

Solving, Graphing and Modeling with Inequalities

Grade 9 – Algebra 1 math · Worksheet Answer Key · Standards: A-REI.B.3, A-CED.A.1, A-CED.A.3

Every answer key shows each algebra step and a test value. Pay attention to the circles on the graphs and to the places where the inequality sign reverses.

Standards: A-REI.B.3, A-CED.A.1, A-CED.A.3 · **Level:** Grade 9 Algebra 1

Problem 1 Add and compare

Subtract 7: $x > 5$.

Open circle at 5, shade right. Check: $6 + 7 = 13 > 12$.

$$x > 5$$

Problem 2 Divide by a positive

Divide by 3 (positive, so the sign stays): $x \leq 7$.

Check: $3(7) = 21 \leq 21$.

$$x \leq 7$$

Problem 3 Two steps with a fraction

Add 2: $\frac{x}{4} \geq 3$. Multiply by 4: $x \geq 12$.

Check: $12/4 - 2 = 1 \geq 1$.

$$x \geq 12$$

Problem 4 Reverse the sign

Divide by -2 and reverse the sign: $x > -7$.

Check: $x = 0$ gives $0 < 14$, true; $x = -8$ gives $16 < 14$, false.

$$x > -7$$

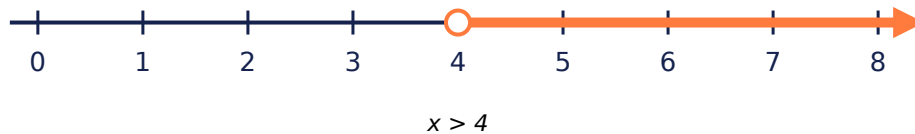
Problem 5 Write from a graph

The circle at -2 is closed, so -2 is included, and the shading goes left.

$$x \leq -2$$

Problem 6 Variables on both sides

Subtract $2x$: $4x - 5 > 11$. Add 5 : $4x > 16$. Divide by 4 : $x > 4$.



Check: $x = 5$ gives $25 > 21$.

$$x > 4$$

Problem 7 Negative coefficient

Subtract 7 : $-3x \geq 15$. Divide by -3 and reverse: $x \leq -5$.

Check: $x = -6$ gives $7 + 18 = 25 \geq 22$.

$$x \leq -5$$

Problem 8 Distribute first

$4x - 8 < 2x + 10$. Subtract $2x$: $2x - 8 < 10$. Add 8 : $2x < 18$. So $x < 9$.

Check: $x = 8$ gives $24 < 26$.

$$x < 9$$

Problem 9 Fraction inequality

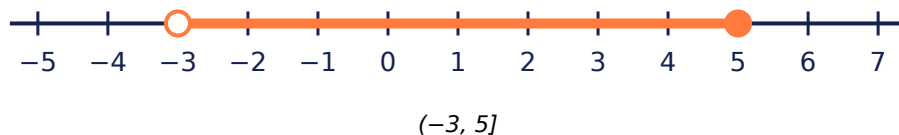
Multiply by 3 : $2x - 1 \leq 15$. Add 1 : $2x \leq 16$. Divide: $x \leq 8$.

Check: $x = 8$ gives $15/3 = 5 \leq 5$.

$$x \leq 8$$

Problem 10 Compound inequality (and)

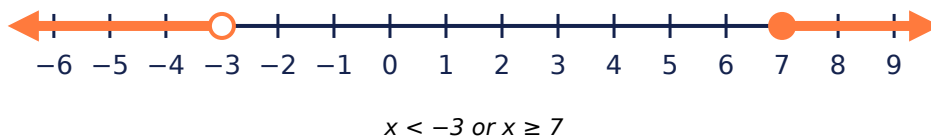
Add 1 to all parts: $-6 < 2x \leq 10$. Divide all parts by 2: $-3 < x \leq 5$.



$-3 < x \leq 5$, which is $(-3, 5]$

Problem 11 Compound inequality (or)

First: $3x < -9$, so $x < -3$. Second: $2x \geq 14$, so $x \geq 7$.



$x < -3 \text{ or } x \geq 7$

Problem 12 Read a segment

Closed at -1 and open at 4 .

$-1 \leq x < 4$, which is $[-1, 4)$

Problem 13 Interval notation

(a) open at -1 , going right: $(-1, \infty)$. (b) closed at 9 , going left: $(-\infty, 9]$. (c) open at 1 , closed at 8 : $(1, 8]$.

(a) $(-1, \infty)$ (b) $(-\infty, 9]$ (c) $(1, 8]$

Problem 14 Test values

$x = -3$: $6 + 6 = 12 > 11$, true. $x = -2$: $6 + 4 = 10$, not greater than 11 .

Solving: $-2x > 5$, so $x < -2.5$.

-3 is a solution, -2 is not; $x < -2.5$

Problem 15 Camp activities

$18 + 7.5a \leq 60$, so $7.5a \leq 42$ and $a \leq 5.6$.

Activities are whole numbers, so the greatest is 5 (cost \$55.50).

5 activities

Problem 16 Test average

$(78 + 85 + 91 + t)/4 \geq 85$. The first three add to 254, so $254 + t \geq 340$ and $t \geq 86$.

Check: $(254 + 86)/4 = 85$.

At least 86

Problem 17 Food truck profit

Profit per wrap: $6.50 - 1.90 = 4.60$. So $4.6w - 420 > 300$, giving $4.6w > 720$ and $w > 156.52$.

Check: 157 wraps give $722.20 > 720$; 156 give 717.60, not enough.

At least 157 wraps

Problem 18 Greenhouse range

$59 \leq 1.8C + 32 \leq 86$. Subtract 32: $27 \leq 1.8C \leq 54$. Divide by 1.8: $15 \leq C \leq 30$.



Greenhouse temperatures in °C.

$15 \leq C \leq 30$, or $[15, 30]$

Problem 19 Robotics budget

$24(6) + 9s \leq 300$, so $144 + 9s \leq 300$ and $9s \leq 156$, giving $s \leq 17.33$.

Whole sensors: 17 (cost $144 + 153 = 297$).

At most 17 sensors

Problem 20 Phone plan comparison

$15 + 4g < 35$, so $4g < 20$ and $g < 5$. The graph agrees: the blue line is below the orange line before 5 GB.

Since $g \geq 0$, the answer is $0 \leq g < 5$.

Plan B is cheaper when $g < 5$