Module 7: Solving Linear Inequalities
Topic 2: Solving Algebraically

Introduction

Hello and welcome! I'm glad you could join me for this lesson in Algebra I. In this lesson, we will focus on solving linear inequalities in two variables. Your knowledge of how to solve linear inequalities in one variable and the properties of inequality will help you successfully progress through this lesson. So without any further ado, let's begin!

Module 7: Solving Linear Inequalities
Topic 2: Solving Algebraically

Anticipatory Set

Solve for x.

$5(x + 2) - 4x < 2$

Step 1: Are there any ***parentheses*****?**
This inequality does have parentheses, so you will need to use the distributive property to expand the left side.

$5(x + 2) - 4x < 2$

Use the distributive property to eliminate the parentheses.

$5x + 10 - 4x < 2$

Step 2: Are there any ***like terms to combine?***
In this case, you do have like terms to combine. Remember to only combine like terms that are on the same side of the inequality.

$5x + 10 - 4x < 2$

$5x$ minus $4x$ is $1x$. Remember that you do not need to write the 1.

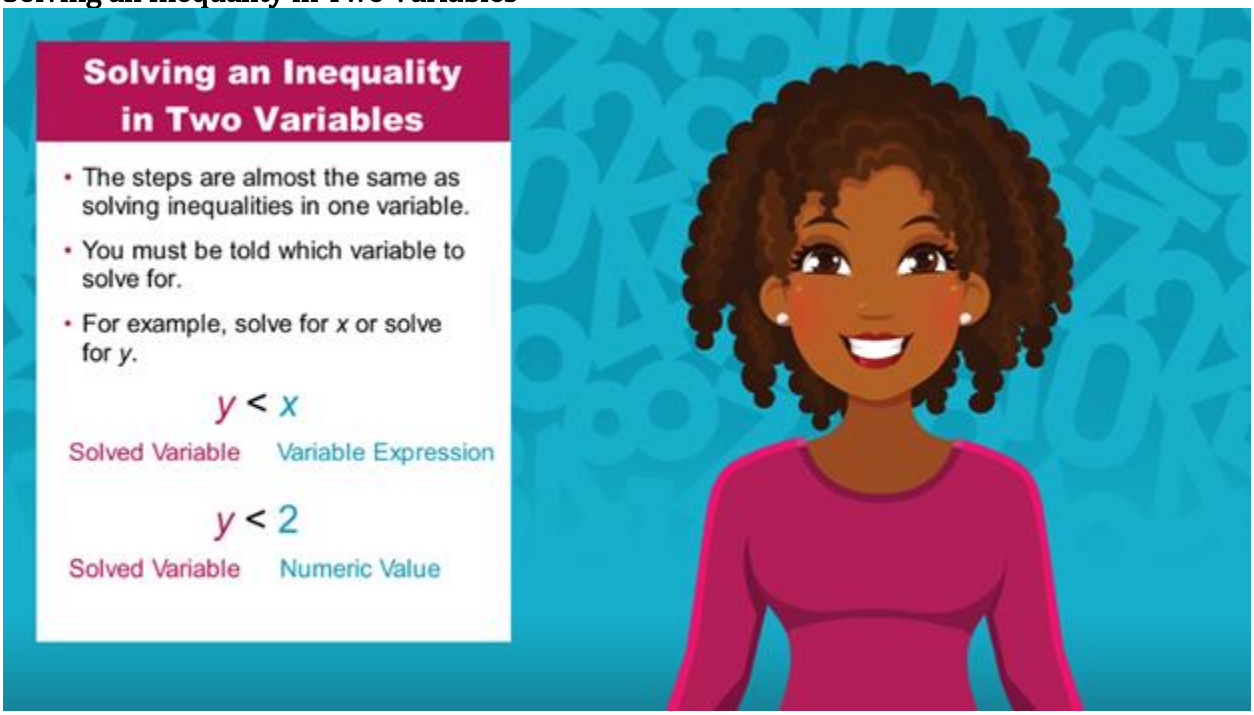
$x + 10 < 2$

Step 3: Now, use inverse operations to ***isolate the variable***.

$$\begin{array}{rrrr} x & + & 10 & < & 2 \\ & - & 10 & & - 10 \\ \hline x & < & -8 & & \end{array}$$

Recall that the subtraction property of inequality states that you can subtract the same value from each side of an inequality and the inequality will remain true. So subtract 10 from each side of the inequality.

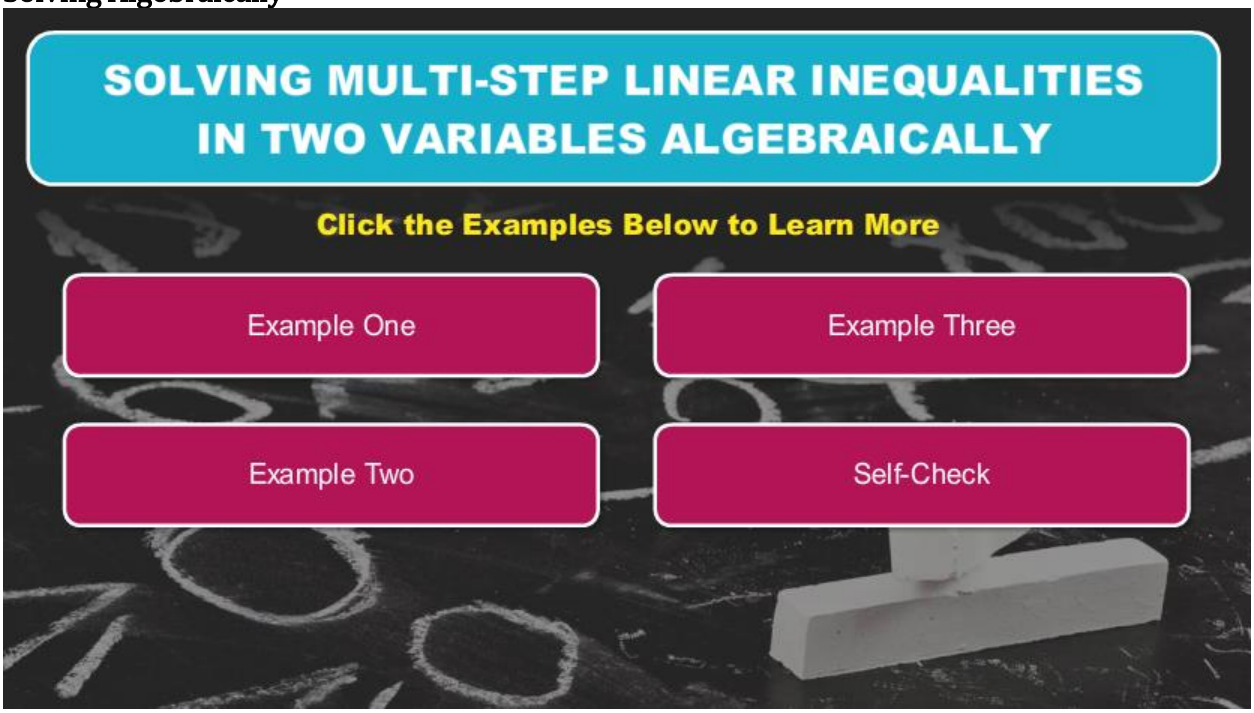
Solving an Inequality in Two Variables



You have performed this process numerous times in order to solve inequalities that only included one variable. You will perform a similar process in order to solve inequalities that include two variables. When solving an inequality in two variables, however, you must be instructed as to which variable to solve for.

The next few examples will involve inequalities that include the variables x and y, and you will be solving for y each time. The goal in this situation, generally, is to end with y on the left side of the inequality, and an expression on the right side. Sometimes that expression will be numeric. Often, however, it will be a variable expression.

Solving Algebraically



Click the examples below to learn more.

Example 1
Solve for y.

$$5(-6x + y) \geq 20$$

Step 1: Are there any ***parentheses***?
This inequality does have parentheses, so you will need to use the distributive property to simplify the left side.

$5(-6x + y) \geq 20$

$-30x + 5y \geq 20$

Use the distributive property to eliminate the parentheses.

Step 2: Do you have any ***like terms to combine?***
In this case, you do not have any like terms to combine. So, you can move on to Step 3.

Step 3: Now, it's time to ***isolate the variable***.
In this example, you are asked to solve for y. Begin using inverse operations to isolate y.

$-30x + 5y \geq 20$

$+30x \qquad +30x$

Add 30*x* to both sides of the inequality.

$5y \geq 30x + 20$

$\frac{5y}{5} \geq \frac{30x}{5} + \frac{20}{5}$

Now divide each term by 5.

$y \geq 6x + 4$

The final result is y is greater than or equal to 6*x* plus 4.

Example 2
Solve for y.

$$-3y - 15 > 2x - 3$$

Step 1: Are there any ***parentheses***?
This inequality does not have any parentheses, so we will not need to use the distributive property. So, move on to Step 2.

Step 2: Do you have any ***like terms to combine?***
In this case, we have no like terms to combine. So, move on to Step 3.

Step 3: Now, it's time to ***isolate the variable.***
In this example, you are asked to solve for y. Begin using inverse operations to isolate y.

$-3y - 15 > 2x - 3$

$+15 \qquad +15$ — Add 15 to both sides of the inequality.

$-3y > 2x + 12$

$\frac{-3y}{-3} > \frac{2x}{-3} + \frac{12}{-3}$ — Now divide each term by negative three.

$y < -\frac{2}{3}x - 4$ — Remember, because you are dividing both sides of the inequality by a negative number, you must flip the inequality sign.

Example 3
Solve for y.

$$7y - 3(x + 2y) > 4$$

Step 1: Are there any ***parentheses***?
This inequality does have parentheses, so you will need to use the distributive property to simplify the left side.

$$7y - 3(x + 2y) > 4$$

Apply the distributive property to eliminate the parentheses.

$$7y - 3x - 6y > 4$$

Step 2: Do you have any ***like terms to combine?***
In this case, you do have some like terms to combine.

$$7y - 3x - 6y > 4$$

On the left side of the inequality, you can combine $7y$ and negative $6y$. There are no like terms to combine on the right side of the inequality, so you can move on to Step 3.

$$y - 3x > 4$$

Step 3: Now, it's time to ***isolate the variable***.
In this example, you are asked to solve for y. Begin using inverse operations to isolate y.

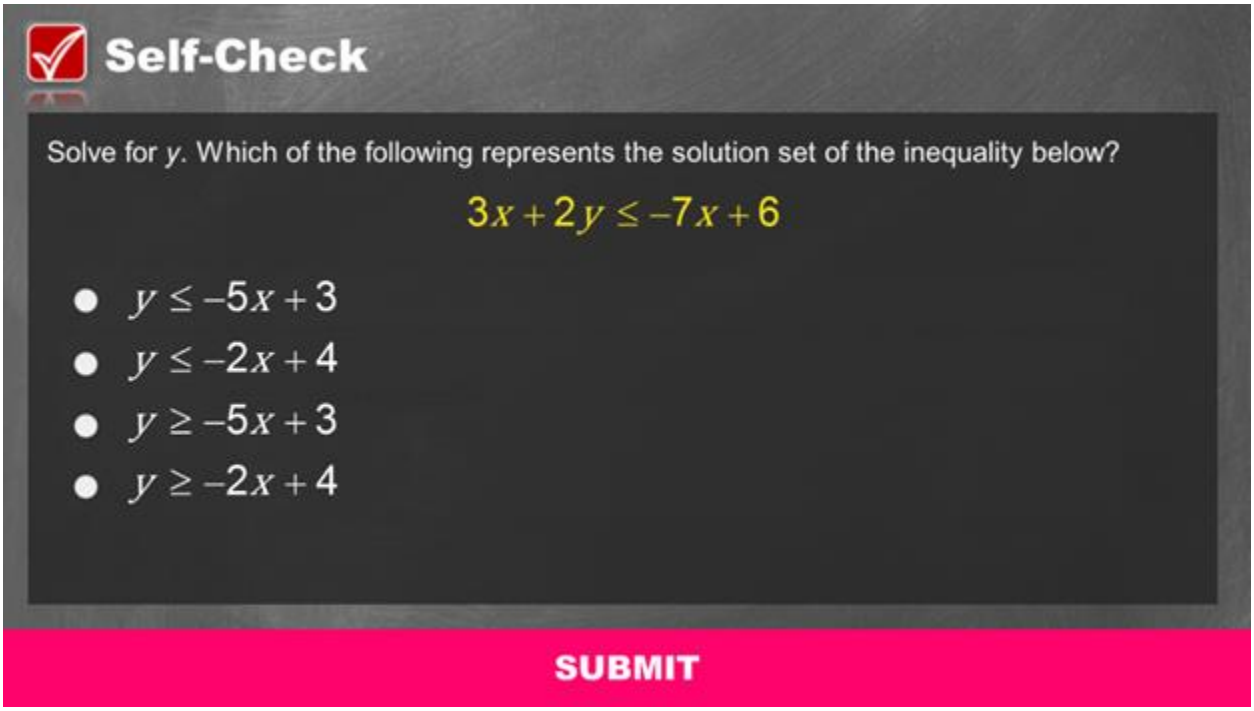
$$y - 3x > 4$$

$$+3x \quad +3x$$

Add $3x$ to both sides.

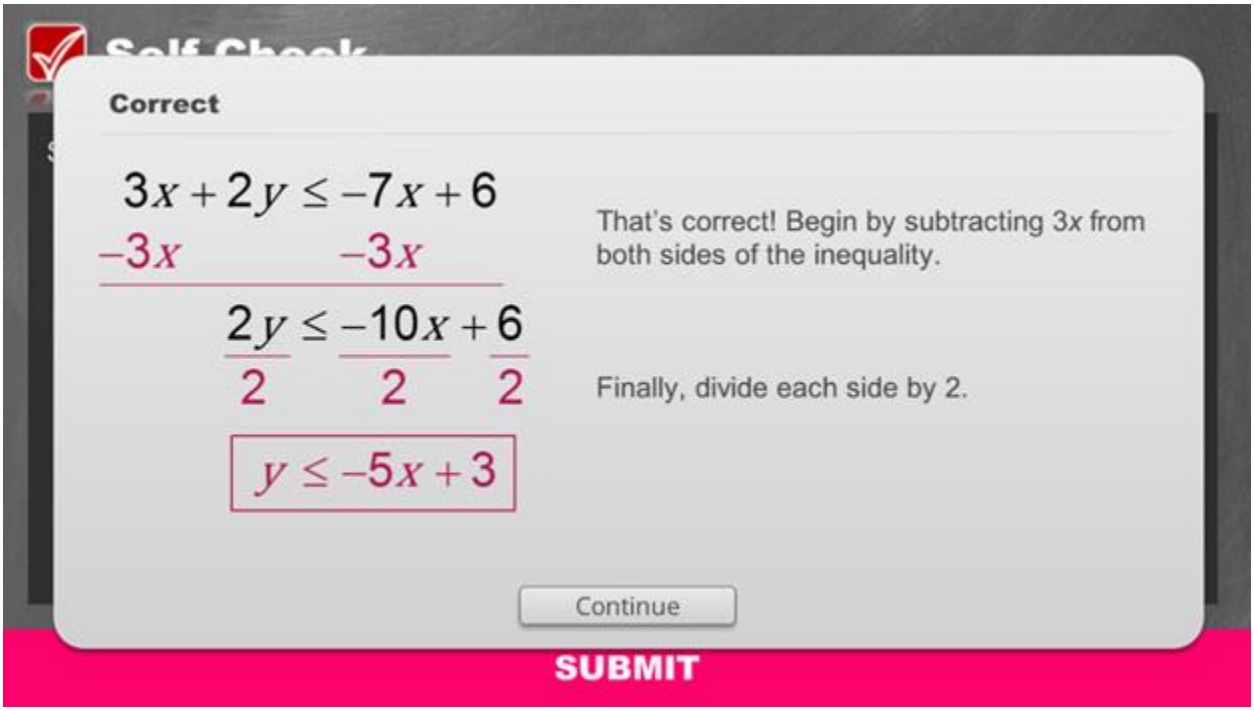
$$y > 3x + 4$$

Self-Check 1



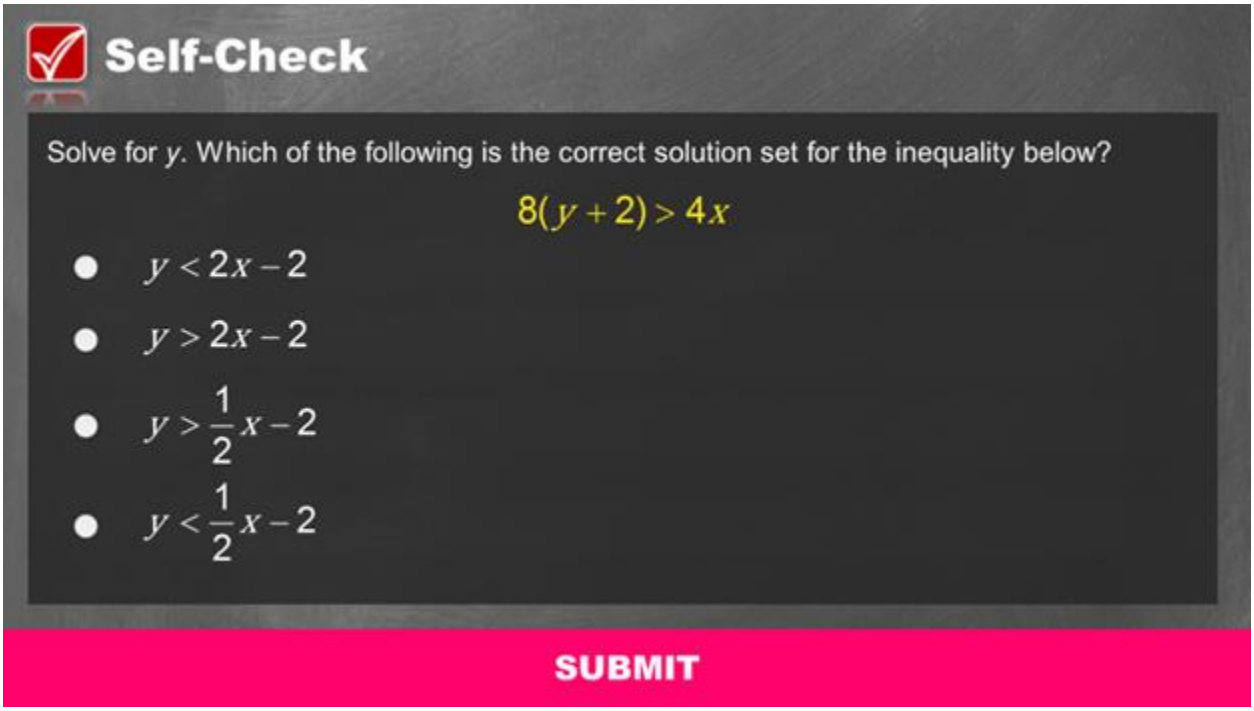
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



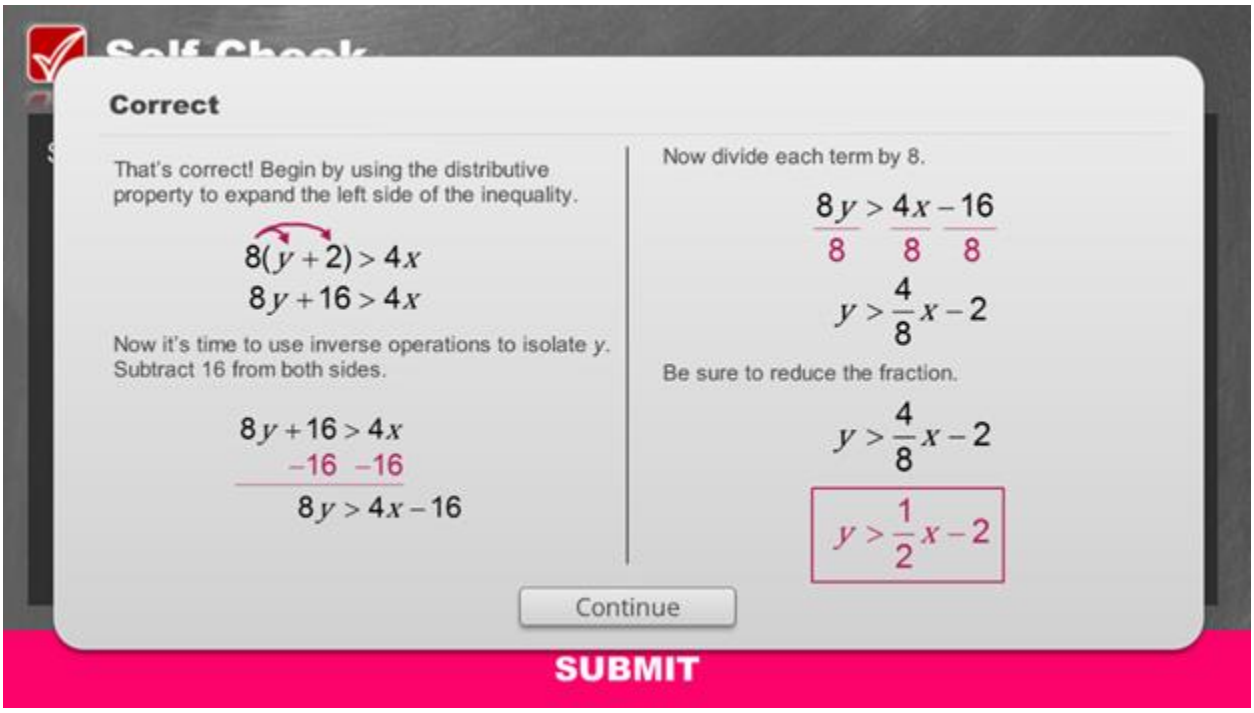
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



Solve the problem in the image above to check your understanding of the content.

Self-Check 2: Answers



For your reference, the image above shows the correct solution to the self-check problem.

Conclusion

You have reached the conclusion of your lesson in solving linear inequalities in two variables. During this lesson, you used your prior knowledge of solving linear inequalities in on variable, as well as your knowledge of the properties of inequality in order to successfully progress through this lesson. I'll see you again soon! Bye for now.