LESSON MAKER PRO

Flip the Sign

Solve inequalities by dividing or multiplying by negative rational numbers.

GRADE 7 · 7.PFA.4.b

7.PFA.4.b "Investigate and explain how the solution set of a linear inequality is affected by multiplying or dividing both sides of the inequality statement by a rational number less than zero."

NAME _____ DATE _____

THE SIGN FLIP RULE

When you multiply or divide both sides of an inequality by a negative rational number, reverse the inequality sign. This keeps the statement true because negative multiplication reverses the order of numbers.

WORKED EXAMPLE

Solve: $-7x > 35$

1. $-7x > 35$
2. Divide both sides by -7.
3. $x < -5$, because dividing by a negative reverses $>$ to $<$.

Answer: $x < -5$

PRACTICE 6 problems

1 Solve: $-3x \leq 18$

ANSWER _____

2 Solve: $x/(-4) > -2$

ANSWER _____

3 Solve: $(-1/2)x < 9$

ANSWER _____

4 Solve: $-12x \geq -48$

ANSWER _____

5 Morgan solves $-11x > -22$ and writes $x > 2$. Is Morgan correct? Write the correct solution and explain what Morgan should change.

ANSWER _____

_____

6 Solve: $(-2/3)x \leq -10$

ANSWER _____

APPLY IT Show your work

1 In a speedrun game test, each shortcut lowers a player's recorded time by 6 seconds. The total time change must be at most -24 seconds to meet a test goal. Let x be the number of shortcuts. Write and solve an inequality. What does your answer mean?

WORK SPACE

ANSWER

2 A school club lends headphones for events. Each late day changes the club's event budget by -9 dollars. The budget change must be greater than -45 dollars. Let x be the number of late days. How many late days are possible?

WORK SPACE

ANSWER

CHALLENGE One step up

Start with $2 < 6$. Multiply both numbers by -1/2 and place the results on a number line. Which is farther right? Now divide 2 and 6 by -1/2; compare those results. Explain why each operation reverses order. Then solve $-9(x - 2) \leq 54$.

ANSWER KEY

Flip the Sign

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve: -3x ≤ 18	**x ≥ -6**
2	Solve: x/(-4) > -2	**x < 8**
3	Solve: (-1/2)x < 9	**x > -18**
4	Solve: -12x ≥ -48	**x ≤ 4**
5	Morgan solves -11x > -22 and writes x > 2. Is Morgan correct? Write the correct solution and explain what Morgan should change.	**No. x < 2. Morgan must reverse the inequality sign when dividing by -11.**
6	Solve: (-2/3)x ≤ -10	**x ≥ 15**

PART 2 · APPLY IT

1. **-6x ≤ -24, so x ≥ 4. The player needs at least 4 shortcuts.** Write -6x ≤ -24. Divide by -6 and reverse the inequality sign to get x ≥ 4.
2. **-9x > -45, so x < 5. Since x is a whole number of days, 0, 1, 2, 3, or 4 late days are possible.** Write -9x > -45. Divide by -9, reverse the sign, and use whole-number values for days.

CHALLENGE

Multiplication gives -1 > -3; -1 is farther right. Division gives -4 > -12, equivalent to multiplying by -2. Reflection across zero reverses left/right order, while scaling by a positive magnitude preserves that reflected order. The inequality gives x - 2 ≥ -6, so x ≥ -4.

Accept equivalent inequality forms, such as -6 ≤ x for x ≥ -6. For context problems, accept the inequality solution and the correct whole-number interpretation when stated. Challenge: require the numerical comparisons and an order explanation, not only a quoted sign-flip rule.