

Learning Target: I can solve a multiplication or division inequality involving negative integers.

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Explore and Discover

Simplify each inequality by substituting the given value for y . Then write whether the resulting inequality is TRUE or FALSE

TAKE each solution and substitute it into inequality

$2y < 4$ → Solve it to see if True or False

$$\begin{aligned} y &= -3 \\ 2y &< 4 \\ 2 \cdot -3 &< 4 \\ -6 &< 4 \quad \text{True} \end{aligned}$$

$$\begin{aligned} y &= 0 \\ 2y &< 4 \\ 2 \cdot 0 &< 4 \\ 0 &< 4 \quad \text{True} \end{aligned}$$

$$\begin{aligned} y &= -1 \\ 2y &< 4 \\ 2 \cdot -1 &< 4 \\ -2 &< 4 \quad \text{True} \end{aligned}$$

$$\begin{aligned} y &= -6 \\ 2y &< 4 \\ 2 \cdot -6 &< 4 \\ -12 &< 4 \quad \text{True} \end{aligned}$$

Check the same values for y , using the following inequality. Write whether the resulting inequality is TRUE or FALSE

$$-2y < 4$$

$$\begin{aligned} * \quad y &= -3 \\ -2y &< 4 \\ -2 \cdot -3 &< 4 \\ 6 &< 4 \quad \text{False} \end{aligned}$$

$$\begin{aligned} y &= 0 \\ -2y &< 4 \\ -2 \cdot 0 &< 4 \\ 0 &< 4 \quad \text{True} \end{aligned}$$

$$\begin{aligned} y &= -1 \\ -2y &< 4 \\ -2 \cdot -1 &< 4 \\ 2 &< 4 \quad \text{True} \end{aligned}$$

$$\begin{aligned} y &= -6 \\ -2y &< 4 \\ -2 \cdot -6 &< 4 \\ 12 &< 4 \quad \text{False} \end{aligned}$$

Compare your solutions from both inequalities. What are some similarities and differences you see?

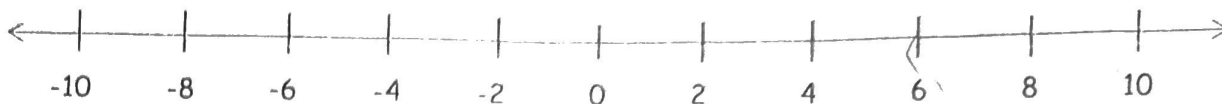
Negative signs change some things

If eating Larger number Always True

If eating smaller number than Always False

Why do we need to flip the inequality sign??

Use the number line to help you answer the questions in the table below:



First Inequality	True or False?	Action	New Inequality	True or False?
1 less than 4 $1 < 4$ ✓	True <small>If true proceed</small>	→ Add 3 to both sides	$1+3 < 4+3$ $4 < 7$	True
-4 less than 6 $-4 < 6$	True <small>If true proceed</small>	→ Subtract 3 from both sides	$-4-3 < 6-3$ $-7 < 3$	True
-1 less than 5 $-1 < 5$	True <small>If true proceed</small>	→ multiply both sides by 2	$-1 \cdot 2 < 5 \cdot 2$ $-2 < 10$	True
-3 less than 3 $-3 < 3$	True <small>If true proceed</small>	→ multiply both sides by -2	$-3 \cdot -2 < 3 \cdot -2$ $6 < -6$	False
-2 less than 10 $-2 < 10$	True <small>If true proceed</small>	→ divide both sides by 2	$-2 \div 2 < 10 \div 2$ $-1 < 5$	True
2 less than 8 $2 < 8$	True <small>If true proceed</small>	→ divide both sides by -2	$2 \div -2 < 8 \div -2$ $-1 < -4$	False

Use your work from the table above to answer the following questions:

1) Which specific actions caused the first inequality to become a false inequality?

multiplying or dividing
by a negative

2) Without changing the action, what could be done to the new inequality to make it true?

$< \rightarrow >$

$> \rightarrow <$

Flip the inequality symbol

3) Summarize what you learned here.



When you multiply or divide by a negative number, you MUST flip the inequality sign.

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Notes

When multiplying or dividing both sides of an inequality by a negative number,
Flip the inequality

Examples:

Multiply
 $-2y < 4$
 $\div -2$
 $y < -2$ → **Flip** → $y > -2$

Division
 $\frac{x}{-6} \geq 4$
 $\cdot -6$
 $x \geq -24$
Flip → $x \leq -24$

Check the TRUE/FALSE solutions from our exploration page!

Try it Out:

$-6x > 48$
 $\div -6$
 $x > -8$
Flip → $x < -8$

$\frac{x}{-5} \geq -7$
 $\cdot -5$
 $x \geq 35$
Flip → $x \leq 35$

Circle the inequalities that would require you to change the inequality symbol:

$5y < -12$

$x - 3 \leq -8$

$-\frac{1}{3}g \leq -2$ ← \cdot by $-$

$-2m > 8$ ← \div by $-$

$\frac{k}{3} \geq -4$

$-2y + 3 > -9$ ← \div by $-$