Solving Inequalities by Multiplying or Dividing

Warm Up

Solve.

1. $n + 42 > 27$ $n > -15$

2. $r + 15 < 39$ $r < 24$

3. $-17 < w - 52$ $35 < w$

4. $34 < m - 19$ $53 < m$

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Essential Question

How do you solve inequalities that involve one operation?

Standard

MCC7.EE.4: Use variables to represent quantities in real-world and mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

$x + 2 < 6$	$x - 5 > 1$	$2x + 1 \leq 11$	$3x + 4 + 3 \geq 19$
			

Complete the tables.

Inequality	Multiply each side by:	New Inequality	New Inequality is True or False?
$3 < 4$	2		
$2 \geq -3$	3		
$-1 \leq 6$	5		
$5 > 2$	−1		
$1 \leq 7$	−5		
$-8 > -10$	−8		

Inequality	Divide each side by:	New Inequality	New Inequality is True or False?
$4 < 8$	4		
$12 \geq -15$	3		
$-16 \leq 12$	−4		
$15 > 5$	−5		

B When both sides of an inequality are multiplied or divided by a _____ number, the inequality is no longer true.

C Complete the tables.

Inequality	Multiply each side by:	New Inequality	Reverse the Inequality Symbol	Reversed symbol makes it True or False?
$5 > 2$	**−1**	$-5 > -2$		
$1 \leq 7$	**−5**	$-5 \leq -35$		
$-8 > -10$	**−8**	$64 > 80$		

Inequality	Divide each side by:	New Inequality	Reverse the Inequality Symbol	Reversed symbol makes it True or False?
$-16 \leq 12$	**−4**	$4 \leq -3$		
$15 > 5$	**−5**	$-3 > -1$		

REFLECT

1. **Conjecture** When both sides of an inequality are multiplied or divided by a negative number, you must _____ to make the statement true.

Inequalities: Multiplying and Dividing by a Negative Number

Multiplication	Division
$\frac{x}{-5} \leq 5$	-3y = 9

When multiplying or dividing by a negative number, I should

_____

_____

Fill in notes then glue into interactive notebook.

Solving Inequalities by Multiplying or Dividing

Multiplication and Division Properties of Inequality			
Positive		**Negative**	
You can multiply or divide both sides of an inequality by the same **positive number**, and the statement will still be true.		You can multiply or divide both sides of an inequality by the same **negative number**, but you must reverse the direction of the inequality symbol for the statement to be true.	
$8 > 6$ $8 \cdot 2 > 6 \cdot 2$ $16 > 12$	$-10 \leq 14$ $\frac{-10}{2} \leq \frac{14}{2}$ $-5 \leq 7$	$3 \geq -2$ $3(-3) \leq -2(-3)$ $-9 \leq 6$	$-9 < 18$ $\frac{-9}{-9} > \frac{18}{-9}$ $1 > -2$

Solving Inequalities by Multiplying or Dividing

Fold example note page in ½ hotdog style.

Label one side FLIP

and the other DON'T FLIP

Additional Example 1A: Solving Inequalities by Multiplying

Solve.

$$\frac{c}{4} \leq -4$$

$$\frac{c}{4} \leq -4$$

$$(4)\frac{c}{4} \leq (4)(-4)$$ *Multiply both sides by 4.*

$$c \leq -16$$

Additional Example 1B: Solving Inequalities by Multiplying

Solve.

$$\frac{t}{-4} > 0.3$$

$$\frac{t}{-4} > 0.3$$

$$(-4)\frac{t}{-4} < (-4)0.3$$

Multiply both sides by –4 and reverse the inequality symbol.

$$t < -1.2$$

Check It Out: Example 1A

Solve.

$$\frac{n}{6} \leq -5$$

$$\frac{n}{6} \leq -5$$

$$(6)\frac{n}{6} \leq (6)(-5)$$ *Multiply both sides by 6.*

$$n \leq -30$$

Check It Out: Example 1B

Solve.

$$\frac{r}{-3} > 0.9$$

$$\frac{r}{-3} > 0.9$$

$$(-3)\frac{r}{-3} < (-3)0.9$$

Multiply both sides by −3 and reverse the inequality symbol.

$$r < -2.7$$

Additional Example 2A: Solving Inequalities by Dividing

Solve. Check your answer.

$$5a \geq 23$$

$$\frac{5a}{5} \geq \frac{23}{5}$$

Divide both sides by 5.

$$a \geq \frac{23}{5}, \text{ or } 4\frac{3}{5}$$

Check

$$5a \geq 23$$

$$5(5) \stackrel{?}{\geq} 23$$

5 is greater than $4\frac{3}{5}$.

Substitute 5 for a.

$$25 \stackrel{?}{\geq} 23 \checkmark$$

Additional Example 2B: Solving Inequalities by Dividing

Solve. Check your answer.

$$192 < -24b$$

$$\frac{192}{-24} < \frac{-24b}{-24}$$

$$-8 > b$$

Divide both sides by –24, and reverse the inequality symbol.

Check

$$192 < -24b$$

$$192 \stackrel{?}{<} -24(-10)$$

–10 is less than –8. Substitute –10 for b.

$$192 \stackrel{?}{<} 240$$ ✓

Check It Out: Example 2A

Solve. Check your answer.

$$6b \geq 25$$

$$\frac{6b}{6} \geq \frac{25}{6}$$

Divide both sides by 6.

$$b \geq \frac{25}{6}, \text{ or } 4\frac{1}{6}$$

Check

$$6b \geq 25$$

$$6(6) \stackrel{?}{\geq} 25$$

$$36 \stackrel{?}{\geq} 25 \checkmark$$

6 is greater than $4\frac{1}{6}$.

Substitute 6 for b.

Check It Out: Example 2B

Solve. Check your answer.

$$85 < -17b$$

$$\frac{85}{-17} < \frac{-17b}{-17}$$

$$-5 > b$$

Divide both sides by –17, and reverse the inequality symbol.

Check

$$85 < -17b$$

$$85 \overset{?}{<} -17(-6)$$

$$85 \overset{?}{<} 102 \quad \checkmark$$

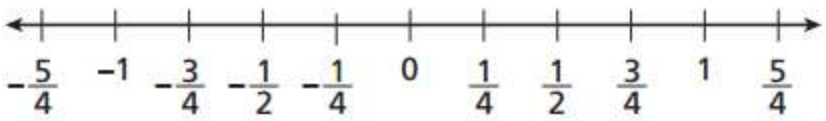
–6 is less than –5. Substitute –6 for b.

WB: Pg. 152

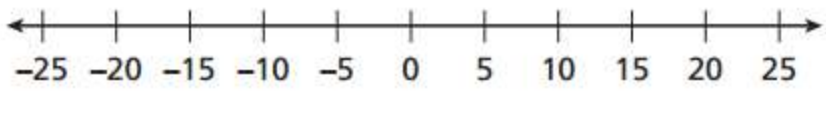
PRACTICE

Solve each inequality, and graph the solution set.

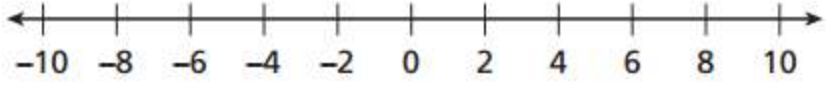
1. $\frac{x}{3} \leq \frac{1}{4}$



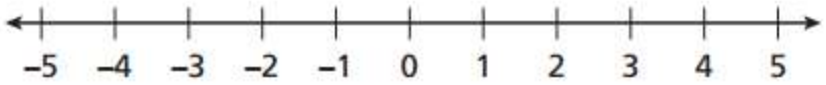
2. $\frac{n}{-6} > 3$



3. $0.4s < 3.6$



4. $12p \leq -48$



Solve each inequality, and explain what the solution set means in the context of the situation.

5. Sandra has more than 90 baseball cards. She keeps the cards in 6 boxes,

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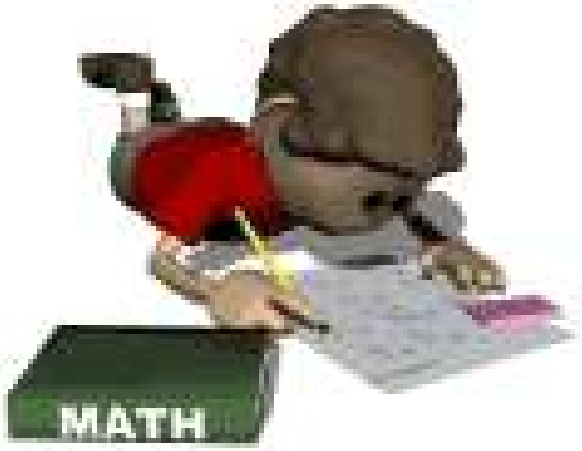
Homework: Workbook Pg. 153 #1-12

Choose 3 division and 3 multiplication problems



Solving Inequalities by Multiplying or Dividing

Check your homework answers: Pg. 153

1. $n \leq 8$
2. $b > -24$
3. $a \geq -27$
4. $t > 42$
5. $s \geq 60$
6. $r \leq 31.8$
7. $c < -8$
8. $a \leq 1.5$
9. $t < -3/4$
10. $s \geq 60$
11. $b > -1\ 1/3$
12. $m \leq -2/3$

Review Video

Class work: Inequality worksheet

Warm UP

Check your homework answers: Pg. 153

1. $n \leq 8$
2. $b > -24$
3. $a \geq -27$
4. $T < 42$

Review Video

Class work: Inequality worksheet.