

# Solving Multi-Step Inequalities

Algebra 1 • Section 3.2

Name: \_\_\_\_\_

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## Quick Review and Helpful Hints

Inequalities solve almost like equations, but dividing or multiplying by a negative reverses the sign. For absolute value, think distance: less-than makes a band, while greater-than usually splits into two rays.

▷ **Example:** Solve  $-2x + 5 < 13$ .

**Work:** Subtract 5 to get  $-2x < 8$ . Divide by  $-2$  and reverse the inequality:  $x > -4$ .

★ **Answer:**  $x > -4$

## ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Solve  $3x + 5 < 20$ .

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2. Solve  $7 - 2y \geq 15$ .

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3. Solve  $4(a - 3) > 20$ .

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4. Solve  $-5p + 2 \leq 17$ .

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5. Solve  $\frac{x+1}{3} \geq 4$ .

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6. Solve  $2(3n - 1) < 16$ .

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7. Solve  $9 - 4r > 21$ .

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8. Solve  $5 + \frac{m}{2} \leq 13$ .

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9. Solve  $8x - 3 \geq 5x + 12$ .

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10. Solve  $10 - 2(k + 4) < 6$ .

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## ◆ Word Problems

11. A student needs at least 90 points. She has 34 and earns 7 per task. Write and solve.

12. A rental costs \$15 plus \$4 per hour and must stay under \$47. How many hours?

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## Answer Keys

1.  $x < 5$

2.  $y \leq -4$

3.  $a > 8$

4.  $p \geq -3$

5.  $x \geq 11$

6.  $n < 3$

7.  $r < -3$

8.  $m \leq 16$

9.  $x \geq 5$

10.  $k > -2$

11.  $34 + 7t \geq 90; t \geq 8$

12.  $h < 8$

### Step-by-Step Explanations

1. Subtract 5 first, then divide by 3; since 3 is positive, the  $<$  stays put.
2. After taking 7 off you have  $-2y \geq 8$  — dividing by a negative flips  $\geq$  into  $\leq$ .
3. Dividing both sides by 4 keeps the direction;  $a - 3 > 5$  then adds up to  $a > 8$ .
4. Clear the  $+2$ , then divide by  $-5$  — and remember a negative divide turns the sign around.
5. Multiply both sides by the positive 3 to lift the fraction, then subtract 1; the sign holds.
6. Distribute to  $6n - 2 < 16$ , add 2, then divide by the positive 6 — direction unchanged.

7. Move the 9 to get  $-4r > 12$ ; the divide by  $-4$  is the moment  $>$  becomes  $<$ .
8. Subtract the 5, then multiply by the positive 2 to undo the halved  $m$  — no flipping needed.
9. Collect the  $x$  terms by subtracting  $5x$ , add 3, and  $3x \geq 15$  gives  $x \geq 5$ .
10. Distribute to  $2 - 2k < 6$ , peel off the 2, then the negative divide swings  $<$  to  $>$ .
11. 'At least' means  $\geq$ , so  $34 + 7t \geq 90$ ; subtracting 34 shows she needs  $t \geq 8$  tasks.
12. 'Under' means a strict  $<$ : write  $15 + 4h < 47$ , then peel the \$15 and divide by 4.



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