Solving Inequalities by Adding or Subtracting

Warm Up

Problem of the Day

Lesson Presentation

Lesson Quizzes

Solving Inequalities by Adding or Subtracting

Warm Up

Write the inequality for each situation.

1. There are at least 28 days in a month.

days in a month ≥ 28

2. The temperature is above 72°.

temperature $> 72°$

3. At most 9 passengers can ride in the van.

passengers ≤ 9

Solving Inequalities by Adding or Subtracting

Problem of the Day

Daryl gave the clerk less than $20 for a CD and received change of at least $5. He ended up with the CD and less money than he started with. Write a compound inequality to show what *C*, the cost in dollars of the CD, could have been.

$0 < C < 15$

Solving Inequalities by Adding or Subtracting

Learn to solve one-step inequalities by adding or subtracting.

Solving Inequalities by Adding or Subtracting

Addition and Subtraction Properties of Inequality			
You can add or subtract the same number on both sides of an inequality, and the inequality will still be true.			
$3 < 5$ $3 + 2 < 5 + 2$ $5 < 7$	$6 > 2$ $6 - 1 > 2 - 1$ $5 > 1$	$4 \leq 7$ $4 + 3 \leq 7 + 3$ $7 \leq 10$	$0 \geq -3$ $0 - 4 \geq -3 - 4$ $-4 \geq -7$

Solving Inequalities by Adding or Subtracting

Additional Example 1A: Using the Addition Property of Inequality

Solve. Then graph the solution set on a number line.

$$n - 7 \leq 15$$

$$\begin{array}{rcl} n - 7 & \leq & 15 \\ +\ 7 & & +\ 7 \\ \hline n & \leq & 22 \end{array}$$

Add 7 to both sides.

Draw a closed circle at 22 then shade the line to the left of 22.

Additional Example 1B: Using the Addition Property of Inequality

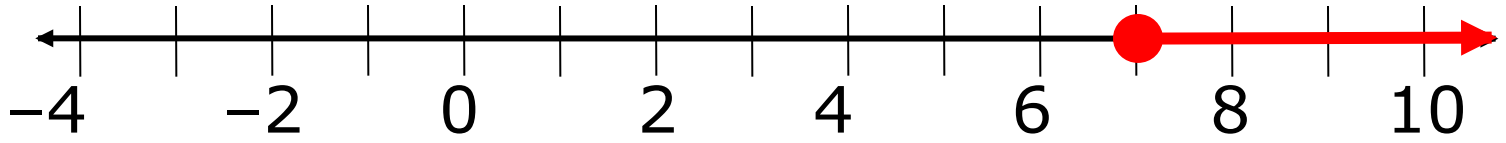
Solve. Then graph the solution set on a number line.

$$a - 10 \geq -3$$

$$\begin{array}{rcr} a - 10 & \geq & -3 \\ +\ 10 & & +10 \\ \hline a & \geq & 7 \end{array}$$

Add 10 to both sides.

Draw a closed circle at 7. Then shade the line to the right.



Solving Inequalities by Adding or Subtracting

Check It Out: Example 1A

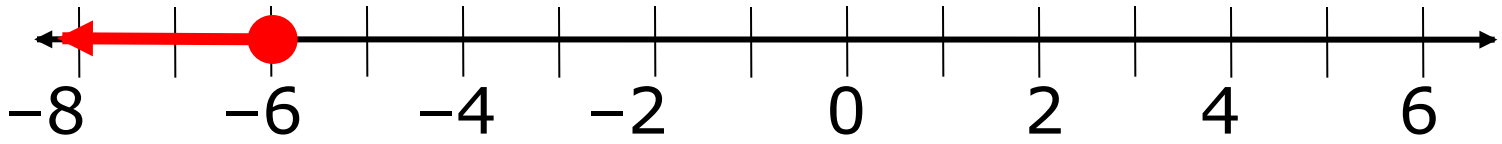
Solve. Then graph the solution set on a number line.

$$d - 12 \leq -18$$

$$\begin{array}{rcl} d - 12 & \leq & -18 \\ +\ 12 & & +\ 12 \\ \hline d & \leq & -6 \end{array}$$

Add 12 to both sides.

Draw a closed circle at –6 then shade the line to the left of –6.



Solving Inequalities by Adding or Subtracting

Remember!

Draw a closed circle when the inequality includes the point and an open circle when it does not include the point.

Check It Out: Example 1B

Solve. Then graph the solution set on a number line.

$b - 14 \geq -8$

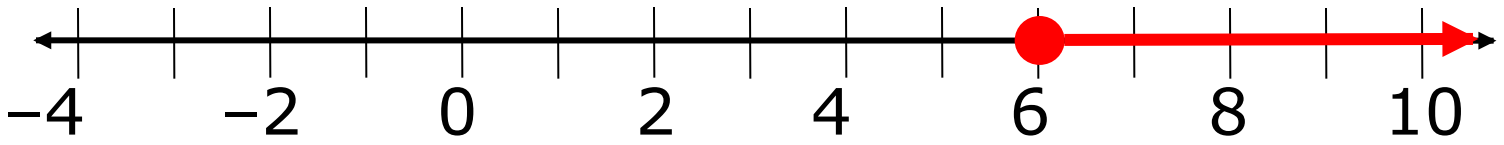
$b - 14 \geq -8$

$+ 14 \quad +14$

$b \geq 6$

Add 14 to both sides.

Draw a closed circle at 6. Then shade the line to the right.



Solving Inequalities by Adding or Subtracting

You can check the solution to an inequality is true by choosing any number in the solution set and substituting it into the original inequality.

Additional Example 2A: Using the Subtraction Property of Inequality

Solve. Check each answer.

$d + 11 > 6$

$d + 11 > 6$

$-11 \quad -11$

$d > -5$

Subtract 11 from both sides.

Check

$d + 11 > 6$

$0 + 11 \stackrel{?}{>} 6$

$11 \stackrel{?}{>} 6$ ✓

0 is greater than –5. Substitute 0 for d.

Additional Example 2B: Solving Inequalities by Subtracting

Solve. Check your answer.

$b + 12 \leq 19$

$b + 12 \leq 19$

$-12 \quad -12$

$b \leq 7$

Subtract 12 from both sides.

Check

$b + 12 \leq 19$

$6 + 12 \stackrel{?}{\leq} 19$

6 is less than 7.

Substitute 6 for b.

$18 \stackrel{?}{\leq} 19$ ✓

Check It Out: Example 2A

Solve. Check each answer.

$c + 15 > 9$

$c + 15 > 9$

$-15 \quad -15$

$c > -6$

Subtract 15 from both sides.

Check

$c + 15 > 9$

$0 + 15 \stackrel{?}{>} 9$

$15 \stackrel{?}{>} 9$ ✓

0 is greater than –6. Substitute 0 for c.

Check It Out: Example 2B

Solve. Check your answer.

$$a + 15 \leq 20$$

$$a + 15 \leq 20$$

$$\underline{-15} \quad \underline{-15}$$

$$a \leq 5$$

Subtract 15 from both sides.

Check

$$a + 15 \leq 20$$

$$4 + 15 \stackrel{?}{\leq} 20$$

$$19 \stackrel{?}{\leq} 20 \checkmark$$

4 is less than 5.
Substitute 4 for a.

Solving Inequalities by Adding or Subtracting

Helpful Hint

When checking your solution, choose a number in the solution set that is easy to work with.

Solving Inequalities by Adding or Subtracting

Additional Example 3: *Money Application*

Edgar's August profit of $137 was at least $20 higher than his July profit. What was July's profit?

Let p represent the profit increase from July to August.

August profit was at least $20 higher than July's profit.

$\$137 \quad \geq \quad 20 + p$

$137 \geq 20 + p$

$-20 \quad -20$ *Subtract 20 from both sides.*

$117 \geq p$

$p \leq 117$ *Rewrite the inequality.*

July's profit was at most $117.

Solving Inequalities by Adding or Subtracting

Check It Out: Example 3

Rylan's March profit of $172 was at least $12 less than his February profit. What was February's profit?

Let p represent the profit decrease from February to march.

March profit was at least $12 less than February's profit.

$\$172 \quad \geq \quad -12 + p$

$172 \geq -12 + p$

$+12 \quad +12$ *Add 12 to both sides.*

$184 \geq p$

$p \leq 184$ *Rewrite the inequality.*

February's profit was at most $184.

Lesson Quizzes

Standard Lesson Quiz

Lesson Quiz for Student Response Systems

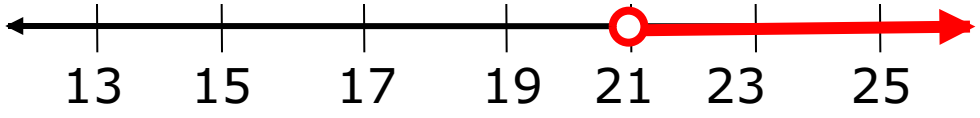
Solving Inequalities by Adding or Subtracting

Lesson Quiz: Part I

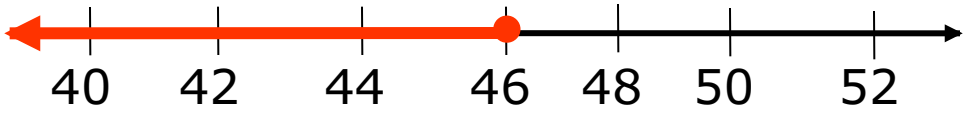
Solve. Then graph each solution set on a number line.

1. $x - 4 > 17$

$x > 21$



2. $z - 27 \leq 19$



$z \leq 46$

Solve. Check each answer

3. $p + 18 \geq -6$ $p \geq -24$

4. $k + 47 > 65$ $k > 18$

Lesson Quiz: Part II

Solve. Check each answer.

5. There are at least 17 more bus riders than walkers in a class. If there are 7 walkers, how many bus riders are there?

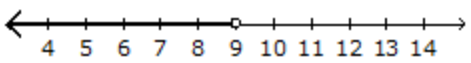
bus riders ≥ 24

Lesson Quiz for Student Response Systems

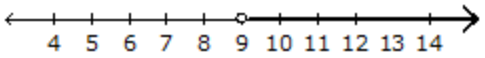
1. Solve the given inequality, and then identify the graph of the solution set on the number line.

$p - 9 > 13$

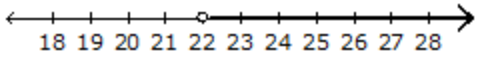
A. $p < 9$



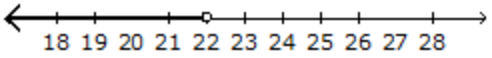
B. $p > 9$



C. $p > 22$



D. $p < 22$



Lesson Quiz for Student Response Systems

2. Solve $q + 15 \geq -8$.

A. $q \leq 23$

B. $q \leq 7$

C. $q \geq -23$

D. $q \geq -7$

Lesson Quiz for Student Response Systems

3. There are at least 15 more football players than baseball players in a class. If there are 12 baseball players, how many football players are there?

A. at least 27

B. at most 27

C. at least 3

D. at most 3