6.2 Solve Inequalities Using Multiplication and Division

Goal • Solve inequalities using multiplication and division.

Your Notes

MULTIPLICATION PROPERTY OF INEQUALITY

Words Multiplying each side of an inequality by a <u>positive</u> number produces an <u>equivalent inequality</u>.

Multiplying each side of an inequality by a <u>negative</u> number and <u>reversing the direction of the inequality symbol</u> produces an equivalent inequality.

Algebra If $a < b$ and $c > 0$, then <u>$ac < bc$</u>.

If $a < b$ and $c < 0$, then <u>$ac > bc$</u>.

If $a > b$ and $c > 0$, then <u>$ac > bc$</u>.

If $a > b$ and $c < 0$, then <u>$ac < bc$</u>.

This property is also true for inequalities involving $\leq$ and $\geq$.

Example 1 *Solve an inequality using multiplication*

Solve $\dfrac{y}{9} > 3$. Graph your solution.

Solution

$\dfrac{y}{9} > 3$ Write original inequality.

<u>9</u> $\cdot \dfrac{y}{9} >$ <u>9</u> $\cdot 3$ Multiply each side by <u>9</u>.

<u>$y > 27$</u>   Simplify.

The solutions are all real numbers <u>greater than 27</u>.

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Example 2 *Solve an inequality using multiplication*

Solve $\dfrac{m}{-2} < 5$. Graph your solution.

Solution

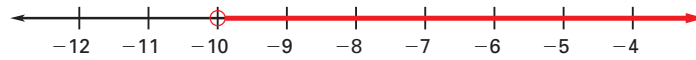$$\dfrac{m}{-2} < 5$$ Write original inequality.

$$\underline{-2} \cdot \dfrac{m}{-2} > \underline{-2} \cdot 5$$ Multiply each side by $\underline{-2}$ and <u>reverse</u> the inequality symbol.

$$\underline{m > -10}$$ Simplify.
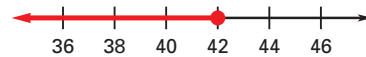
The solutions are all real numbers <u>greater than -10</u>.

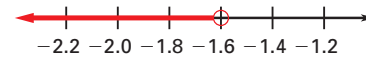✔ *Checkpoint* **Solve the inequality. Graph your solution.**

1. $\dfrac{r}{7} \geqslant 6$

$r \geqslant 42$

2. $\dfrac{s}{-4} > 0.4$

$s < -1.6$

3. $\dfrac{n}{-5} \forall -2$

$n \geqslant 10$

4. $\dfrac{w}{6} < -0.8$

$w < -4.8$
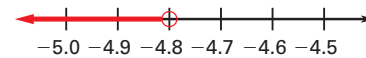
DIVISION PROPERTY OF INEQUALITY

Words   Dividing each side of an inequality by a <u>positive</u> number produces an <u>equivalent inequality</u>.

Dividing each side of an inequality by a <u>negative</u> number and <u>reversing the direction of the inequality symbol</u> produces an equivalent inequality.

Algebra   If $a < b$ and $c > 0$, then $\dfrac{a}{c} < \dfrac{b}{c}$.

If $a < b$ and $c < 0$, then $\dfrac{a}{c} > \dfrac{b}{c}$.

If $a > b$ and $c > 0$, then $\dfrac{a}{c} > \dfrac{b}{c}$.

If $a > b$ and $c < 0$, then $\dfrac{a}{c} < \dfrac{b}{c}$.

This property is also true for inequalities involving $\leq$ and $\geq$.

Example 3   *Solve an inequality using division*

Solve $-4x < 36$. Graph your solution.
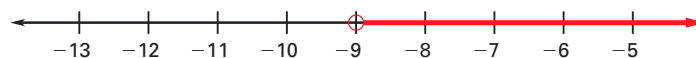
Solution

$-4x < 36$ **Write original inequality.**

$\dfrac{-4x}{-4} > \dfrac{36}{-4}$ **Divide each side by** <u>-4</u> **and** <u>reverse</u> **the inequality symbol.**

<u>$x > -9$</u>   **Simplify.**

The solutions are all real numbers <u>greater than -9</u>.

Example 4 *Solve a real-world problem*

Pizza Party You have a budget of $45 to buy pizza for a student council meeting. Pizzas cost $7.50 each. Write and solve an inequality to find the possible numbers of pizzas that you can buy.
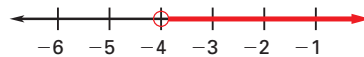
Solution

Price per pizza (dollars per pizza)	·	Number of pizzas (pizzas)	≤	Budget amount (dollars)
7.50	·	p	≤	45

$7.50 · p ≤ 45$ **Write inequality.**

$p ≤ 6$ **Divide each side by** __7.50__.

You can buy at most __6__ pizzas.

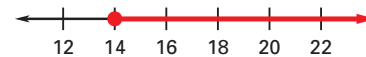✔ *Checkpoint* **Solve the inequality. Graph your solution.**

5. $-9k < 36$

$k > -4$

6. $10n ≥ 140$

$n ≥ 14$

7. In Example 4, suppose that you had a budget of $50 and each pizza costs $8. Write and solve an inequality to find the possible numbers of pizzas that you can buy.

$8 · p ≤ 50; p ≤ 6.25;$ You can buy at most 6 pizzas.

Homework