GRADE 7 · UNIT 10 · LESSON 1

Exploring Inequalities – Part 1

MA.7.AR.2.1

I can tell whether a number is a solution of an inequality, graph all its solutions on a number line, and write the inequality a graph shows.

Warm-Up

1. Rewrite with the fewest terms: $-2(3x - 5) + 4x$
2. Find the value of $4 - 3m$ when $m = -2$.
3. Find the value: $-6.5 + 4$
4. Which is greater, -4 or -1.5?

Warm-Up

1. Rewrite with the fewest terms: $-2(3x - 5) + 4x$ $-2x + 10$
2. Find the value of $4 - 3m$ when $m = -2$. **10**
3. Find the value: $-6.5 + 4$ **−2.5**
4. Which is greater, -4 or -1.5? **−1.5**

Vocabulary

inequality

a statement that compares two amounts with <, >, ≤ or ≥: $x > 3$

solution

a number that makes the inequality true: 5 is a solution of $x > 3$

solution set

all the solutions — usually infinitely many, so they are drawn, not listed

boundary

the number that separates the solutions from the numbers that are not: 3 for $x > 3$ and for $x < 3$. Open circle: not a solution. Closed: a solution.

Notes

I. Inequality symbols, and what a solution is

$<$ is less than. $>$ is greater than. Both are strict.

$\leq$ is less than or equal to. $\geq$ is greater than or equal to.

A solution makes the inequality true.

For $x > 3$: 5 is a solution, because $5 > 3$ is true.

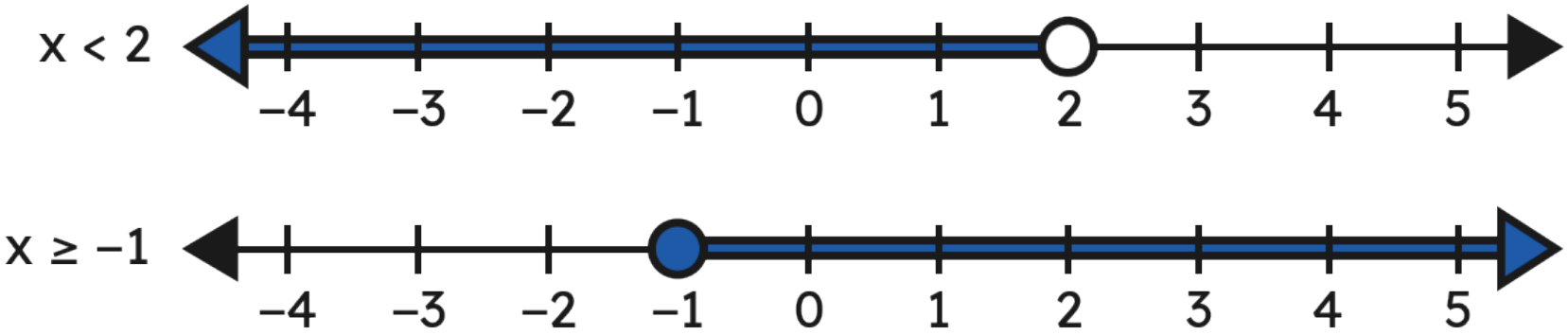
3 is not a solution of $x > 3$: $3 > 3$ is false.

Notes

II. A graph shows every solution

Open circle: the boundary is not a solution. Closed circle: it is.

The arrow covers every other solution.



Notes

III. The variable on the right

$7 > x$ says the same as $x < 7$

Read it from the variable: x is less than 7.

Same solutions, same graph: an open circle at 7 and the arrow to the left.

Example 1

Which of -3, -2 and 0.5 are solutions of $n - 4 > -6$?

Example 1

-3: $-3 - 4 = -7$, and $-7 > -6$ is false.

-2: $-2 - 4 = -6$, and $-6 > -6$ is false.

0.5: $0.5 - 4 = -3.5$, and $-3.5 > -6$ is true.

Answer: Only 0.5 is a solution.

Your Turn

Which of -1, 1 and 2.5 are solutions of $k - 3 > -2$?

Your Turn

Which of -1, 1 and 2.5 are solutions of $k - 3 > -2$?

-1: $-1 - 3 = -4$, and $-4 > -2$ is false

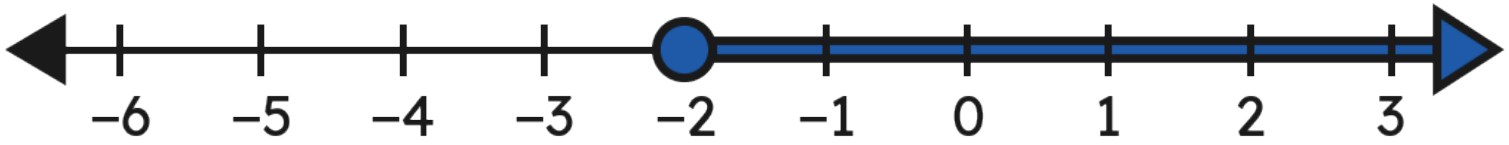
1: $1 - 3 = -2$, and $-2 > -2$ is false

2.5: $2.5 - 3 = -0.5$, and $-0.5 > -2$: yes

Answer: Only 2.5

Example 2

Write the inequality the graph shows. Use x.



Example 2

The circle is closed: –2 is a solution, so the symbol has “or equal to”.

The arrow points right: the numbers greater than –2.

Answer: $x \geq -2$

Your Turn

A graph has an open circle at 3 and an arrow pointing left.

Write its inequality. Use x.

Your Turn

A graph has an open circle at 3 and an arrow pointing left.

Write its inequality. Use x.

Open circle: 3 is not a solution, so $<$ or $>$

Arrow to the left: the numbers less than 3

Answer: $x < 3$

Whiteboards · Question 1 of 9

$x > -5$

Is –3 a solution?

Answer it.

Whiteboards · Question 1 of 9

$x > -5$

Is –3 a solution?

$-3 > -5$ is true: –3 is to the right of –5

Answer: Yes

Whiteboards · Question 2 of 9

$x > -5$

Is –5 a solution?

Answer it.

Whiteboards · Question 2 of 9

$x > -5$

Is –5 a solution?

$-5 > -5$ is false: –5 is not greater than itself

Answer: No

Whiteboards · Question 3 of 9

$x \geq -5$

Is –5 a solution?

Answer it.

Whiteboards · Question 3 of 9

$x \geq -5$

Is –5 a solution?

$-5 \geq -5$ is true: –5 is equal to –5

Answer: Yes

Whiteboards · Question 4 of 9

$m + 2 < 0$

Which numbers are solutions? Select all.

A. -1.5

B. -3

C. -2.5

D. -2

E. 2

Answer it.

Whiteboards · Question 4 of 9

$m + 2 < 0$

Which numbers are solutions? Select all.

$-3 + 2 = -1$ and $-2.5 + 2 = -0.5$: both are below 0

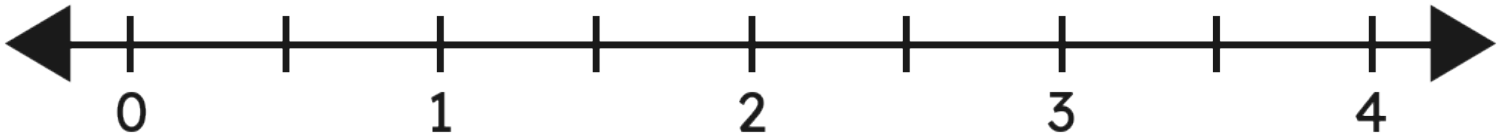
$-2 + 2 = 0$, $-1.5 + 2 = 0.5$, $2 + 2 = 4$: none is below 0

Answer: B and C

Whiteboards · Question 5 of 9

$w \leq 2.5$

Graph its solutions.

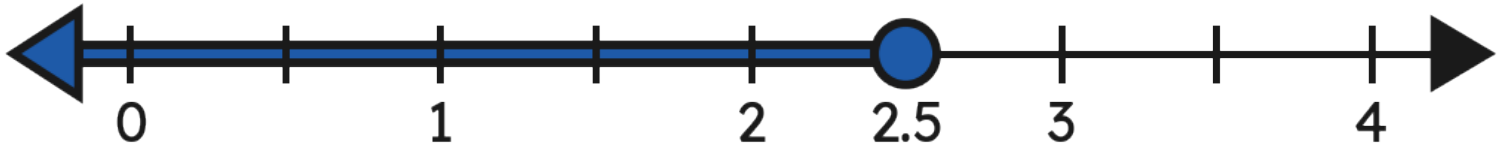


Answer it.

Whiteboards · Question 5 of 9

$w \leq 2.5$

Graph its solutions.



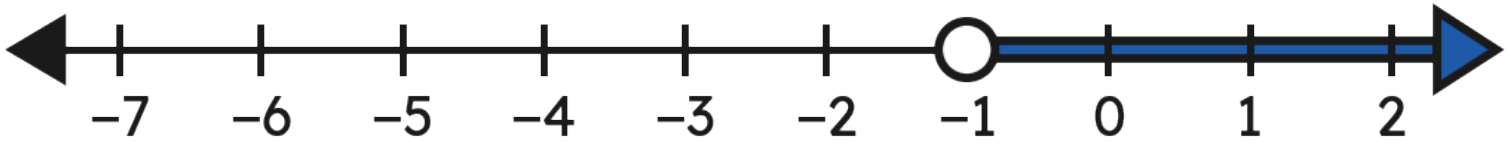
2.5 is a solution of $w \leq 2.5$, so the circle at 2.5 is closed

Less than: the arrow points left

Answer: A closed circle at 2.5, arrow to the left

Whiteboards · Question 6 of 9

Which inequality does the graph show?



A. $x < -1$

B. $x > -1$

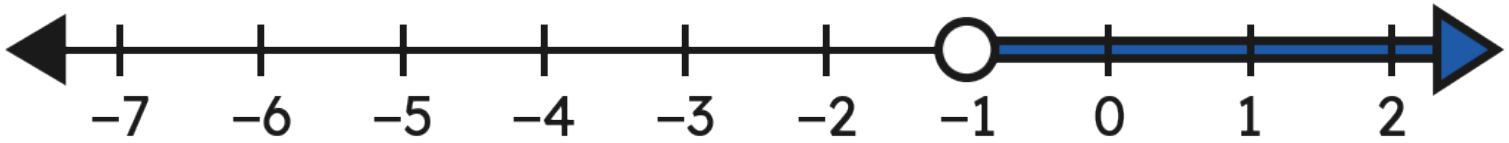
C. $x > 1$

D. $x \geq -1$

Answer it.

Whiteboards · Question 6 of 9

Which inequality does the graph show?



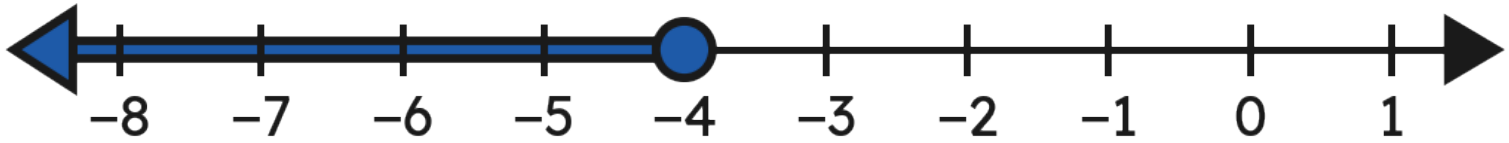
The circle at −1 is open: −1 is not a solution, so > or <

Arrow to the right: the numbers greater than −1

Answer: B — x > −1

Whiteboards · Question 7 of 9

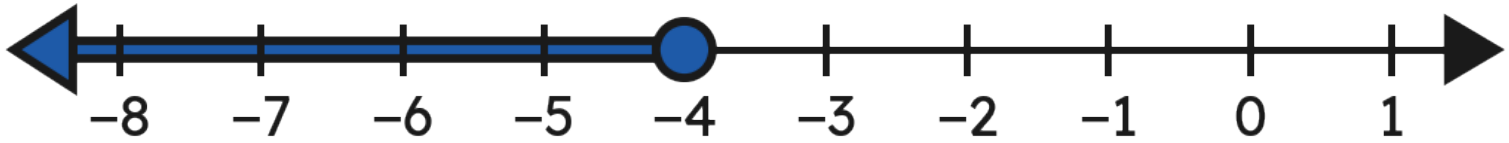
Write the inequality the graph shows. Use x.



Answer it.

Whiteboards · Question 7 of 9

Write the inequality the graph shows. Use x.



The circle at −4 is closed: −4 is a solution, so ≤ or ≥

Arrow to the left: the numbers less than −4

Answer: $x \leq -4$

Whiteboards · Question 8 of 9

Riders must be at least 48 inches tall, and Jo is 46 inches tall and 11 years old.

Can Jo ride?

Answer it.

Whiteboards · Question 8 of 9

Riders must be at least 48 inches tall, and Jo is 46 inches tall and 11 years old.

Can Jo ride?

At least 48: $h \geq 48$

$46 \geq 48$ is false

Answer: No — 46 is less than 48

Whiteboards · Question 9 of 9

Mia says 4 is a solution of $x < 4$ because its graph has a circle at 4.

Is Mia right? Explain.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Mia says 4 is a solution of $x < 4$ because its graph has a circle at 4.

Is Mia right? Explain.

$4 < 4$ is false: the circle at 4 is open

Answer: No — $4 < 4$ is false; the circle is open.

Independent Practice

1. Is -7 a solution of $y < -6.5$?
2. Is 3 a solution of $3 \geq k$?
3. Is -1 a solution of $a - 2 > -3$?
4. Describe the graph of $r > -4.5$.
5. A graph has a closed circle at 6 and an arrow pointing left. Write its inequality. Use x.
6. Write $-3 \leq m$ with the variable first.

Before You Go

A solution makes the inequality true.

Open circle: not a solution. Closed: a solution.

Tomorrow: find the boundary without testing — solve, then graph.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 10 test.

Today's skills — all required

Solutions to inequalities (8BA)
Graph inequalities on number lines (VLU)
Write inequalities from number lines (JNL)