

Solve & Discuss It!

Alex and Hope were trying to solve $-6x > 24$. Whose inequality shows the solution? Show your work.

Alex's Work: $x > -4$

Hope's Work: $x < -4$

Construct Arguments Why does more than one value of x make the inequality true?

Lesson 5-5

Solve Inequalities Using Multiplication or Division

I can... solve inequalities using multiplication or division.

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Focus on math practices


Be Precise What do you notice about the inequality symbols used in the original inequality and in the correct solution?

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Essential Question How is solving inequalities with multiplication and division similar to and different from solving equations with multiplication and division?

EXAMPLE 1 Solve Inequalities That Involve Multiplication or Division of Positive Values

Gina's pet pot-bellied pig is on a diet. He can have no more than 18 ounces of pig food per day. How many scoops of pig food can Gina feed the pig without going over 18 ounces?



Look for Relationships How can the Multiplication Property of Equality help you solve this problem?

STEP 1 Write an inequality to represent the situation.

Ounces per scoop	·	Number of scoops	≤	Maximum daily ounces
4	·	s	≤	18

The total can be equal to but not more than 18.


STEP 2 Solve the inequality as you would an equation. Then graph the solution.

$$4s \leq 18$$

$$\frac{4s}{4} \leq \frac{18}{4}$$

$$s \leq 4.5$$

Use the inverse relationship between multiplication and division and the *Division Property of Inequality* to isolate the variable.



Gina can feed her pig up to $4\frac{1}{2}$ scoops of food.


Try It!

Solve the inequality $\frac{d}{7} > 15$. Then graph the solution.

$$\frac{d}{7} > 15$$

· $\frac{d}{7}$ > 15 ·

> 105



Convince Me! Frances solved the inequality $5g \geq 35$. She says that 7 is a solution to the inequality. Is Frances correct? Explain.

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EXAMPLE 2 Solve Inequalities Using Division by a Negative Value

Solve the inequality $-3.4m \leq 17$. Then graph the solution.

$$\frac{-3.4m}{-3.4} \leq \frac{17}{-3.4}$$

Use the inverse relationship between multiplication and division and the *Division Property of Inequality* to isolate the variable.

$$m \geq -5$$

Dividing by a negative value reverses the inequality symbol.

Try It!

Solve each inequality. Then graph the solution.

a. $149.76 > -19.2x$

b. $-3.25y < -61.75$

EXAMPLE 3 Solve Inequalities Using Multiplication by a Negative Value

Solve the inequality $-\frac{r}{2.25} \geq 7$. Then graph the solution.

$$-\frac{r}{2.25} \geq 7$$

$$-2.25 \cdot -\frac{r}{2.25} \geq 7 \cdot -2.25$$

Use the inverse relationship between multiplication and division and the *Multiplication Property of Inequality* to isolate the variable.

$$r \leq -15.75$$

Multiplying by a negative value reverses the inequality symbol.

Try It!

Solve each inequality. Then graph the solution.

a. $\frac{k}{-0.5} < 12$

b. $-\frac{5}{4}h \geq 25$

KEY CONCEPT

Solving inequalities with multiplication and division is the same as solving equations with multiplication and division when the values are positive. Use the inverse relationship between multiplication and division to isolate the variable.

$$2.5x = 15$$

$$\frac{2.5x}{2.5} = \frac{15}{2.5}$$

$$x = 6$$

Use inverse relationships and properties of inequality to isolate the variable.

When multiplying or dividing by negative values, the inequality symbol is reversed.

$$-2.5x \geq 15$$

$$\frac{-2.5x}{-2.5} \leq \frac{15}{-2.5}$$

$$x \leq -6$$

Multiplying or dividing by a negative value reverses the inequality.

Do You Understand?

- Essential Question** How is solving inequalities with multiplication and division similar to and different from solving equations with multiplication and division?
- Construct Arguments** Why is $-x < 3$ equivalent to $x > -3$? Provide a convincing argument.
- If a , b , and c are rational numbers and $a > b$, is $ac > bc$ always true? Justify your answer.

Do You Know How?

- Solve each inequality. Then graph the solution.
 - $4x > 12$
 - $\frac{x}{4} \leq -12$
 - $-4x > 12$
- Vanna is saving for a trip. The hotel room will be \$298.17 for 3 nights, and there will be additional fees. What is her daily cost?
 - Write an inequality for the situation.
 - Solve the inequality. Then provide a statement that represents the solution of the problem.

Handwritten solutions for the 'Do You Know How?' problems:

1a. $4x > 12$
 $\frac{4x}{4} > \frac{12}{4}$
 $x > 3$

1b. $\frac{x}{4} \leq -12$
 $\frac{x}{4} \leq -12$
 $x \leq -48$

1c. $-4x > 12$
 $\frac{-4x}{-4} < \frac{12}{-4}$
 $x < -3$

2. $3x > 298.17$
 $\frac{3x}{3} > \frac{298.17}{3}$
 $x > \$99.39$

Vanna is spending more than \$99.39 each night.


Name: _____

Practice & Problem Solving

Leveled Practice In 6–9, fill in the boxes to solve the inequality. Then graph the solution.


6. $8m \leq 56$

$$\frac{8m}{8} \leq \frac{56}{8}$$

$$x \leq \boxed{}$$


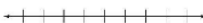
7. $-\frac{4}{3}x < -8$

$$\boxed{} \cdot -\frac{4}{3}x < -8 \cdot \boxed{}$$

$$x > \boxed{}$$



8. $-7x > 56$

$$\frac{7x}{7} < \frac{56}{7}$$

$$x < \boxed{}$$


9. $\frac{m}{5} \geq 2$

$$\boxed{} \cdot \frac{m}{5} \geq 2 \cdot \boxed{}$$

$$m \geq \boxed{}$$


10. Kyra and five friends shared a bag of fruit snacks. Each person got no more than 3 fruit snacks. The inequality $x \div 6 \leq 3$ represents this situation. Solve the inequality to find the possible numbers of fruit snacks that were in the bag.

11. Over the next 17 months, Eli needs to read more than 102 e-books. The inequality $17x > 102$ represents the number of e-books he needs to read per month. Solve the inequality to find the number of e-books Eli needs to read per month.

12. Brittney can spend no more than \$15 for new fish in her aquarium.

- Let f be the number of fish she can buy. What inequality represents the problem?
- How many fish can Brittney buy?



13. Isaac has a bag of n peanuts. He shares the peanuts with 5 of his friends. Each person gets at least 18 peanuts. The inequality $18 \leq n \div 6$ represents this situation. Graph the solution of this inequality.

- Solve the inequality $-3x < 12$.
- Reasoning** Describe how you know the direction of the inequality sign without solving the inequality.

15. **Higher Order Thinking** Renata and her family go through an average of more than 15 cans of sparkling water each day. They buy cases of 24 cans at \$3.30 a case.

- Write an inequality for the number of cases they go through in 30 days.
- Solve the inequality in part a. If they buy only full cases, how much do they spend on sparkling water in 30 days?



Handwritten work for problem 15:

$$24 \cdot C > 15(30)$$

$$\frac{24 \cdot C}{24} > \frac{450 \text{ cans}}{24} \text{ per month}$$

16. Solve the inequality. Graph the solution on the number line.

$$-6.25x > -38\frac{3}{4}$$


Handwritten work for problem 16:

$$C > 18.75$$

Renata and her family must buy 19 cases of sparkling water each month.

Assessment Practice

17. Cynthia plans to build a tree house that is $\frac{1}{3}$ the size of Andrew's tree house. Cynthia plans to make the area of her tree house at least 13 square feet.

PART A
Write and solve an inequality to find the area of Andrew's tree house. Let x be the area of Andrew's tree house.

PART B
Describe how you know which tree house is larger without solving the inequality.

