1 set

def: a set is a collection of objects . objects that form a set are called elements of the set.
Notation: we use capital letters to denote sets. We use lower case letters to denote elements.

1.1 Explicitly described sets:

$\{1, 2, -3, 1/2\} = S$ $\{1, 3, \{1, 2\}\}\} = T$ $1 \in S$, $5 \notin S$
Notation: $a \in A$ reads " a is a n elements of A", "a belongs to A" or " a lies in A" $b \notin A$ reads "b is not an element of A"
$2 \notin T, \{1, 2\} \in T$
def: The cardinality of a set S is the number of elements in S.
Notation: $|S|$ For how we will only look at the cardinalities of sets with finitely many elements.
$|S| = 4$
$|T| = 3$

1.2 Standard reserved names for sets:

$\mathbb{N}$ = set of natural numbers = $\{1, 2, 3, 4, ...\}$
$\mathbb{Z}$ = set of integers = $\{0, 1, 2, 3, ...\}$
$\mathbb{Q}$ = set of rational numbers
$\mathbb{R}$ = set of real numbers
$\mathbb{C}$ = set of complex numbers
$\emptyset = \{\}$ - set with no elements - the empty set $||\emptyset| = 0$

Ex : $A = \{\emptyset, \{\emptyset\}\}$

$|A| = 2$
$\emptyset \in A$
$\{\emptyset\} \in A$
$|\emptyset| = 1$

1.3 Sets described by a property:

$S = \{x \in U | p(x)\}$ Here U in some fixed set

the condition x must satisfy

Example
$S = \{x \in \mathbb{N} | x^2 = 9\} = \{3\}$
$T = \{x \in \mathbb{R} | x^2 = 9\} = \{3, -3\}$

1.4 Sets described by a generating formula:

$S = \{\mathscr{F}(x) | x \in \mathbb{R}\}$ where $\mathbb{R}$ in some fixed set

formula (an expression in X)

$\mathbb{Q} = \{\frac{a}{b} | a \in \mathbb{Z}, b \in \mathbb{N}\}$

$\mathbb{C} = \{a + bi | a, b \in \mathbb{R}\}$ where $i = \sqrt{-1}$