

UNIT 2 • REASONING WITH EQUATIONS AND INEQUALITIES

Lesson 1: Solving Equations and Inequalities

Instruction

Guided Practice 2.1.3

Example 1

Solve the inequality $\frac{-3x-4}{7} > 5$.

1. Isolate the variable by eliminating the denominator.

In this inequality, the denominator means “divide by 7.” Eliminate it by performing the inverse operation, multiplication. Multiply both expressions of the inequality by 7.

$$\begin{aligned} 7 \cdot \frac{-3x-4}{7} &> 7 \cdot 5 \\ -3x-4 &> 35 \end{aligned}$$

2. Isolate the variable.

Perform the inverse operation of adding 4 to both expressions of the inequality.

$$\begin{array}{r} -3x-4 > 35 \\ +4 \quad +4 \\ \hline -3x > 39 \end{array}$$

Now solve.

3. Divide both sides of the inequality by the coefficient, -3 .

$$\begin{aligned} \frac{-3x}{-3} &> \frac{39}{-3} \\ x &< -13 \end{aligned}$$

Notice that the direction of the inequality symbol changed because we divided by -3 .

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4. The solution to the original inequality $\frac{-3x-4}{7} > 5$ is all numbers less than -13 . To check this, choose any number less than -13 to show a true statement. Let's try -20 . Be sure to substitute the value into the original inequality.

$$\frac{-3x-4}{7} > 5$$

Original inequality

$$\frac{-3(-20)-4}{7} > 5$$

Substitute -20 for x .

$$\frac{60-4}{7} > 5$$

Multiply, then subtract.

$$\frac{56}{7} > 5$$

Simplify the fraction.

$$8 > 5$$

$8 > 5$ is a true statement; therefore, all numbers less than -13 will result in a true statement.



Example 2

Solve the inequality $5x + 4 \geq 11 - 2x$.

1. Move the variable to one side of the inequality.

Notice the variable x is in both expressions of the inequality. Begin by choosing which side you want your variable to appear on. Just like with equations, this is a choice, but most people choose to have all variables on the left side of the inequality. Continue by adding $2x$ to both expressions of the inequality.

$$5x + 4 \geq 11 - 2x$$

$$\begin{array}{r} +2x \quad \quad +2x \\ \hline \end{array}$$

$$7x + 4 \geq 11$$



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2. Isolate the variable.

Subtract 4 from both expressions.

$$\begin{array}{r} 7x + 4 \geq 11 \\ -4 \quad -4 \\ \hline 7x \geq 7 \end{array}$$



3. Finally, divide both sides of the inequality by the coefficient of x , 7.

$$\begin{array}{r} \frac{7x}{7} \geq \frac{7}{7} \\ x \geq 1 \end{array}$$



4. The solution to the original inequality, $5x + 4 \geq 11 - 2x$, is all numbers greater than or equal to 1.



5. To check this solution, choose a number greater than or equal to 1, such as 2, and substitute it for all instances of x in the original inequality.

$5x + 4 \geq 11 - 2x$	Original inequality
$5(2) + 4 \geq 11 - 2(2)$	Substitute 2 for each instance of x .
$10 + 4 \geq 11 - 4$	Simplify each expression.
$14 \geq 7$	This is a true statement.

Our check proved true, so we can be sure that our solution of $x \geq 1$ is accurate.

