

# Notation of Sets

Homework: worksheet given in class.

$\mathbb{N}$

This is called a list

$$\mathbb{N} = \{0, 1, 2, \dots\}$$

Note: Not always you can list a set

~~Number line~~

$$x \in \mathbb{N}$$

Set notation

$$\{x : x \in \mathbb{N}\}$$

such that " $\mid$ "

Interval Notation

~~Interval Notation only works with Real Numbers~~

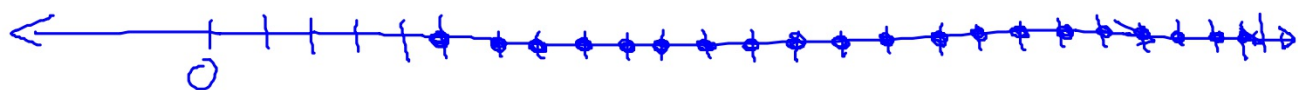
$\mathbb{N}$

Number of students in a classroom, which is 5 to 25

Set Notation  $\{5, 6, 7, \dots, 25\}$

$\{x \mid 5 \leq x \leq 25 \text{ and } x \in \mathbb{N}\}$

Number line



Interval Notation

~~X~~

Integers between -3 and 2.

List  $\{-2, -1, 0, 1\}$

Set Notation

$\{x : -3 < x < 2 \text{ and } x \in \mathbb{Z}\}$

Number line



Interval Notation

~~X~~

all Real  $\mathbb{R}$   
Numbers between -10 and 8, including -10

~~$\{-10, -9, -8, \dots, 8\}$~~  cannot list

Set Notation

$$\{x \mid -10 \leq x < 8\}$$

Number line



Interval Notation

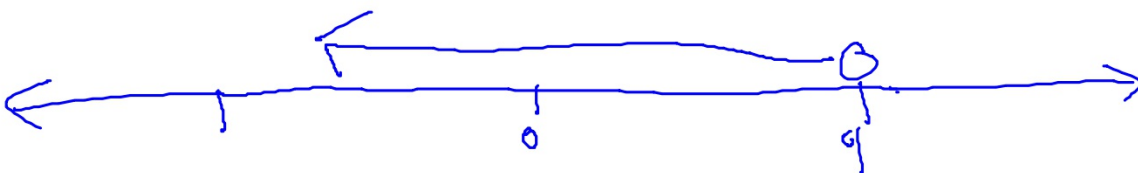
$$[-10, 8)$$

Numbers that are smaller than 9.

Set notation

$$\{x \mid x < 9\}$$

Number line



Interval Notation

$$(-\infty, 9)$$

<sup>are</sup>  
numbers at least 15

$$\{x : x \geq 15\}$$



$$[15, \infty)$$

At restaurant "Chez Farouk" kids under 12 eat for free

Note: age is Real numbers

Set notation:

$$\{x \mid 0 < x < 12\}$$

Number line:



Interval notation:

$$(0, 12)$$

To be able to watch this movie you must be at least 15 years old.

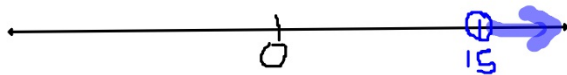
Note: age is "all Real numbers", i guess you could say  $\mathbb{R}^+$

Age is not Integers. In math, this is called *continuous* (all real numbers) versus *discrete* (only natural numbers)

Set notation:

$\{x: x \geq 15\}$

Number Line



Interval Notation:

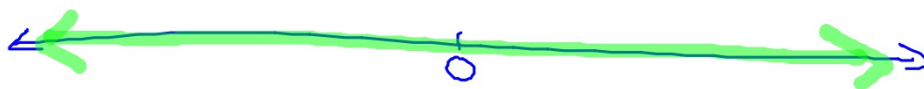
$[15, \infty)$

All Real numbers

Set Notation

$\mathbb{R}$

Number line



Interval notation

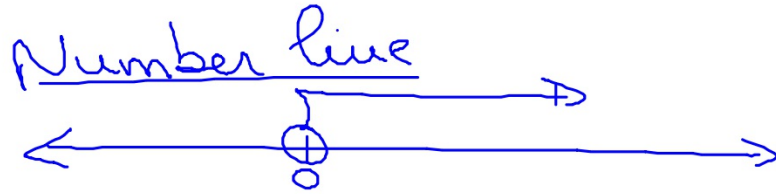
$(-\infty, \infty)$

note: remember you  
CANNOT list real numbers  
WHY???

All positive numbers

This means only positive numbers

$$\mathbb{R}^+ \text{ or } \{x : x > 0\}$$



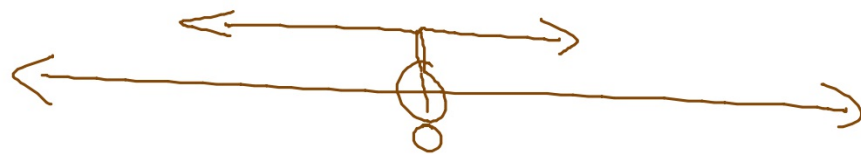
Interval Notation

$$(0, \infty)$$

$$\frac{a}{b} \text{ but } b \neq 0$$

Set Notation for possible numbers for b.

$$\mathbb{R}^* \text{ or } \{x \mid x \neq 0\}$$



Note: \* means  
all Real numbers but 0

$$(-\infty, 0) \cup (0, \infty)$$

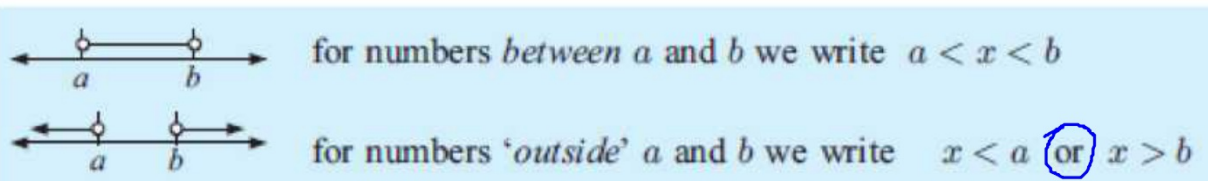
## Summary

# Set-builder notation

$\{x \in \mathbb{Z} \mid 2 \leq x \leq 6\}$	<p>is set-builder notation for the set of integers from 2 to 6, inclusive.    <math>\in</math> = "is an element of"</p> <p><math>\mathbb{Z}</math> = the set of integers</p> <p><math>\mid</math> = the words "such that"</p> <p>The statement is read, "all <math>x</math> that are elements of the set of integers, such that, <math>x</math> is between 2 and 6 inclusive."</p>
$\{x \in \mathbb{Z} \mid x > 0\}$	<p>The statement is read, "all <math>x</math> that are elements of the set of integers, such that, the <math>x</math> values are greater than 0, positive."</p> <p>(The positive integers can also be indicated as the set <math>\mathbb{Z}^+</math>.)</p>
<p>It is also possible to use a colon (:), instead of the <math>\mid</math>, to represent the words "such that".</p> <p><math>\{x \in \mathbb{Z} \mid 2 \leq x \leq 6\}</math> is the same as <math>\{x \in \mathbb{Z} : 2 \leq x \leq 6\}</math></p>	

$\{2, 3, 4, 5, 6\}$	<p>is a <span style="color: blue;">list</span> for the set of integers from 2 to 6, inclusive.</p>
$\{1, 2, 3, 4, \dots\}$	<p>is a <span style="color: blue;">list</span> for the set of positive integers. The three dots indicate that the numbers continue in the same pattern indefinitely. (Those three dots are called an <b>ellipsis</b>.)</p>
<p><span style="color: blue;">list</span> Rosters may be awkward to write for certain sets that contain an infinite number of entries. <span style="color: blue;">impossible</span></p>	

- If a graph contains a small **open circle** end point such as  $\text{---} \circ$ , the end point is **not included**.
- If a graph contains a small **filled-in circle** end point such as  $\text{---} \bullet$ , the end point is **included**.



Don't do  ~~$b < x < a$~~

For example:

$\{x: x \geq 3\}$	is read "the set of all $x$ such that $x$ is greater than or equal to 3" and has number line graph	
$\{x: x < 2\}$	has number line graph	
$\{x: -2 < x \leq 1\}$	has number line graph	
$\{x: x \leq 0 \text{ or } x > 4\}$	has number line graph	