Linear inequalities: direction and endpoints — Teacher answers

Year 7, lower volume • text pp. 71–78 • textbook lessons 36–39

Use the worked and guided tasks selectively. The eight core paper tasks are prerequisites, independent tasks and exits; further practice and extensions are optional.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

Prerequisites: Compare signed numbers, solve simple equations and recognise strict versus non-strict inequality symbols.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

Inquiry and discussion: 18 minutes with number-line cards: start from −3<1 and predict what adding 5, multiplying by 2, or multiplying by −2 does to the order (3 min). Place the resulting pairs on a common number line and compare which operation reverses the positions (6 min). Solve 3x>6 and −3x>6 separately, then test x=3 and x=−3 in both original inequalities (6 min). Explain why subtraction alone does not reverse the sign and show the open endpoint required by a strict inequality (3 min).

Worked example 1

Solve the inequality.

$$3 - 2x \geq 7$$

Reference answer

$x \leq -2$.

$$x \leq -2$$

1. Collect variable terms on the left and constants on the right: $-2x \geq 4$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x \leq -2$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Guided attempt 2

Solve the inequality.

$$2(x - 1) < x + 5$$

1. Expand $2(x - 1) < x + 5$ to $2x - \square < x + 5$.
2. Subtract x and add 2 on both sides: $x < 5 + \square$.
3. Thus $x < \square$; decide whether the boundary is included.

Reference answer

$x < 7$.

$$x < 7$$

1. Collect variable terms on the left and constants on the right: $1x < 7$.
2. Divide by the positive coefficient; the direction stays the same.
3. The solution set is $x < 7$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 3

Does x=3 satisfy $2x + 1 > 8$?

A. No; 7 is not greater than 8.

B. Yes; all positive x work.

Reference answer

No; 7 is not greater than 8.

1. Substitute 3 into the left side: 2×3+1=7.
2. 7>8 is false.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 4

Start with −3<1. Multiplying both sides by −2 gives which true inequality?

A. $6 < -2$

B. $6 > -2$

Reference answer

$6 > -2$

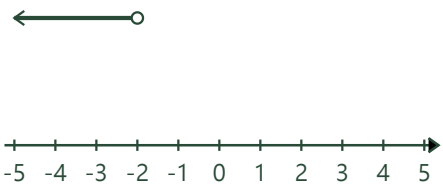
1. Products are 6 and −2.
2. A negative multiplier reverses the direction.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 5

Solve the inequality and show its solution on the blank number line.

$$-3x > 6$$



Use the stated conditions and the labelled scales.

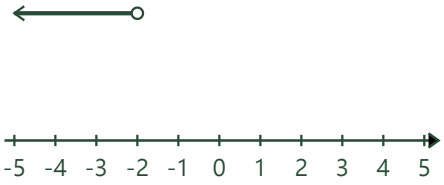
Reference answer

$x < -2$.

$$x < -2$$

1. Collect variable terms on the left and constants on the right: $-3x > 6$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x < -2$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.



Use the stated conditions and the labelled scales.

Independent practice 6

Solve the inequality.

$$5x - 4 \leq 11$$

Reference answer

$x \leq 3$.

$$x \leq 3$$

1. Collect variable terms on the left and constants on the right: $5x \leq 15$.
2. Divide by the positive coefficient; the direction stays the same.
3. The solution set is $x \leq 3$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 7

Solve the inequality.

$$\frac{x+1}{2} > \frac{x-2}{3}$$

Reference answer

$x > -7$.

$$x > -7$$

1. Collect variable terms on the left and constants on the right: $\frac{1}{6}x > \frac{-7}{6}$.
2. Divide by the positive coefficient; the direction stays the same.
3. The solution set is $x > -7$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 8

Solve the inequality.

$$4 - 2(x+1) \geq x - 7$$

Reference answer

$x \leq 3$.

$$x \leq 3$$

1. Collect variable terms on the left and constants on the right: $-3x \geq -9$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x \leq 3$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 9

Solve the inequality.

$$-x \leq 4$$

Reference answer

$x \geq -4$.

$$x \geq -4$$

1. Collect variable terms on the left and constants on the right: $-1x \leq 4$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x \geq -4$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 10

For $x \leq 3$, which endpoint marking is correct?

A. A filled point at 3, extending left.
B. An open point at 3, extending left.
C. A filled point at 3, extending right.

Reference answer

A filled point at 3, extending left.

1. Equality is allowed, so include 3.
2. Smaller numbers lie to the left.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 11

Solve the inequality.

$$2x + 3 < 7$$

Reference answer

$x < 2$.

$$x < 2$$

1. Collect variable terms on the left and constants on the right: $2x < 4$.
2. Divide by the positive coefficient; the direction stays the same.
3. The solution set is $x < 2$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 12

Solve the inequality.

$$3x + 2 \geq 5x - 6$$

Reference answer

$x \leq 4$.

$$x \leq 4$$

1. Collect variable terms on the left and constants on the right: $-2x \geq -8$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x \leq 4$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 13

Solve the inequality.

$$-4(x - 2) > 12$$

Reference answer

$x < -1$.

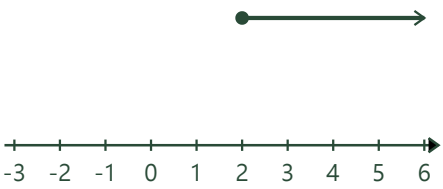
$$x < -1$$

1. Collect variable terms on the left and constants on the right: $-4x > 4$.
2. Divide by a negative coefficient and reverse the inequality.
3. The solution set is $x < -1$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 14

Read the given number line and write its solution set. The filled endpoint is included.



Use the stated conditions and the labelled scales.

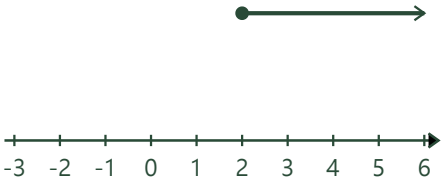
Reference answer

$x \geq 2$

$$x \geq 2$$

1. The marked region begins at 2 and extends right.
2. The filled endpoint includes equality: x≥2.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.



Use the stated conditions and the labelled scales.

Extension 15

Solve the inequality.

$$2x + 1 < 2x + 3$$

Reference answer

$x \in \mathbb{R}$.

$$x \in \mathbb{R}$$

1. Collect variable terms on the left and constants on the right: $0x < 2$.
2. The resulting constant statement is always true.
3. The solution set is $x \in \mathbb{R}$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Extension 16

Solve the inequality.

$$2x + 5 \leq 2x + 1$$

Reference answer

$\varnothing$.

$$\varnothing$$

1. Collect variable terms on the left and constants on the right: $0x \leq -4$.
2. The resulting constant statement is false.
3. The solution set is $\varnothing$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.