Solving Multi-Step Inequalities



Vocabulary

1. Multiple Choice You must reverse the direction of an inequality symbol when you multiply both sides of an inequality by a number that is ?.

(A) less than 0

B greater than 0

less than or equal to 0

2. Write reverse if the inequality symbol will change when you solve the inequality. Write same if the symbol will remain the same.

3t < 6

 $5x \le -10$

Same reverse

Vocabulary Builder



at least (adverbial phrase) at leest; at most (adverbial phrase) at mohst

Main Idea: The phrase at least describes the least possible number that can be used. The phrase at most describes the greatest possible number that can be used.

Using Symbols: The inequality $x \ge 5$ means "x is at least 5." The inequality $x \le 5$ means "x is at most 5."

Ste Your Vocabulary

3. Complete each sentence with the words at least or at most.

You must be ? 18 years of age to vote in a national election.

An elevator can safely carry ? 15 people.

When water boils, you know the temperature is _

If all books cost \$3 and Jape has \$20, she can buy _? 6 books.

4. Use your answers to Exercise 3. Complete each inequality with \leq or \geq .

212

3b



িবেরিলিমেরী Using More Than One Step

Got 13? What are the solutions of the inequality $-6a - 7 \le 17$? Check your solutions.

5. Circle the first step in solving the inequality. Then underline the second step.

Add 7 to each side.

Divide each side by 6.

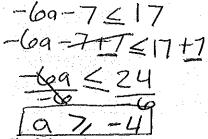
Divide each side by -6and reverse the inequality.

Subtract 7 from each side.

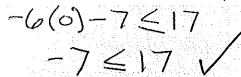
Multiply each side by 6.

Multiply each side by −6 and reverse the inequality.

6. Use your answers to Exercise 5 to solve the inequality.



- 7. Check the endpoint by substituting into the related equation, -6a - 7 = 17.
- 8. Check the inequality symbol by substituting into the original inequality, $-6a - 7 \le 17$.





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টিবেটিন্নিট্ট Writing and Solving a Multi-Step Inequality

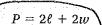
Got It? You want to make a rectangular banner that is 18 ft long. You have no more than 48 ft of trim for the banner. What are the possible widths of the banner?



18++

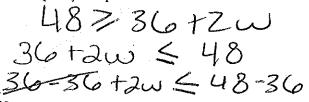
9. Circle the formula for the perimeter of a rectangle.

 $C = 2\pi r$



10. Write an algebraic expression to describe the distance around a rectangular banner with a length of 18 ft and a width of w ft.

- 11. The distance around the banner should be at least / at most 48 feet.
- 12. Use the expression you wrote in Exercise 10 and the information from Exercise 11. Write an inequality to represent the situation described in the problem. Then solve your inequality.



13. The width of the banner should be at most



Problem 3) Using the Distributive Property

Got It? What are the solutions of $15 \le 5 - 2(4m + 7)$? Check your solutions.

14. Use the justifications at the right to solve the inequality.

$$15 \le 5 + 2(4m + 7)$$
$$15 \le 5 - 8m - 14$$

$$15 \leq -8m - \boxed{9}$$

$$|15 + |9| \leq -8m - 9 + 9$$

$$24 \leq -8m$$

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$$-3$$
 m $m < -3$ Simplify.

Write the original inequality.

Distributive Property

Subtract.

Addition Property of Inequality

Add.

Division Property of Inequality

15. Check your solutions by following the steps below.

$$15 \stackrel{?}{\leq} 5 - 2(4 \cdot | + 7)$$

Substitute one of your solutions to Exercise 14.

Multiply within parentheses.

Add within parentheses.

Multiply.

Simplify.



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Got it? What are the solutions of 3b + 12 > 27 - 2b? Check your solutions.

16. The inequality is solved below. Write a justification for each step.

$$3b + 12 > 27 - 2b$$

$$2b + 3b + 12 > 27 - 2b + 2b
5b + 12 - 727
5b + 12 - 12 > 27 - 12$$

$$5b + 12 - 12 > 27 - 12$$

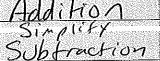
$$\Rightarrow \quad \frac{5b}{5} > \frac{15}{5}$$

Property of Inequality

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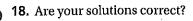
Subfraction

Property of Inequality



Division Property of Inequality

Simple fy. 17. Check your solutions in the original inequality.



Yes / No

Got It? What are the solutions of the inequality $9 + 5n \le 5n - 1$?

19. Solve the inequality $9 + 5n \le 5n - 1$.

9+54-50 < 5250-1

- **20.** The inequality $9 + 5n \le 5n 1$ is always never true.
 - So, the solution is all real numbers (there is no solution).

Affways fre = 9<10/



Lesson Check . Do you UNDERSTAND?

Error Analysis Your friend says that the solutions of the inequality -2(3-x) > 2x - 6 are all real numbers. Do you agree with your friend? Explain. What if the inequality symbol were \geq ?

21. The inequality -2(3-x) > 2x-6 is solved below. Write a justification from the box for each step.

$$-2(3-x) > 2x-6$$

$$-6 + 2x > 2x - 6$$

$$-6 + 2x - 2x > 2x - 6 - 2x$$

$$-6 > -6$$

Distributive Property
Simplify.
Subtraction Property
of Inequality

Write the original inequality.

22. Look at the final inequality in Exercise 21. Is the inequality ever true?

Yes / No

23. Do you agree with your friend? Explain. What if the inequality symbol were ≥?

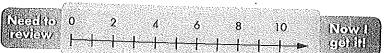


Math Success

Check off the vocabulary words that you understand.

- multi-step inequalities
- properties of inequality
- solutions

Rate how well you can solve multi-step inequalities.



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