Language: set notation

set: do not define.

"collection of objects".

How to specify a set:

1) List all its elements

set-builder notation: $\{1, 2, 3, 4, \dots\} = \mathbb{N}$ – natural numbers

elements of our set

LaTeX command: {\mathbb N}

2) Write down the conditions defining our set as a subset of a universal set.

could be $\mathbb{R}$, or $\mathbb{R}^n = \underbrace{\mathbb{R} \times \mathbb{R} \times \dots \times}_{\text{will define}}$

real numbers

About the course

Instructor: Julia Gordon, MATH 217

Most of the course materials will be on the course website (not canvas)

On canvas:
- assignments
- solutions
- link to Piazza
- computer projects (in October and November)

Text: Janisch "Linear Algebra" (online at UBC library)

email: gor@math.ubc.ca

Why need the universal set:
- to avoid "set of all sets" paradox.

is this set an element of itself?

- both Yes and No.

more precisely, see "Russell's paradox" link.

speaking of sets of sets:

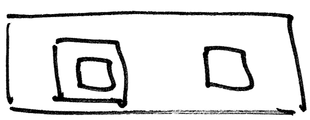
How to build everything from nothing:

$\emptyset$ - empty set

$\{\emptyset\}$ - a set of one element: the empty set

(imagine: a box containing an empty box)

$\{\{\emptyset\}, \emptyset\}$ - a set of 2 elements



When listing elements, repetitions do not matter: $\{1, 1, 2, 3\} = \{1, 2, 3\} = \{3, 2, 1\}$.

Defining sets by a condition:

1) $\{x \in \mathbb{R} : x > 0\}$ - the set of positive numbers

an element of

$\boxed{\text{\\in}}$ - TeX

also used: $|$
read as "such that"

$\{x \in \mathbb{R} \mid x > 0\}$

2) $A = \{x \in \mathbb{N} : x \text{ is even}\}$

$2 \in A$ but $27 \notin A$.

$\boxed{\text{\\notin}}$

More notation:

$\forall$ - universal quantifier

$\exists$ - existential quantifier

Example $\exists\ x \in \mathbb{R} : x^2 + 3x - 2 = 0$

"exists a real number x such that $x^2 + 3x - 2 = 0$".

True

How to prove:

- exhibit ~~the~~ an x that satisfies it.

- or give an argument:

  $ax^2+bx+c = 0$

  has a real root if and only if

  $b^2 - 4ac \geq 0$