GRADE 7 · UNIT 10 · LESSON 2

Solving One-Step Inequalities Using Addition and Subtraction

MA.7.AR.2.1

I can solve one-step inequalities by adding or subtracting on both sides, graph the solutions, and check them with a number from each side.

Warm-Up

1. Is -2 a solution of $x \geq -2$?
2. Rewrite with the fewest terms: $(5x + 2) - (2x - 3)$
3. Find the value: $\frac{2}{3} - \frac{1}{6}$
4. Solve: $x + 4 = -3$

Warm-Up

1. Is -2 a solution of $x \geq -2$? **Yes: $-2 \geq -2$ is true**
2. Rewrite with the fewest terms: $(5x + 2) - (2x - 3)$ $3x + 5$
3. Find the value: $\frac{2}{3} - \frac{1}{6}$ $\frac{1}{2}$
4. Solve: $x + 4 = -3$ $x = -7$

Vocabulary

addition property of inequality

add the same number to both sides and the inequality stays true: $2 < 5$, so $2 + 3 < 5 + 3$

subtraction property of inequality

subtract the same number from both sides and it stays true: $2 < 5$, so $2 - 7 < 5 - 7$

asymmetric property of inequality

an inequality read the other way round says the same thing: $-10 > x$ says $x < -10$

Notes

I. Add or subtract on both sides: the symbol stays

$2 < 5$ is true.

Add 3 to both sides: $2 + 3 < 5 + 3$, and $5 < 8$ is still true.

Subtract 7 from both sides: $2 - 7 < 5 - 7$, and $-5 < -2$ is still true.

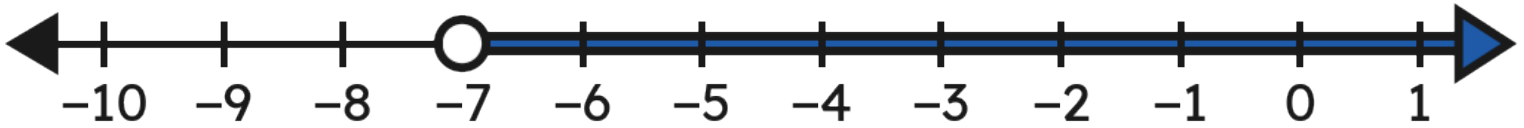
Adding or subtracting the same number on both sides keeps the symbol.

Notes

II. Solve it like an equation, then graph and check

$x + 4 > -3$: subtract 4 from both sides.

$x > -7$



Check 0, on the arrow: $0 + 4 > -3$ is true.

Check −8, off the arrow: $-8 + 4 > -3$ is false.

Example 1

$$n - 3.5 < 2$$

Solve it. Then check one number on each side of the boundary.

Example 1

Add 3.5 to both sides: $n < 2 + 3.5$, so $n < 5.5$.

Graph: an open circle at 5.5, the arrow to the left.

Check 0: $0 - 3.5 = -3.5$, and $-3.5 < 2$ is true.

Check 6: $6 - 3.5 = 2.5$, and $2.5 < 2$ is false.

Answer: $n < 5.5$

Your Turn

$$m - 2.5 \geq -4$$

Solve it. Then check one number on each side of the boundary.

Your Turn

$$m - 2.5 \geq -4$$

Solve it. Then check one number on each side of the boundary.

Add 2.5 to both sides: $m \geq -4 + 2.5$, so $m \geq -1.5$

Graph: a closed circle at -1.5, the arrow to the right

Check 0: $0 - 2.5 = -2.5$, and $-2.5 \geq -4$ is true

Check -2: $-2 - 2.5 = -4.5$, and $-4.5 \geq -4$ is false

Answer: $m \geq -1.5$

Example 2

$$-4 > 6 + x$$

Solve it. Write the answer with the variable first.

Example 2

Subtract 6 from both sides: $-4 - 6 > x$, so $-10 > x$.

Read it from the variable: $x < -10$.

Graph: an open circle at -10, the arrow to the left.

Answer: $x < -10$

Your Turn

$$-7 \geq 2 + m$$

Solve it. Write the answer with the variable first.

Your Turn

$$-7 \geq 2 + m$$

Solve it. Write the answer with the variable first.

Subtract 2 from both sides: $-7 - 2 \geq m$, so $-9 \geq m$

Read it from the variable: $m \leq -9$

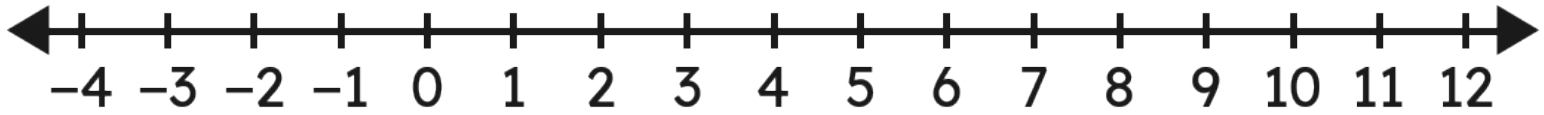
Graph: a closed circle at −9, the arrow to the left

Answer: $m \leq -9$

Whiteboards · Question 1 of 9

$x + 5 > 3$

Solve it. Then graph the solutions.

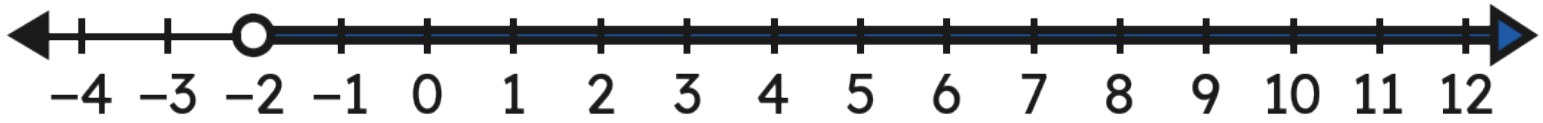


Answer it.

Whiteboards · Question 1 of 9

$x + 5 > 3$

Solve it. Then graph the solutions.



Subtract 5 from both sides: $3 - 5 = -2$, so $x > -2$

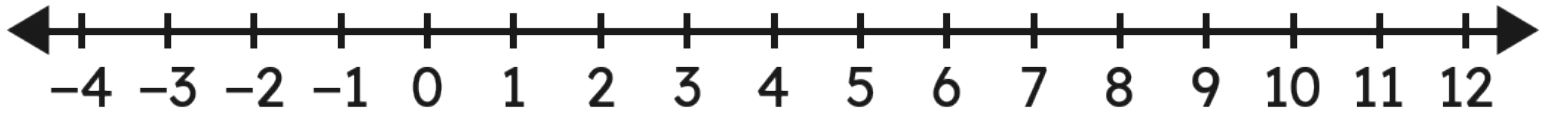
Graph: an open circle at −2 (not a solution), arrow to the right

Answer: $x > -2$

Whiteboards · Question 2 of 9

$x - 5 > 3$

Solve it. Then graph the solutions.

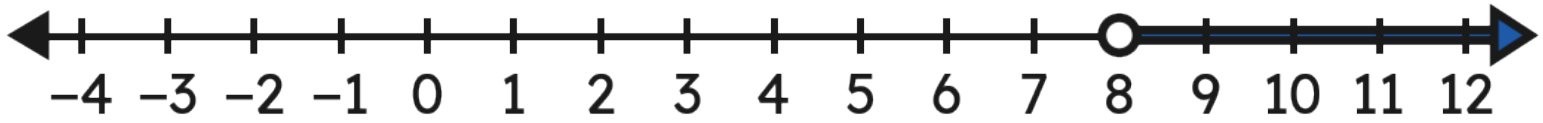


Answer it.

Whiteboards · Question 2 of 9

$x - 5 > 3$

Solve it. Then graph the solutions.



Add 5 to both sides: $3 + 5 = 8$, so $x > 8$

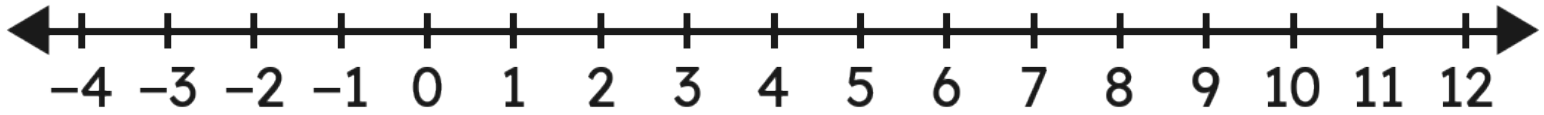
Graph: an open circle at 8 (not a solution), arrow to the right

Answer: $x > 8$

Whiteboards · Question 3 of 9

$x - 5 \geq 3$

Solve it. Then graph the solutions.

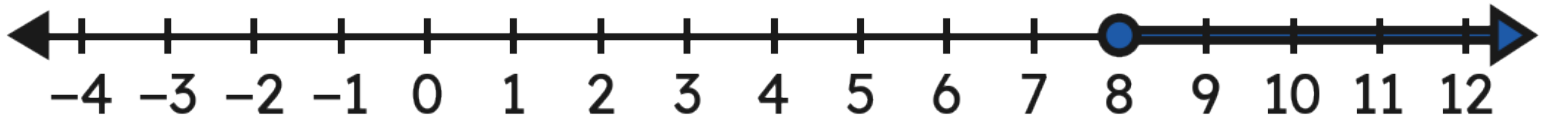


Answer it.

Whiteboards · Question 3 of 9

$x - 5 \geq 3$

Solve it. Then graph the solutions.



Add 5 to both sides: $3 + 5 = 8$, so $x \geq 8$

Graph: a closed circle at 8 (now a solution), arrow to the right

Answer: $x \geq 8$

Whiteboards · Question 4 of 9

$t + 2.4 \leq 1$

Solve it.

A. $t \leq -1.4$

B. $t \leq 3.4$

C. $t \leq 1.4$

D. $t < -1.4$

Answer it.

Whiteboards · Question 4 of 9

$t + 2.4 \leq 1$

Solve it.

Subtract 2.4 from both sides: $1 - 2.4 = -1.4$

$t \leq -1.4$: subtracting keeps the symbol

Answer: A — $t \leq -1.4$

Whiteboards · Question 5 of 9

$$y - \frac{2}{3} < \frac{1}{6}$$

Solve it.

Answer it.

Whiteboards · Question 5 of 9

$y - \frac{2}{3} < \frac{1}{6}$

Solve it.

Add $\frac{2}{3}$ to both sides: $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$

$y < \frac{5}{6}$

Answer: $y < \frac{5}{6}$

Whiteboards · Question 6 of 9

$-2.5 \geq a - 4$

Solve it. Write the answer with the variable first.

Answer it.

Whiteboards · Question 6 of 9

$-2.5 \geq a - 4$

Solve it. Write the answer with the variable first.

Add 4 to both sides: $-2.5 + 4 = 1.5$, so $1.5 \geq a$

Read it from the variable: $a \leq 1.5$

Answer: $a \leq 1.5$

Whiteboards · Question 7 of 9

$9 < 12 + d$

Solve it.

A. $d > 21$

B. $d > 3$

C. $d > -3$

D. $d < -3$

Answer it.

Whiteboards · Question 7 of 9

$9 < 12 + d$

Solve it.

Subtract 12 from both sides: $9 - 12 = -3$, so $-3 < d$

Read it from the variable: $d > -3$

Answer: C — $d > -3$

Whiteboards · Question 8 of 9

A backpack can hold at most 18 pounds, and it has 11.5 pounds and 4 pockets.

How many more pounds can go in?

Answer it.

Whiteboards · Question 8 of 9

A backpack can hold at most 18 pounds, and it has 11.5 pounds and 4 pockets.

How many more pounds can go in?

At most 18: $11.5 + p \leq 18$

Subtract 11.5: $18 - 11.5 = 6.5$, so $p \leq 6.5$

Answer: At most 6.5 more pounds

Whiteboards · Question 9 of 9

Lena solved $x + 7 \geq 3$ and got $x \geq 10$.

What did Lena do wrong? Solve it correctly.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Lena solved $x + 7 \geq 3$ and got $x \geq 10$.

What did Lena do wrong? Solve it correctly.

Lena added 7 to 3; the + 7 is undone by subtracting 7

$3 - 7 = -4$, so $x \geq -4$

Answer: Added 7 instead of subtracting: $x \geq -4$

Independent Practice

1. Solve: $k + 8 < 3$
2. Solve: $k - 8 < 3$
3. Solve: $w + 1.6 \geq -0.4$
4. Solve: $\frac{3}{4} > z - \frac{1}{2}$
5. Solve: $-5 \leq 3 + h$
6. A suitcase can weigh at most 50 pounds and weighs 38.5 pounds now. Write and solve an inequality for p, the pounds that can still go in.

Before You Go

Add or subtract the same number on both sides: the symbol stays.

Check one number on each side of the boundary.

Tomorrow: multiplying and dividing — and the one time the symbol reverses.

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

Solve one-step addition and subtraction inequalities (7MP)
Solve and graph one-step addition and subtraction inequalities (9WP)
Solve one-step addition and subtraction inequalities: word problems (9GC)