \,|\, x \notin \mathbb{A}\}$
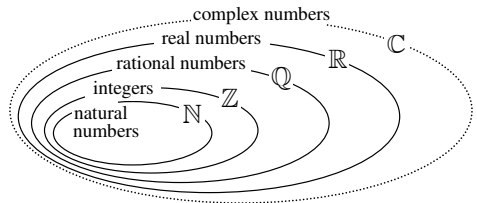
1.2 Number sets

$\mathbb{N} = \{1, 2, 3, \ldots\} \qquad \mathbb{N}_0 = \{0, 1, 2, 3, \ldots\}$

$\mathbb{Z} = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$

$\mathbb{Q} = \left\{\dfrac{z}{n} \,\middle|\, z \in \mathbb{Z} \text{ and } n \in \mathbb{N}\right\}$

$\mathbb{R} = \text{set of all decimals}$

$\mathbb{C} = \{x + \mathrm{i}y \,|\, x \in \mathbb{R}, y \in \mathbb{R} \text{ and } \mathrm{i}^2 = -1\}$

complex numbers
real numbers
rational numbers
integers
natural numbers

1.3 Arithmetic

Commutative law:	$a + b = b + a$	$a \cdot b = b \cdot a$
Associative law:	$(a + b) + c = a + (b + c)$	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$
Distributive law:	$a \cdot (b \pm c) = a \cdot b \pm a \cdot c$	$(a \pm b) \cdot c = a \cdot c \pm b \cdot c$
		$(a \pm b) : c = a : c \pm b : c$

Absolute value of a number: $\quad |a| := \begin{cases} a, & \text{if } a \geq 0 \\ -a, & \text{if } a < 0 \end{cases}$