

Precalculus

Interval notation, the \in and the \cup symbols

Todor Milev

2019

Outline

- 1 Interval notation
- 2 Inequalities and interval notation

Review of standard interval notation

- If you are familiar with all aspects of the following notation:

$$x \in (-\infty, 7) \cup (9, 12],$$



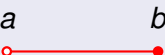
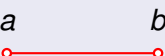
feel free skip the next slides.

- In particular, in the next two slides we cover:
 - the open/closed/semi-closed interval notation;
 - the “belongs to” \in sign;
 - the union \cup sign.

Let $a < b$ be two real numbers.

Definition (Interval notation)

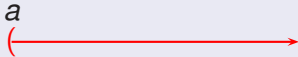
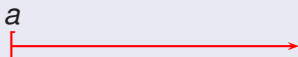
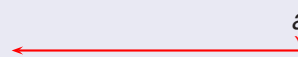

The set (interval) of all real numbers from a to b is denoted as follows.

Notation	Endpoints	Picture
$[a, b]$	including both a and b	 or $[\text{---}]$
$[a, b)$	including a but not b	 or $[\text{---})$
$(a, b]$	including b but not a	 or $(\text{---}]$
(a, b)	including neither a nor b	 or (---)

Let a be a number.

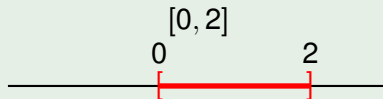
Definition (Infinite intervals)

The set of all numbers greater than/smaller than a is denoted with the help of the ∞ symbol.

Notation	Endpoint	Picture
(a, ∞)	pts. to the right of a excluding a	
$[a, \infty)$	pts. to the right of a including a	
$(-\infty, a)$	pts. to the left of a excluding a	
$(-\infty, a]$	pts. to the left of a including a	

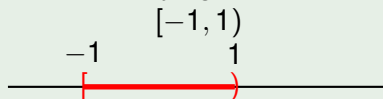
Example

Write the set of numbers x satisfying $0 \leq x \leq 2$ in interval notation.



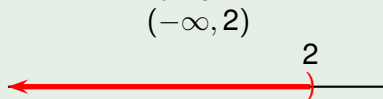
Example

Write the set of numbers x satisfying $-1 \leq x < 1$ in interval notation.



Example

Write the set of numbers x satisfying $x < 2$ in interval notation.



Definition

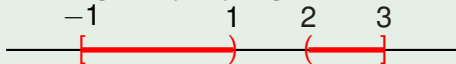
Let A and B be sets.

- The union of A and B is the set consisting of the elements in A and the elements in B , without additional elements.
- The union of A and B is denoted by

$$A \cup B$$

Example

Plot the points in the set $[-1, 1) \cup (2, 3]$.



Plot the points in the set $[-1, 2) \cup (1, 3]$.



- To draw the points of a union draw both on top of one another.

Definition

Let A be a set. The notation

$$x \in A$$

is read as

- x belongs to A or
- x is an element of A .

Example

Express the statement $-1 < x \leq 2$ using the \in symbol and the interval notation.

$$x \in (-1, 2]$$

Express the statement $x < 0$ or $1 \leq x < 2$ using the \in symbol and the interval notation.

$$x \in (-\infty, 0) \cup [1, 2)$$