First 5 Minutes — Review Question

GRADE 7 • TOPIC 5 • LESSON 5.4 | 5 points • Work independently

Lesson 5.4 • Solve Inequalities Using Addition or Subtraction

Which values satisfy x < 4: 2, 4, 6?

1. Show each step in your notebook.
2. Explain the operation or rule you used.

Real-Life Connection & Key Concepts

Essential question

How is solving inequalities with addition and subtraction similar to solving equations?

Explain It!

Selena expects to wait at most 15 minutes for a bus; Martin expects more than 15 minutes. Graph both wait times. Who expects the longer wait? If they both wait 10 minutes, whose estimate is consistent?

What we will learn

Write and solve one-step inequalities; graph solutions; distinguish strict and inclusive boundaries.

Definitions & rules

Inequality: a statement comparing quantities using <, >, ≤, or ≥.

Adding or subtracting the same number on both sides preserves the inequality direction.

Open circle: < or >. Closed circle: ≤ or ≥.

Example 1 — Addition & Subtraction Inequalities

GRADE 7 • TOPIC 5 • LESSON 5.4 | Guided example • Model and explain

Problem

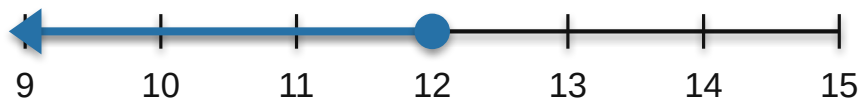
The combined suitcase limit is 50 lb. Raul’s first bag weighs 38 lb. What can his second bag weigh, p? Write, solve and graph.

Worked solution

$38 + p \leq 50$.

Subtract 38 from both sides.

$p \leq 12$; at most 12 lb.



Included endpoint • shade left

Add or subtract the same value on both sides; keep the inequality direction.

Example 2 — Addition & Subtraction Inequalities

GRADE 7 • TOPIC 5 • LESSON 5.4 | Guided example • Model and explain

Problem

The evening temperature could be as low as −12.5°F. It dropped 7.5°F from afternoon to evening. What could the afternoon temperature t have been?

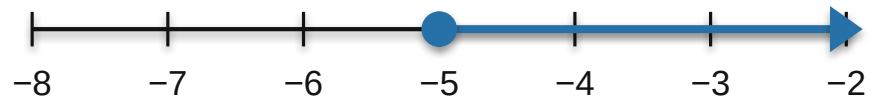
Worked solution

$t - 7.5 \geq -12.5$.

Add 7.5 to both sides.

$t \geq -5$°F.

Add or subtract the same value on both sides; keep the inequality direction.



Included endpoint • shade right

Example 3 — Addition & Subtraction Inequalities

GRADE 7 • TOPIC 5 • LESSON 5.4 | Guided example • Model and explain

Problem

Solve and graph $x - \frac{1}{2} < -\frac{2}{3}$.

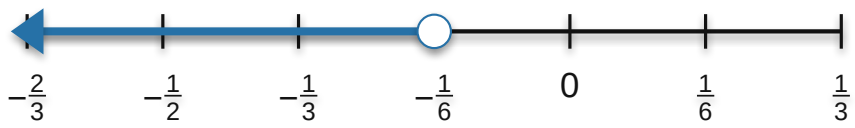
Worked solution

Add $\frac{1}{2}$ to both sides.

$x < -\frac{2}{3} + \frac{1}{2} = -\frac{4}{6} + \frac{3}{6}$.

$x < -\frac{1}{6}$.

Add or subtract the same value on both sides; keep the inequality direction.



Excluded endpoint • shade left

Individual Work

GRADE 7 • TOPIC 5 • LESSON 5.4 | 10 minutes total • 10 points

Complete all five tasks. Show your reasoning.

6. (p. 287) Solve and graph $x + 5 < 7$.

7. (p. 287) Solve and graph $x - 4 \geq 12$.

8. (p. 287) Solve and graph $x + 10 \geq 14$.

Individual Work — continued

GRADE 7 • TOPIC 5 • LESSON 5.4 | 10 minutes total • 10 points

Finish the remaining problems. Check your work.

9. (p. 287) Solve and graph $x - 20 \leq -11$.

10. (p. 287) There are 16 students and room for at most 26. Write, solve and graph an inequality for n additional students.

Individual Work — Answer Key

Add or subtract the same value on both sides; keep the inequality direction.

6. (p. 287)

Subtract 5 from both sides: $x < 2$. Open circle at 2 because 2 is excluded; shade left.

7. (p. 287)

Add 4 to both sides: $x \geq 16$. Closed at 16 because equality is allowed; shade right.

8. (p. 287)

Subtract 10: $x \geq 4$. Closed at 4; shade right for values greater than 4.

9. (p. 287)

Add 20: $x \leq 9$. Closed at 9; shade left for values below 9.

10. (p. 287)

$16 + n \leq 26$. Subtract 16: $n \leq 10$. Because n counts students, n is a whole number from 0 to 10. Graph these values.

Group Work

GRADE 7 • TOPIC 5 • LESSON 5.4 | 8 minutes total • 10 points

Work together. Each person must contribute a solution.

13. (p. 288) Mason subtracts 5 from both sides to solve $x - 5 < 11$. Correct his error and graph the solution.

15. (p. 288) A temperature falls 4°F after the heater stops. The temperature is at least 67°F. What was the temperature T before?

Group Work — continued

GRADE 7 • TOPIC 5 • LESSON 5.4 | 8 minutes total • 10 points

Agree on a solution and be ready to explain it.

16. (p. 288) You have $21 and need at least $47. Write and solve for additional money m; graph.

17. (p. 288) Solve $x - 7.35 \geq 2.87$. Write two equivalent inequalities.

Group Work — Answer Key

GRADE 7 • TOPIC 5 • LESSON 5.4 | Discuss and justify

Add or subtract the same value on both sides; keep the inequality direction.

13. (p. 288)

$x - 5 < 11 \rightarrow x < 16$. Mason subtracted 5 instead of adding 5. Open at 16, shade left.

15. (p. 288)

$T - 4 \geq 67 \rightarrow T \geq 71°F$ before heater stopped.

16. (p. 288)

$21 + m \geq 47 \rightarrow m \geq 26$ dollars. Closed at 26, shade right.

17. (p. 288)

Add 7.35: $x \geq 10.22$. Equivalent forms: $x \geq 10.22$ and $10.22 \leq x$.

Exit Ticket

GRADE 7 • TOPIC 5 • LESSON 5.4 | 2 minutes • Independent check

Before you leave, solve this problem.

Solve and graph $x - 4.5 \leq -2$.

Show your work.

Write the answer with the correct units or graph, if needed.