

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

Solve and graph multiplication and division inequalities, including negative coefficients.

Essential Question

Why must the comparison reverse when both sides are multiplied or divided by a negative number?

DO NOW

1. Solve $x + 7 \leq 2$ and describe its graph.
2. Solve $x - 4 > -9$ and describe its graph.
3. Evaluate $(-3)(-5)$ and $(-3)(2)$.
4. Which is greater: -8 or -2 ?

SEE IT

Start with $-2 < 4$. Multiply both numbers by 3, then multiply the original pair by -3 . Place each resulting pair on a number line. What happens to their order?

QUICK WRITE | 2 MINUTES

Is a negative number appearing anywhere in an inequality enough reason to reverse the symbol? Explain.

PART II INVESTIGATE

POSITIVE SCALE OR NEGATIVE SCALE?

Complete the transformed comparison and decide whether its direction changes. Use the same operation on both sides.

Original comparison	Operation	New comparison	Direction changes?
$-3 < 2$	Multiply by 4		
$-3 < 2$	Multiply by -4		
$-12 \leq 6$	Divide by 3		
$-12 \leq 6$	Divide by -3		

THINK LIKE A MATHEMATICIAN

1. Compare solving $4x < -20$ and $-4x < 20$. Why do their graphs point in opposite directions?

2. What information is lost if both sides of an inequality are multiplied by 0? Explain using $2 < 5$.

CREATE OR COMPARE

Write two inequalities with solution set $x \geq -2$: one with a positive coefficient and one with a negative coefficient. Check both at $x = -2$ and $x = 0$.

PART III MAKE SENSE AND PRACTICE

WHAT WE CAN CONCLUDE

Multiplying or dividing both sides by a **positive** number preserves direction. Multiplying or dividing by a **negative** number reverses direction. Do not use 0 as a divisor or as a reversible multiplier. Check the original inequality at the boundary and on both sides.

WORKED MODEL

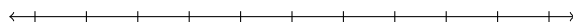
Solve $-\frac{3}{4}x \leq 6$. Multiply both sides by $-\frac{4}{3}$ and reverse the symbol: $x \geq -8$. Check $x = 0$: $0 \leq 6$ is true.

Check $x = -9$: $\frac{27}{4} \leq 6$ is false.

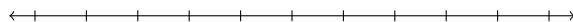


TRY IT

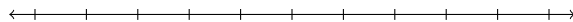
1. $5x < -15$



2. $\frac{x}{-4} \leq 2$



3. $-\frac{2}{3}x > 4$



4. Each folder is 0.8 centimeter thick. A shelf has 22 centimeters of usable width. Write and solve an inequality for the number of folders f . Give the greatest whole-number count.

MATH WRITE | 5 MINUTES

A student solves $-5x < 15$ as $x < -3$. Correct the error and test a value that exposes it.

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. $2x < -10$

2. $-3x \leq -6$

3. $\frac{x}{5} > 0$

4. $\frac{x}{-2} \geq -\frac{7}{2}$

5. $4x \geq -4$

6. $-2x > -8$

7. $\frac{x}{3} \leq -1$

8. $-\frac{1}{2}x < -3$

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