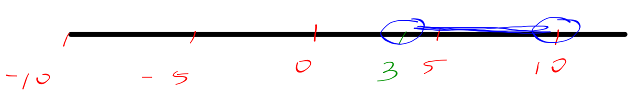
From yesterday : Draw the interval on the number line [,]

3.1 How to Read Interval Notation

Intervals are a very useful way of representing a set of numbers. Consider the following examples:

smaller #'s min larger #'s max

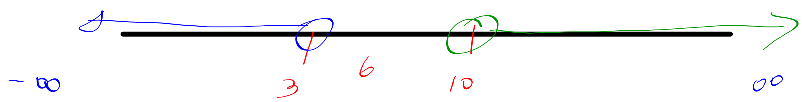


excluding bracket excluding bracket

$x \in]3, 10[$

x belongs to [ ] the interval of #'s excluding 3 to 10 excluded

intervals are for solution sets of variable inbetween two endpoints



$]-\infty, 3[\cup]10, \infty$

$b \leq 10$

$b \geq 6$

[min, max]

[6, 10] books

Lesson 5 : Notation of Inequalities cont'd and Solving Inequalities March 31st 2023

$\mathbb{R}$ $\mathbb{N}$ $\mathbb{Z}$ $\mathbb{Q}$ $\mathbb{Q}'$ → main types of number sets

i. Find the definition of your given number set (group).

ii. Pick 3 examples of elements (numbers) that belong to your set:

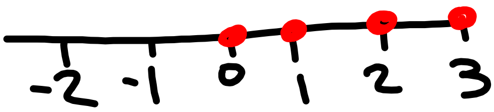
$\{0, \sqrt{2}, -2, -7, 1, \frac{1}{3}, \underset{3.14\ldots}{\pi}, \frac{10}{2}, \underset{2.17\ldots}{e}, 3, 4\}$

iii. Represent your number set graphically on the # line

iv. BONUS : YES or NO : could you represent your number set w/ interval notation?

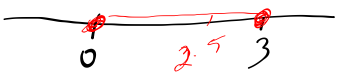
$\mathbb{N}$ – Natural Numbers

$$A = \{0, 1, 2, +\infty\}$$



no interval for Natural #

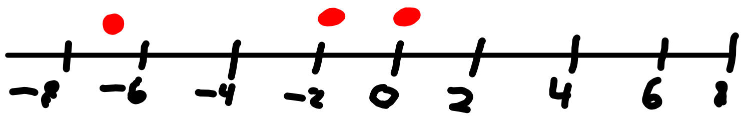
[0, 3] is no good for natural #



$\mathbb{Z}$ - Double strike Z

- stands for the sets of all integers and not fraction, decimal and whole number

$\{-2, 0, -7\}$

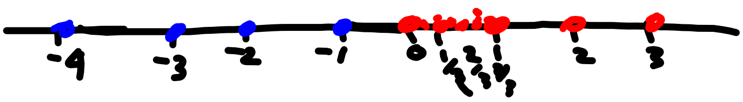


$\mathbb{Q}$ a rational number is a number that can be expressed as the quotient or fraction of 2 integers

7

ex: $\left\{ \frac{1}{3}, \frac{10}{2}, -2, -7 \right\}$

no interval form



$\pi \in \underbrace{[3.14159\ldots, \infty[}_{\text{interval of rational + irrational \#'s}}$

$\mathbb{Q}'$:

Irrational: Numbers that cannot be represented as a simple fraction, can be infinite, Not periodic.

$0.3333\dot{3} = \frac{1}{3} \in \mathbb{Q}$

$\frac{1}{3} \notin \mathbb{Q}'$

Ex: π, E, $\sqrt{2}$

$\frac{\sqrt{2}}{3} \in \mathbb{Q}'$

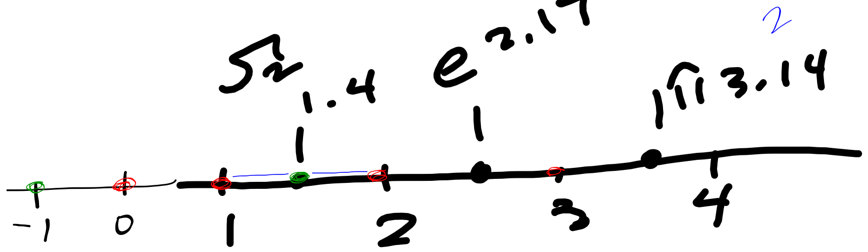
$\frac{\sqrt{4}}{2} \notin \mathbb{Q}'$

$\frac{2}{2} = 1 \in \mathbb{Q}$

$1 \in \mathbb{N}$

$1 \notin \mathbb{Q}'$

$1 \in \mathbb{Z}$



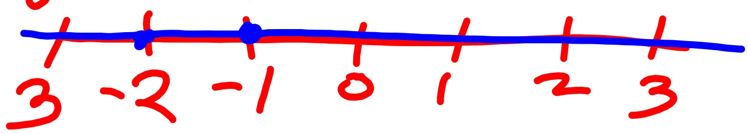
$\mathbb{R}$ - Real Numbers

} of class

Doing number you can think of.

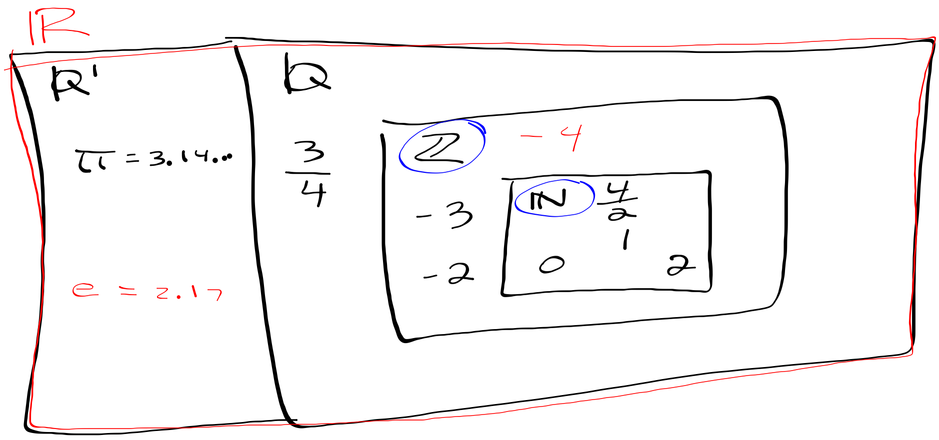
rational $\frac{5}{3}$, $0.\dot{6}3$ $0.0\overline{12}$

integers $(\ldots, -2, -1$



$\mathbb{R}$ $]-\infty, \infty[$

Back @ 10:10


ℝ
ℚ'
π = 3.14...
e = 2.17
ℚ
3/4
ℤ
-4
-3
-2
ℕ
4/2
1
0
2

curly brackets $\{ \quad \}$ a set $\boxed{P179}$

$4^{th}/5^{th}$ Ways to Represent Inequalities

Roster Method

e.x.

$A = \{2, 3, 4\}$

the are 3 elements in set A.

Recall: [min, max] interval

$C = [2, 4]$

there are an infinite amount of elements

$B = \{2, 3, 4, \dots\}$

min — to ∞

$D = \{-2, -1, 0, 1, 2, 3\}$

6 elements = finite

$\mathbb{Z}$ or $\mathbb{N}$

infinite element = $\mathbb{R}$ or $\mathbb{Z}$ or $\mathbb{N}$

$E = \{-2, -1, 0, 1, 2, 3, \dots\}$

min — to ∞ max

$F = \{-1, 0, 1\}$

$G = \{\dots, 2, 3, 4\}$

max

to $-\infty$ min

Set-Builder Notation

3 elements

$A = \{x \in \mathbb{N} \mid 2 \le x \le 4\}$

cannot write $\mathbb{R}$

$A \cancel{=} \{x \in \mathbb{R} \mid 2 \le x \le 4\}$

an infinite amount of elements

$C = \{x \in \mathbb{R} \mid 2 \le x \le 4\}$

$B = \{x \in \mathbb{N} \mid x \ge 2\}$

B is a set of elements x that belong to such that

$\boxed{P179}$

$D = \{x \in \mathbb{Z} \mid -2 \le x \le 3\}$

✓ conventional way

$E = \{x \in \mathbb{Z} \mid x \ge -2\}$

$E = \{x \in \mathbb{Z} \mid 2 \le x < \infty\}$

$\min \le x \le \max$

$F = \{x \in \mathbb{Z} \mid -1 \le x \le 1\}$

$G = \{x \in \mathbb{Z} \mid x \le 4\}$

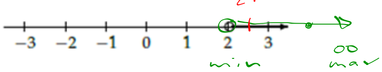
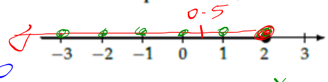
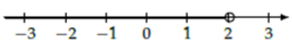
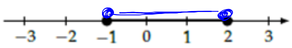
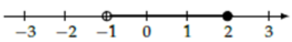
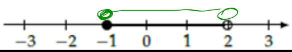
$\mathbb{N}$

Summary: Representing an Inequality

L → R

Roster method

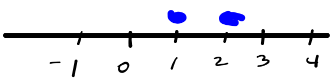
Set - Builder Notation
$\min \leq x \leq \max$

Algebraic Expression	Number Line (Graphical Representation)	Interval notation	Roster method	Set-Builder Notation
$x > 2$		$x \in]2, +\infty[$ (min, max)	$\varnothing$	$\{x \in \mathbb{R} \mid 2 < x < \infty\}$ $\{x \in \mathbb{R} \mid x > 2\}$
$x \leq 2$		$x \in]-\infty, 2]$ included	$\varnothing$	$\{x \in \mathbb{R} \mid -\infty < x \leq 2\}$ $\{x \in \mathbb{R} \mid x \leq 2\}$
$x < 2$		$x \in]-\infty, 2[$		
$-1 \leq x \leq 2$		$x \in [-1, 2]$	$\varnothing$	$\{x \in \mathbb{R} \mid -1 \leq x \leq 2\}$
$-1 < x \leq 2$		$x \in]-1, 2]$		
$-1 \leq x < 2$		$x \in [-1, 2[$		

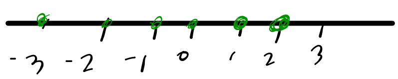
2.5, min, ∞ max

0.5, −∞ min, max

$1 \leq x \leq 2$
$x \in \mathbb{N}$



$\varnothing$ $\{1, 2\}$ $\{x \in \mathbb{N} \mid 1 \leq x \leq 2\}$
$\min < x < \max$



$\varnothing$ $\{\ldots, 1, 2\}$ $\{x \in \mathbb{Z} \mid x \leq 2\}$

You do (for homework)
P 185 # 4.8 (the 1st five rows) ← start

P 186 - 187 # 4.9 - # 4.11

Solving Inequalities : Same as Solving Equations $\bar{w}$ one $\boxed{\text{Exception}}$

Recall :

$4 + 2^{+1} = 3 + 3^{+1}$

consider : below is true

$3 \leq 5$

$3^{+1} \leq 5^{+1}$ True

$\frac{4}{2} \leq \frac{6}{2}$ True

$2^{-1} \leq 3^{-1}$ True

$-2 \times 1 \leq 2^{\times -2}$ False

$-2 \leq -4$

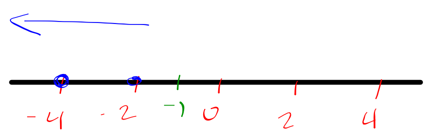
True !

$\frac{-2}{2} \geq \frac{-4}{2}$ True

$\frac{-1}{-1} \geq \frac{-2}{-1}$ True cuz we flipped !

$1 \leq 2$

smaller #



nota bene :

whenever you × or ÷ (both sides of) an equality by a negative #, you must flip the sign

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Q.1 Represent the solution set to the inequality on the # line.

$\boxed{\text{Solve}}$: find value of x that make a true statement values

step i : Isolate x $\bar{w}$ o. o. to both sides. Which operation 1st?

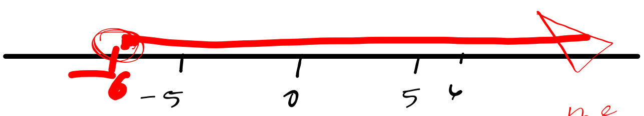
(4) B
(3) E
(2) {D, M}
(1) {A, S}

$-4^{+4} - 1 \cdot x < 2 + 4$

$\frac{\cancel{-1} \cdot x}{\cancel{-1}} < \frac{6}{-1}$

$x > -6$

step ii : Flip sign when needed.



↳ the red is the solution set.

check by picking any solution (one solution)

$x = 8$

$-4 - x < 2$

$-4 - 8 < 2$

$-12 < 2$ True

Q2. Solve and put answer on # line

$10 - 2 \cdot x \geq 6$ -10 -10

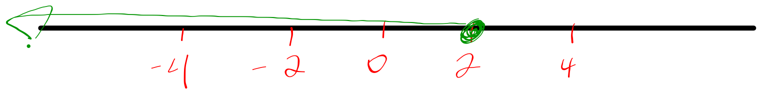
$\frac{-2 \cdot x}{-2} \geq \frac{-4}{-2}$

$x \leq 2$

step i

step ii careful flipping!

B
E
D
M
A
S



check $x = -2$

$10 - 2x \geq 6$

$10 - 2(-2) \geq 6$

$10 + 4 \geq 6$

$14 \geq 6$ True!

$\boxed{\text{Q3.}}$

$6x - 2(-2x + 4) < 32$

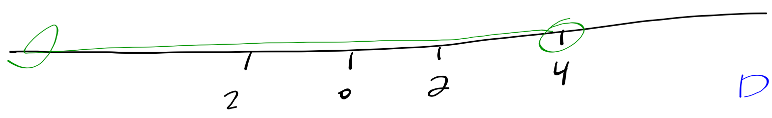
$6x + (-2)(-2x) + 4(-2) < 32$

$6x + 4x - 8 < 32$

$10x - 8 < 32$ $+8$ $+8$

$\frac{10 \cdot x}{10} < \frac{40}{10}$

$x < 4$



You do

HMWK:

p 166
#4.1 #4.2

Read solving
188 - 190

Do p 196 - 197

Do pg 198 #4.15
(1st 3 rows)

Do pg 204
#4.22