3-2 Solving Inequalities Using Addition or Subtraction

Vocabulary

Review

1. Write an *inequality symbol* to represent each verbal description.

Symbol	Verbal Description	Symbol	Verbal Description
	• less than, fewer than		• less than or equal to • at most, no greater than • as much as, no more than
	• greater than, more than		• greater than or equal to • at least, no less than • as little as, no fewer than

Vocabulary Builder

equivalent (adjective) **ee KWIV uh lunt**

Related Word: equal

Main Idea: Numbers or expressions are **equivalent** when they have equal values.

Examples: $\frac{12}{4}$ is **equivalent** to 3.

The expression $1 + 6$ is **equivalent** to $9 - 2$.

Use Your Vocabulary

Equivalent inequalities **are inequalities that have the same solutions. Write an inequality that is *equivalent* to the inequality that is given.**

2. Since $10 \geq -3, -3$ ____ 10.

3. Since $-7 < -1, -1$ ____ -7.

4. If $b > -10$, then -10 ____ b.

5. If $h \leq 0$, then 0 ____ h.

6. Cross out the equations that are NOT *equivalent* to $x = 3$.

$3 = x$ $\quad x = \frac{1}{3}$ $\quad x + 2 = 5$ $\quad x + 2 = 5 - 2$

7. Cross out the inequalities that are NOT *equivalent* to $x \leq 3$.

$3 \geq x$ $\quad x \leq \frac{1}{3}$ $\quad x + 2 \geq 5$ $\quad x + 2 \leq 5 - 2$

Take note

Key Concept Addition and Subtraction Properties of Inequality

When you add or subtract the same number on each side of an inequality, the relationship between the two sides does not change.

Complete each inequality using either the *Addition Property of Inequality* or the *Subtraction Property of Inequality*.

8. Since $3 > -1$, $3 + 5 > -1 +$ ____.

9. Since $4 \leq 9$, $4 + n \leq 9 +$ ____.

10. If $z < 8$, then $z - (-4) < 8 -$ ____.

11. If $w \geq k$, then $w - t \geq k -$ ____.

Problem 1 Using the Addition Property of Inequality

Got It? **What are the solutions of $n - 5 < -3$? Graph the solutions.**

12. First add 5 to both sides of $n - 5 < -3$. Then simplify.

$$n - 5 + \_\_\_\_ < -3 + \_\_\_\_$$

$$n < \_\_\_\_$$

13. Circle the graph that shows the solutions of $n - 5 < -3$.

Problem 2 Solving an Inequality and Checking Solutions

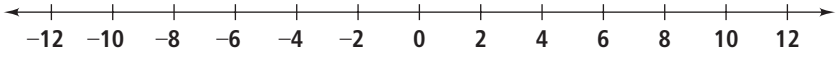
Got It? **What are the solutions of $m - 11 \geq -2$? Graph and check the solutions.**

14. Underline the correct words to complete the sentence.

To isolate the variable, add 11 to / subtract −2 from each side of the equation.

15. Solve the inequality.

16. Graph the inequality on the number line below.



17. Check the related equation.
Substitute for m in $m - 11 = -2$.

$\square - 11 \stackrel{?}{=} -2$

$\square = -2$

Does it check? Yes / No

18. Check the inequality symbol by replacing m with one of your solutions to Exercise 16.

$m - 11 \geq -2$

$\square - 11 \stackrel{?}{\geq} -2$

$\square \geq -2$

Does it check? Yes / No

Problem 3 Using the Subtraction Property of Inequality

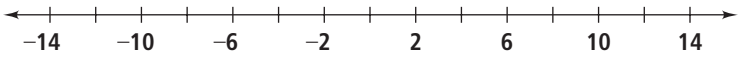
Got It? **What are the solutions of $-1 \geq y + 12$? Graph the solutions.**

19. Subtract 12 from both sides of the inequality. Then simplify.

$-1 - \square \geq y + 12 - \square$

$\square \geq y$

20. Graph the inequality on the number line.



21. Check your solution in the related equation and inequality to make sure it is correct.

Is your solution correct? Yes / No

Problem 4 Writing and Solving an Inequality

Got It? **A club has a goal to sell at least 25 plants for a fundraiser. Club members sell 8 plants on Wednesday and 9 plants on Thursday. What are the possible numbers of plants the club can sell on Friday to meet their goal?**

22. Circle the inequality that represents *at least*.

$<$ $>$ $\leq$ $\geq$

23. Complete the model below.

Relate plants sold Wednesday plus plants sold Thursday plus plants sold Friday is at least 25

Define Let $p =$ _____.

Write 8 $+$ $\square$ $+$ $\square$ $\square$ 25

24. Simplify and solve the inequality.

25. Club members must sell at least _____ plants on Friday to meet their goal.

Lesson Check • Do you UNDERSTAND?

Reasoning **What can you do to $x + 4 \leq 10$ to get $x \leq 6$?**

26. Circle the operation in the first inequality.

addition	division	multiplication	subtraction

27. Circle the operation you can use to undo the operation you circled in Exercise 26.

addition	division	multiplication	subtraction

28. Explain what you can do to $x + 4 \leq 10$ to get $x \leq 6$.

_____

_____

Math Success

Check off the vocabulary words that you understand.

☐ equivalent inequalities ☐ Addition and Subtraction Properties of Inequality

Rate how well you can *solve inequalities by adding or subtracting.*

Need to review 0 2 4 6 8 10 Now I get it!