

PART I GET STARTED**Today's Mathematics**

Write, solve, graph, and interpret two-step inequalities.

Essential Question

How do equation-solving steps extend to inequalities, and when must direction reverse?

DO NOW

1. Solve $-3x \geq 12$ and describe the graph.

2. Solve $\frac{x}{4} < 2$ and describe the graph.

3. Solve $2x + 5 = 13$ and check.

4. Expand $-2(x + 3)$.

SEE IT

A club has \$12 and earns \$4 for each item sold. It needs at least \$40. Define n as the number sold and write $4n + 12 \geq 40$. Explain the two operations that isolate n , then interpret the result.

QUICK WRITE | 2 MINUTES

Why does the symbol stay the same in $4n + 12 \geq 40$? What would change if the coefficient of the variable were negative?

PART II INVESTIGATE

TRACK THE DIRECTION AT EACH STEP

Record both inverse operations, the solution, and a graph description. Check an included and an excluded value.

No.	Inequality	First step	Second step / solution
1	$3x + 2 < 11$		
2	$-3x + 2 < 11$		
3	$\frac{x}{4} - 1 \geq 2$		
4	$\frac{x}{-4} - 1 \geq 2$		

THINK LIKE A MATHEMATICIAN

1. Compare solving $-3x + 2 < 11$ with solving $-3x + 2 = 11$. How are the steps alike, and what is different about the answers?

2. For $-2(x - 4) \leq 6$, compare distributing first with dividing both sides by -2 first. Where does reversal occur in each method?

CREATE OR COMPARE

Write a two-step inequality with a negative coefficient and solution set $x < 5$. Check an included value, the endpoint, and an excluded value.

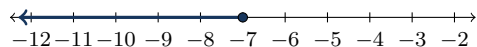
PART III MAKE SENSE AND PRACTICE

WHAT WE CAN CONCLUDE

Simplify when needed, undo addition or subtraction, then undo multiplication or division. Reverse the symbol only for negative scaling. Graph the complete solution set and check the original inequality. For whole-number counts, interpret the boundary with the correct rounding and nonnegative restriction.

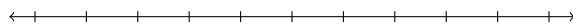
WORKED MODEL

Solve $-2(x + 3) \geq 8$. Divide by -2 and reverse: $x + 3 \leq -4$. Subtract 3: $x \leq -7$. Check $x = -8$: $10 \geq 8$ is true; $x = -6$ gives $6 \geq 8$, false.

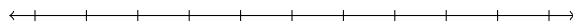


TRY IT

1. $4x - 7 > 5$



2. $\frac{x}{-3} + 2 \leq -1$



3. $-\frac{1}{2}(x + 4) < 3$



4. A theater pays \$120 to rent equipment and earns \$9 per ticket. How many tickets must it sell to make a profit of at least \$200? Write and solve an inequality, then interpret the whole-number boundary.

MATH WRITE | 5 MINUTES

A student solves $-4x + 6 \leq 18$ as $-4x \leq 12$, then $x \leq -3$. Identify the exact step that fails and describe the correct graph.

PART IV PUZZLE PRACTICE

Homework

Name _____

Date _____

Solve each item. Graph on your own paper. Match your result to the answer bank and put its letter in the numbered box. Decode a useful mathematical reminder.

1. $2x + 1 < -9$

2. $-3x + 4 \leq -2$

3. $\frac{x}{5} - 2 > -2$

4. $\frac{x}{-2} + 1 \geq -\frac{5}{2}$

5. $4x - 3 \geq -7$

6. $-2x + 5 > -3$

7. $\frac{x}{3} + 2 \leq 1$

8. $-\frac{1}{2}(x - 2) < -2$

ANSWER BANK

O $x < 4$	S $x > 0$	H $x > 6$	T $x < -5$
T $x \leq -3$	T $x \leq 7$	E $x \geq 2$	B $x \geq -1$

1

2

3

4

5

6

7

8