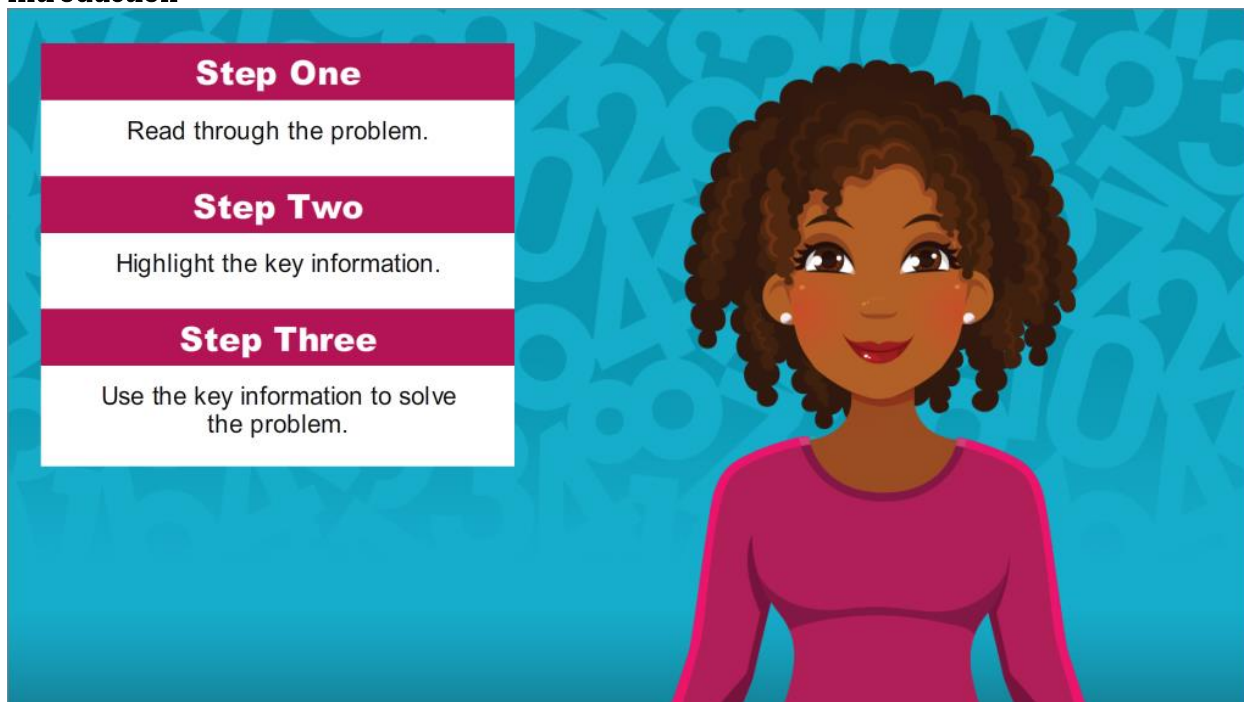


## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Introduction



<b>Step One</b>
Read through the problem.
<b>Step Two</b>
Highlight the key information.
<b>Step Three</b>
Use the key information to solve the problem.

In this lesson you will learn how to solve practical problems involving systems of inequalities. Remember that although practical problems are packed with a lot of information to sort through, you have a three-step process to help you along:

**Step 1:** Read through the problem

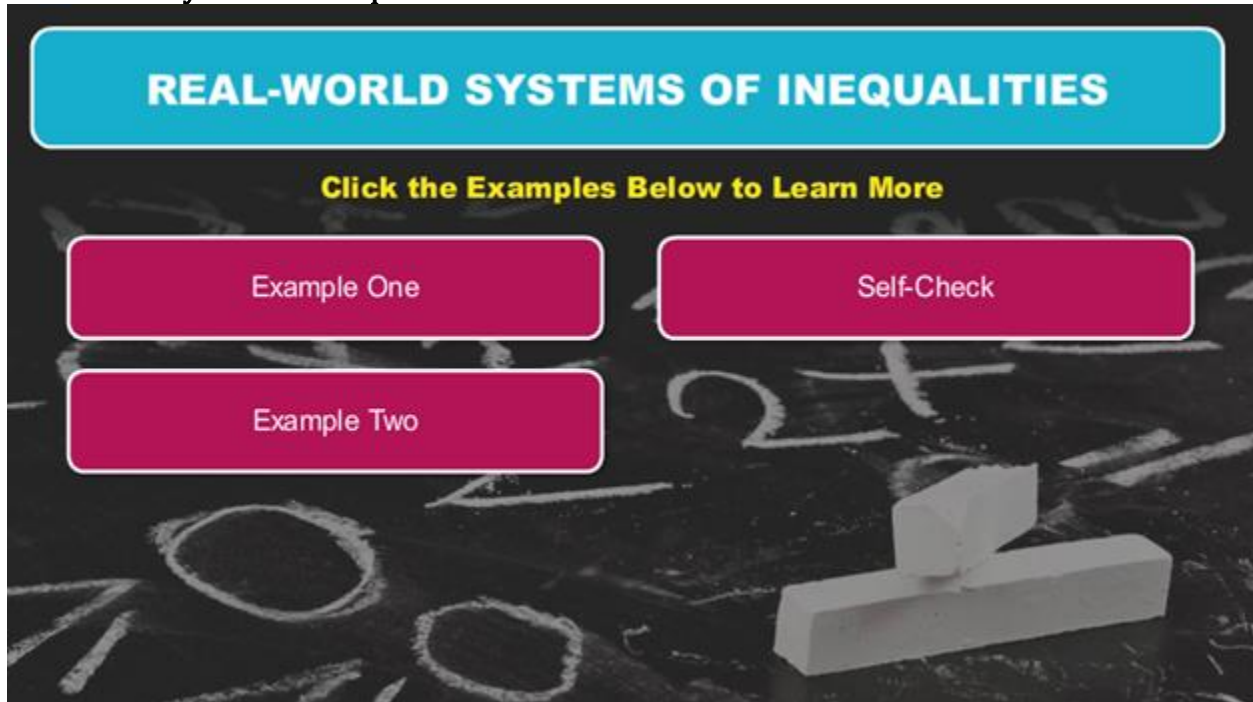
**Step 2:** Highlight the key information

**Step 3:** Use the key information to solve the problem

Remember your process as you prepare to start the first example.

**Module 7: Solving Linear Inequalities**  
**Topic 4: Real-World Systems of Inequalities**

Real-World Systems of Inequalities

An interactive graphic with a dark background featuring faint chalkboard numbers and a white eraser. At the top, a blue rounded rectangle contains the text "REAL-WORLD SYSTEMS OF INEQUALITIES" in white. Below this, yellow text reads "Click the Examples Below to Learn More". Three pink rounded rectangles are arranged in a 2x2 grid: "Example One" (top-left), "Self-Check" (top-right), and "Example Two" (bottom-left).

**REAL-WORLD SYSTEMS OF INEQUALITIES**

Click the Examples Below to Learn More

Example One

Self-Check


Example Two

Click the examples below to learn more.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 1



**Example 1**

Tickets for the school play are \$9 for each adult and \$7 for each student. There are 80 tickets available and the goal is to achieve sales of more than \$140.

Let  $x$  represent the number of adult tickets sold and let  $y$  represent the number of student tickets sold.

Write a system of inequalities to model the situation.

**Read through the problem above. Click to highlight important passages.**

**Next**

Take a few moments to read through Example 1. Highlight the information you think is necessary to solve the problem.

*Tickets for the school play are \$9 for each adult and \$7 for each student. There are 80 tickets available and the goal is to achieve sales of more than \$140.*

*Let  $x$  represent the number of adult tickets sold and let  $y$  represent the number of student tickets sold.*

*Write a system of inequalities to model the situation.*

Read through the problem above. Click to highlight important passages.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 1 (continued)



#### Example 1

Tickets for the school play are \$9 for each adult and \$7 for each student. There are 80 tickets available and the goal is to achieve sales of more than \$140.

Let  $x$  represent the number of adult tickets sold and let  $y$  represent the number of student tickets sold.

Write a system of inequalities to model the situation.

Did you highlight the important facts?

- Tickets are \$9 for each adult and \$7 for each student
- There are 80 tickets available
- The goal is to achieve sales of more than \$140
- $x$  represents the number of adult tickets sold and  $y$  represents the number of student tickets sold
- Write a system of inequalities to model the situation

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 1 (continued)

Example 1	
$x$ number of adult tickets sold	Tickets for the school play are \$9 for each adult and \$7 for each student. There are 80 tickets available and the goal is to achieve sales of more than \$140.
$y$ number of student tickets sold	
\$9 cost of each adult ticket	
\$7 cost of each student ticket	
\$140 sales goal	Let $x$ represent the number of adult tickets sold and let $y$ represent the number of student tickets sold.
	Write a system of inequalities to model the situation.
$9x + 7y > 140$	

Remember that a system of inequalities is a group of inequalities. Therefore, you will write more than one inequality to model this situation. In this problem,  $x$  represents the number of adult tickets sold and  $y$  represents the number of student tickets sold. You know that adult tickets are \$9 each and student tickets are \$7 each. You can represent this part of the problem with the expression:

$$9x + 7y$$

You also know that the goal is to achieve sales of more than \$140. So:

$$9x + 7y > 140$$

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 1 (continued)

Example 1	
$x$ number of adult tickets sold	Tickets for the school play are \$9 for each adult and \$7 for each student. There are 80 tickets available and the goal is to achieve sales of more than \$140.
$y$ number of student tickets sold	
\$9 cost of each adult ticket	Let $x$ represent the number of adult tickets sold and let $y$ represent the number of student tickets sold.
\$7 cost of each student ticket	
\$140 sales goal	Write a system of inequalities to model the situation.
80 tickets available	
$\begin{cases} 9x + 7y > 140 \\ x + y \leq 80 \end{cases}$	

Now you have written one inequality to represent part of the given information. In the problem, you are also informed that there are 80 tickets available for sale. So, the school can sell no more than 80 tickets. Therefore:

$$x + y \leq 80$$

Now, you have written the two inequalities necessary to complete the system:

$$\begin{cases} 9x + 7y > 140 \\ x + y \leq 80 \end{cases}$$

It is worth it mention that the inequalities in a system can be written in any order. If you were to switch the order that the inequalities were written, the system would still correctly model the situation.

$$\begin{cases} x + y \leq 80 \\ 9x + 7y > 140 \end{cases}$$

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2



#### Example 2

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

**Read through the problem above.  
Click to highlight important passages.**

Next

Now take a few moments to read through Example 2. Highlight the key information.

*The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.*

*Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.*

Read through the problem above. Click to highlight important passages.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



#### Example 2

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

Did you highlight these important facts?

- The sophomore class is selling hats for \$10 each and t-shirts for \$12 each
- The goal is to raise a minimum of \$480 from the sales of at least 100 items
- Determine a combination of hats and t-shirts that can be sold in order to reach the goal



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

$x$   
number of hats sold

$y$   
number of t-shirts sold

**\$10**  
cost of each hat

**\$12**  
cost of each t-shirt

$x$  +   $y$

**Example 2**

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

**Enter the correct values into the expression on the left. Then click submit.**

**Submit**

In order to determine a combination of hats and t-shirts that can be sold to reach the goal, you will need to begin by writing a system to model the situation. Then, you can use the graphing calculator to identify a solution.

You know that  $x$  represents the number of hats sold and  $y$  represents the number of t-shirts sold. You also know that the hats are sold for \$10 each and t-shirts for \$12 each. So you can model this part of the situation by using the expression:

$$?x + ?y$$

Enter the correct values into the expression on the left. Then click submit,

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

Example 2	
<p><math>x</math> number of hats sold</p> <p><math>y</math> number of t-shirts sold</p> <p><b>\$10</b> cost of each hat</p> <p><b>\$12</b> cost of each t-shirt</p> <p><math>10x + 12y</math></p> <p>The hats cost \$10 each and the t-shirts cost \$12 each. Therefore, the inequality above can be used to model this part of the situation.</p>	<p>The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.</p> <p>Let <math>x</math> represent the number of hats sold and <math>y</math> represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.</p>
<p>Next</p>	

The hats cost \$10 each and the t-shirts cost \$12 each. Therefore,  $10x + 12y$  can be used to model this part of the situation.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

Example 2 (continued)

$x$   
number of hats sold

$y$   
number of t-shirts sold

**\$10**  
cost of each hat

**\$12**  
cost of each t-shirt

$10x + 12y$  ? 480

$\geq$  $\leq$  $<$  $>$

**Example 2**

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

Complete the expression on the left by clicking the correct inequality sign.

**Submit**

You also know that the sophomore class hopes to achieve a minimum of \$480 in sales. Therefore?

$$10x + 12y \quad ? \quad 480$$

Complete the expression on the left by click the correct inequality sign.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

Example 2	
<p><math>x</math> number of hats sold</p> <p><math>y</math> number of t-shirts sold</p> <p><b>\$10</b> cost of each hat</p> <p><b>\$12</b> cost of each t-shirt</p> <p><math>10x + 12y \geq 480</math></p> <p>Because the sophomore class hopes to achieve sales of more than \$480, the inequality above can be used to represent this part of the situation.</p>	<p>The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.</p> <p>Let <math>x</math> represent the number of hats sold and <math>y</math> represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.</p> <p><b>Next</b></p>

Because the sophomore class hopes to achieve sales of more than \$480, the inequality  $10x + 12y \geq 480$  can be used to represent this part of the situation.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

You are also told that the sophomore class hopes to sell at least 100 items. Which of the following inequalities correctly models this part of the scenario?

- $x + y \leq 100$
- $x + y < 100$
- $x + y \geq 100$
- $x + y > 100$

#### Example 2

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

**Choose the inequality from the left that correctly models this part of the scenario.**

Submit

You are also told that the sophomore class hopes to sell at least 100 items. Which of the following inequalities correctly models this part of the scenario?

- A)  $x + y \leq 100$
- B)  $x + y < 100$
- C)  $x + y \geq 100$
- D)  $x + y > 100$

Choose the inequality from the left that correctly models this part of the scenario.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

You are also told that the sophomore class hopes to sell at least 100 items. Which of the following inequalities correctly models this part of the scenario?

$$x + y \geq 100$$

The sophomore class hopes to sell at least 100 items, or in other words, 100 items or more. Therefore, the inequality above can be used to model this part of the scenario.

#### Example 2

The sophomore class of a local high school is having a fundraiser for a class trip. Students are selling hats for \$10 each and t-shirts for \$12 each. The class hopes to raise a minimum of \$480 from the sales of at least 100 items.

Let  $x$  represent the number of hats sold and  $y$  represent the number of t-shirts sold. Determine a combination of hats and t-shirts that can be sold in order to reach the class goal.

Next

The sophomore class hopes to sell at 100 items, or in other words 100 items or more. Therefore,  $x + y \geq 100$  can be used to model this part of the scenario.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

**Example 2**

You now have the two inequalities that complete the system. Now solve each inequality for  $y$ , so that you can identify a solution using the graphing calculator.

$$\begin{cases} 10x + 12y \geq 480 \\ x + y \geq 100 \end{cases}$$

**Click each of the inequalities in the system above to view its solution.**

You now have the two inequalities that complete the system:

$$\begin{cases} 10x + 12y \geq 480 \\ x + y \geq 100 \end{cases}$$

Now solve each inequality for  $y$ , so that you can identify a solution using the graphing calculator.

Click each of the inequalities in the system above to view its solution.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

Example 2

You now have the two inequalities that complete the system. Now solve each inequality for  $y$ , so that you can identify a solution using the graphing calculator.

$$\begin{cases} 10x + 12y \geq 480 \\ x + y \geq 100 \end{cases}$$

Click each of the inequalities in the system above to view its solution.

$$\begin{aligned} 10x + 12y &\geq 480 \\ \underline{-10x} \quad \quad \underline{-10x} & \\ 12y &\geq \frac{-10x}{12} + \frac{480}{12} \\ y &\geq -\frac{10}{12}x + 40 \\ \hline y &\geq -\frac{5}{6}x + 40 \end{aligned}$$

$$10x + 12y \geq 480$$

$$\begin{array}{r} -10x \qquad \qquad -10x \\ \hline \end{array}$$

$$\frac{12y}{12} \geq \frac{-10x}{12} + \frac{480}{12}$$

$$y \geq -\frac{10}{12}x + 40$$

$$y \geq -\frac{5}{6}x + 40$$

Subtract  $10x$  from both sides.

Divide each term by 12.

$-\frac{10}{12}$  can be reduced to  $-\frac{5}{6}$

$$x + y \geq 100$$

$$\begin{array}{r} -x \qquad \qquad -x \\ \hline \end{array}$$

$$y \geq -x + 100$$

Subtract  $x$  from both sides.

After solving each inequality for  $y$ , the results are:

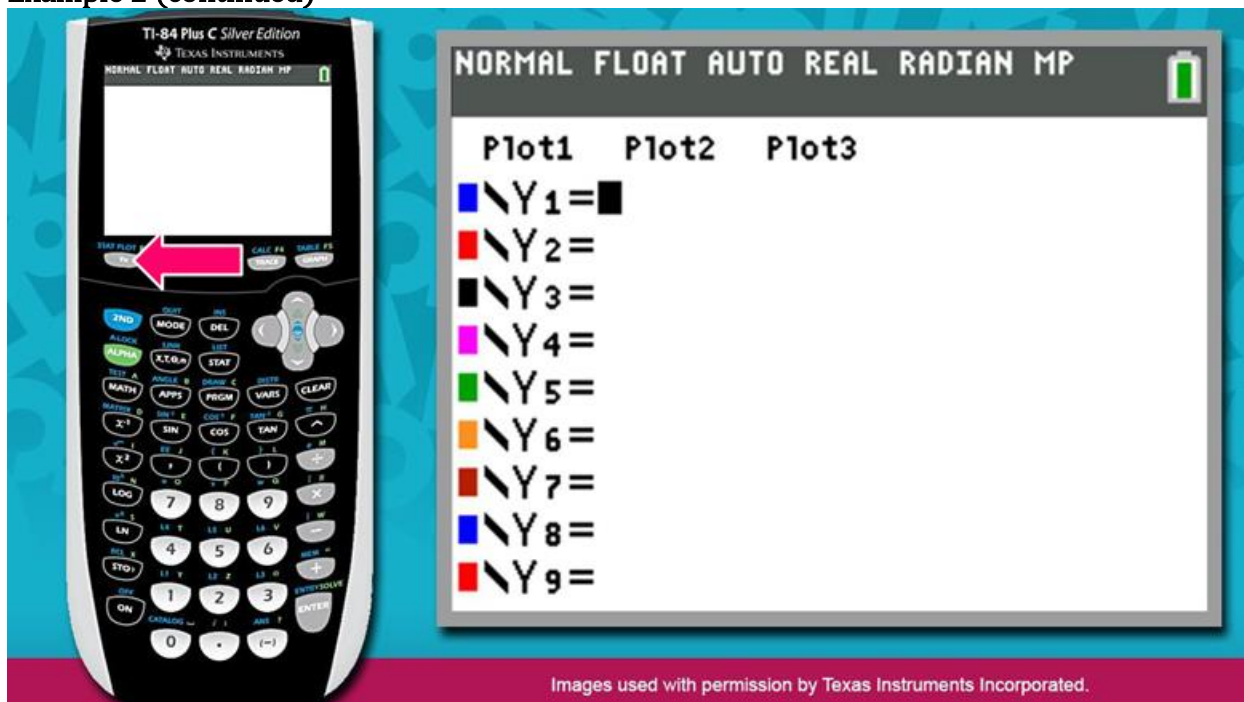
$$\begin{aligned} y &\geq -\frac{5}{6}x + 40 \\ y &\geq -x + 100 \end{aligned}$$



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



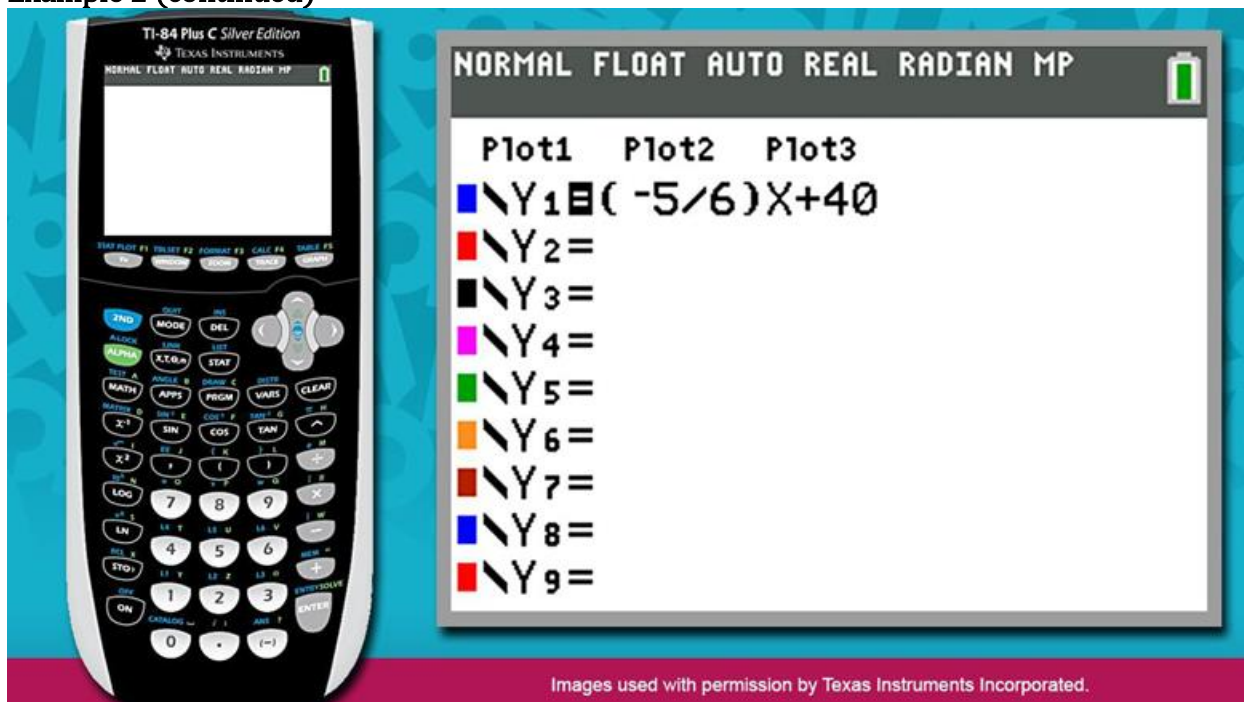
Now that you have solved each inequality for  $y$ , you can use the graphing calculator to identify a solution. Begin by clearing the calculator's memory.

Press  $Y=$

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

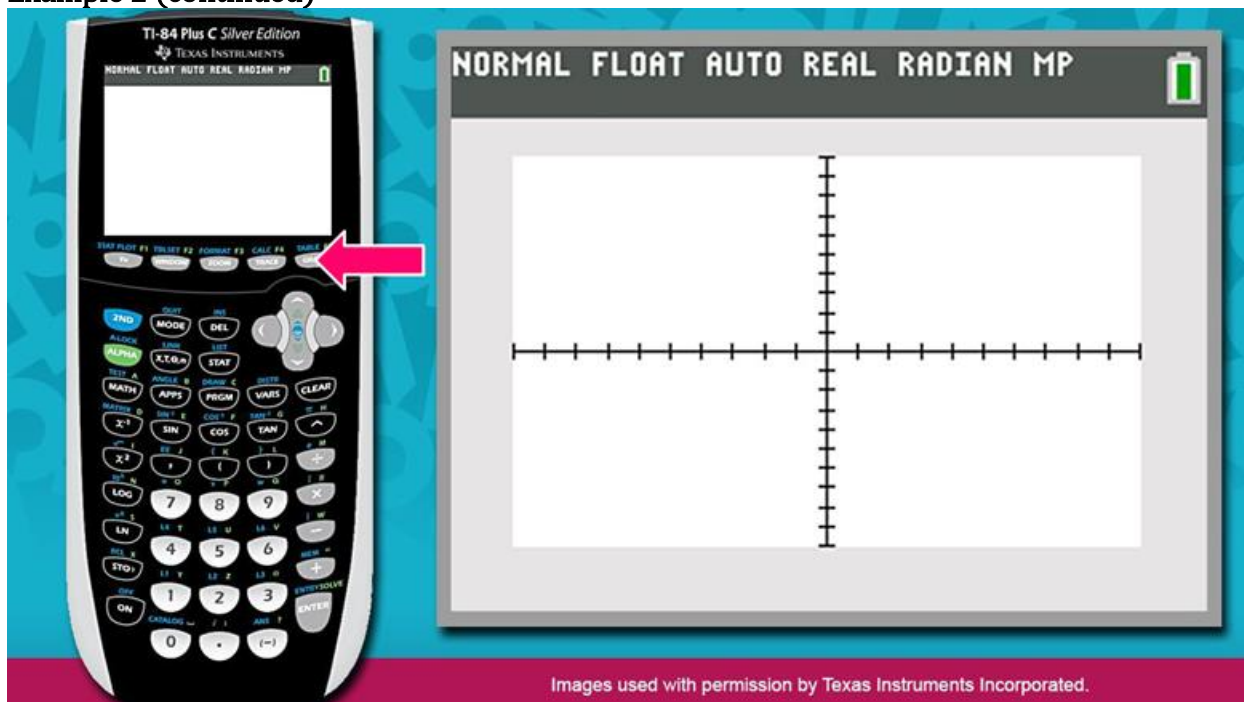


Now enter the right side of the first inequality to the right of  $Y_1$ . Remember when entering a fraction, you should use parentheses.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



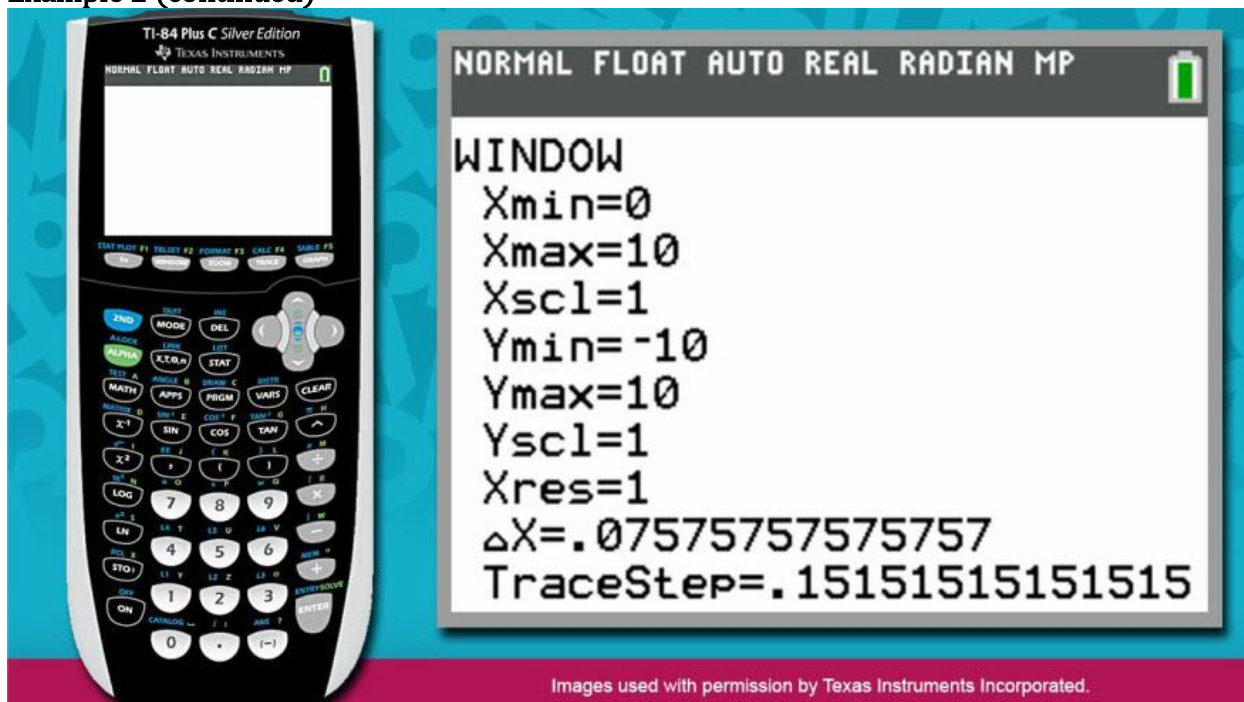
Press GRAPH

You will immediately notice that you don't see a line appear on the calculator's screen. This is a signal that the values along the  $x$ - and  $y$ -axes are not large enough for the line to appear. You will need to adjust the scale on the  $x$ - and  $y$ -axes. This is the time for you to consider what values of  $x$  and  $y$  make sense for this real-world scenario.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



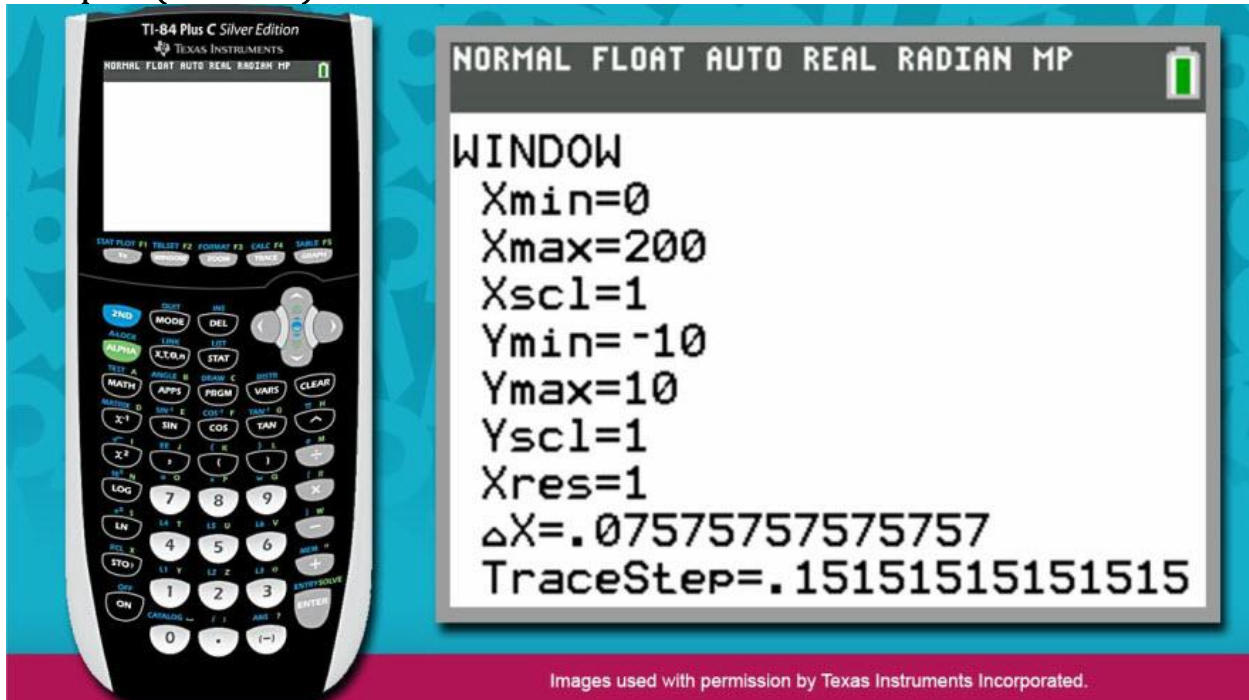
Press WINDOW

Because  $x$  represents the number of hats sold, negative  $x$ -values will not make sense. It is impossible to sell a negative number of hats. The smallest number of hats that can be sold is 0. So set the minimum  $x$ -value to 0.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

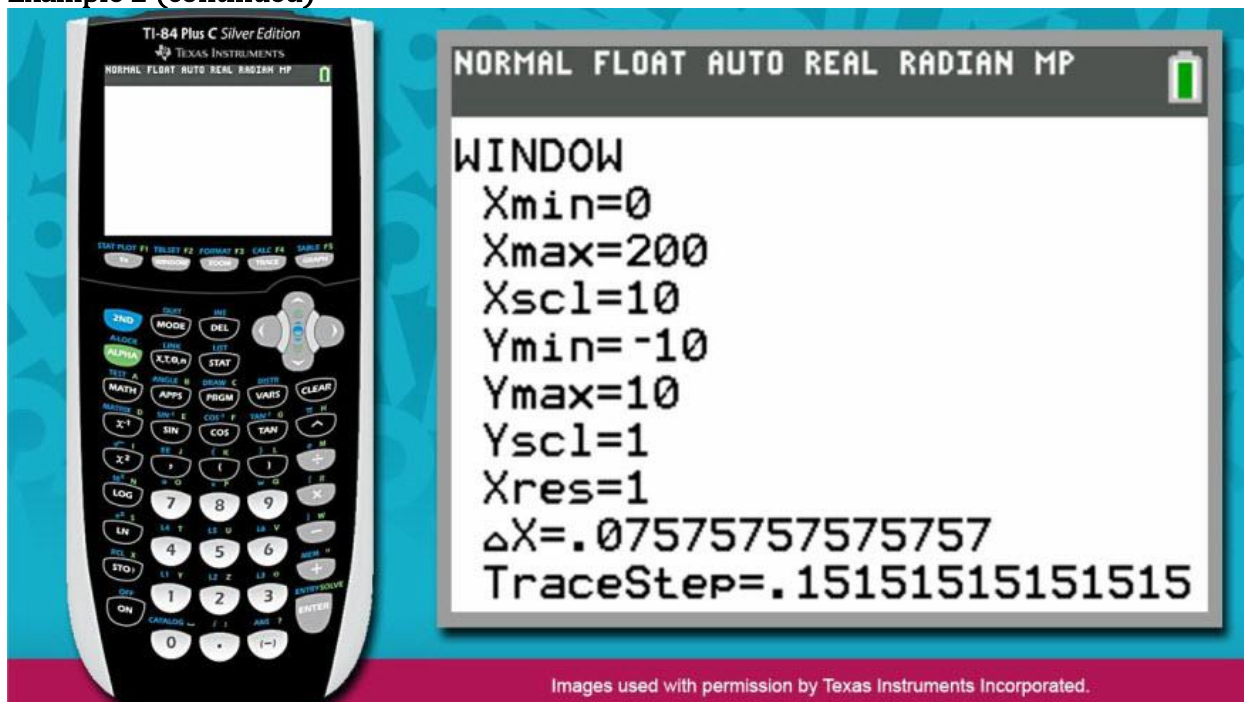


You aren't told how many hats, in total, are available for sale. So you can't be certain exactly what the maximum  $x$ -value should be. You will have to reason your way through this part, a little. You know that the goal is to sell at least 100 hats and t-shirts, in total. So set the  $x$ -max to a value more than 100; say 200. If you notice that this value is too small or too large, you can change it later.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

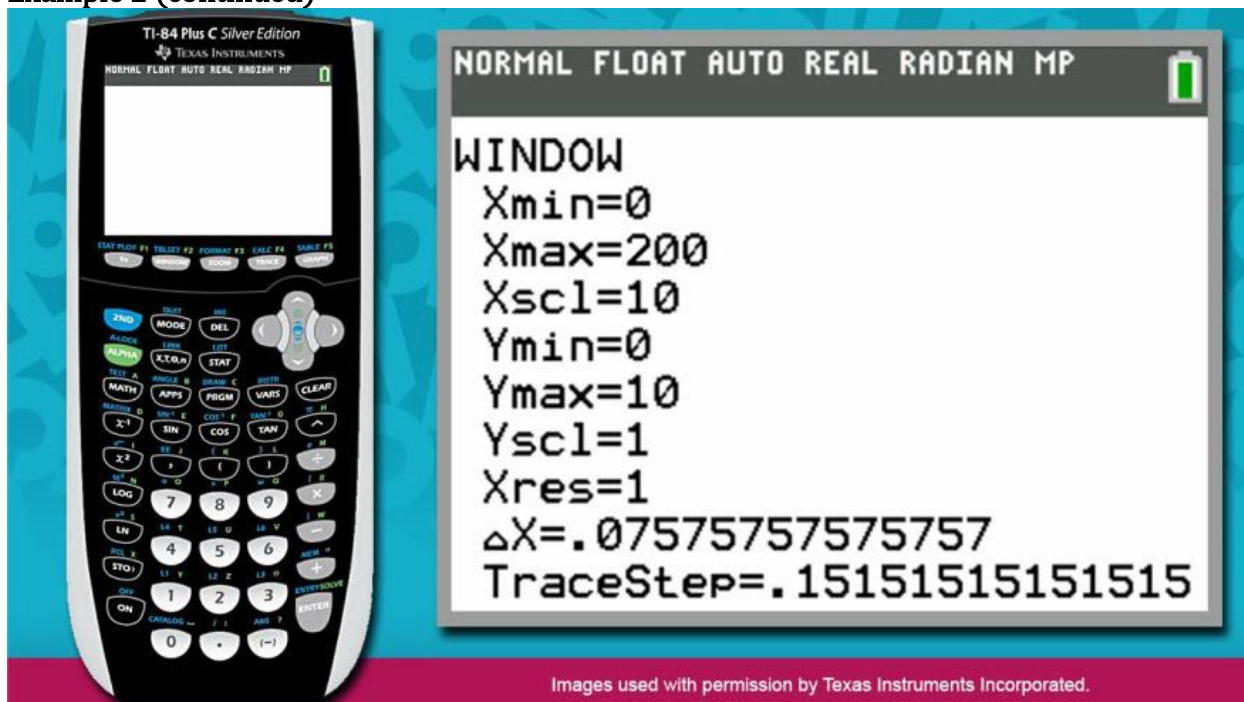


Because the  $x$ -min is set to 0 and the  $x$ -max is set to 200, it is appropriate to increase the  $x$ -scale, so that you will have a good view of the line once it is graphed. Change the  $x$ -scale from 1 to 10. Now, there will be 10 units between consecutive tick marks along the  $x$ -axis.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

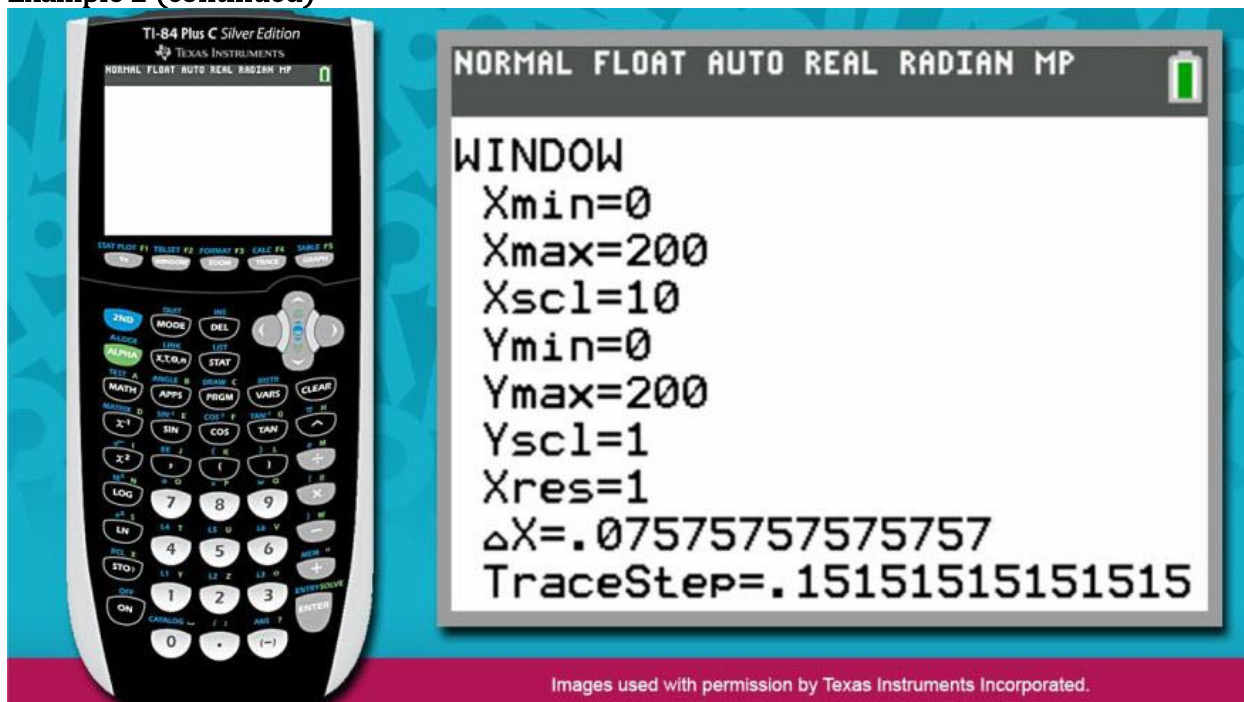


Now move on to adjust the values on the y-axis. Because  $y$  represents the number of t-shirts sold, negative  $y$ -values will not make sense. It is impossible to sell a negative number of t-shirts. The smallest number of t-shirts that can be sold is 0. So set the  $y$ -min to 0.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



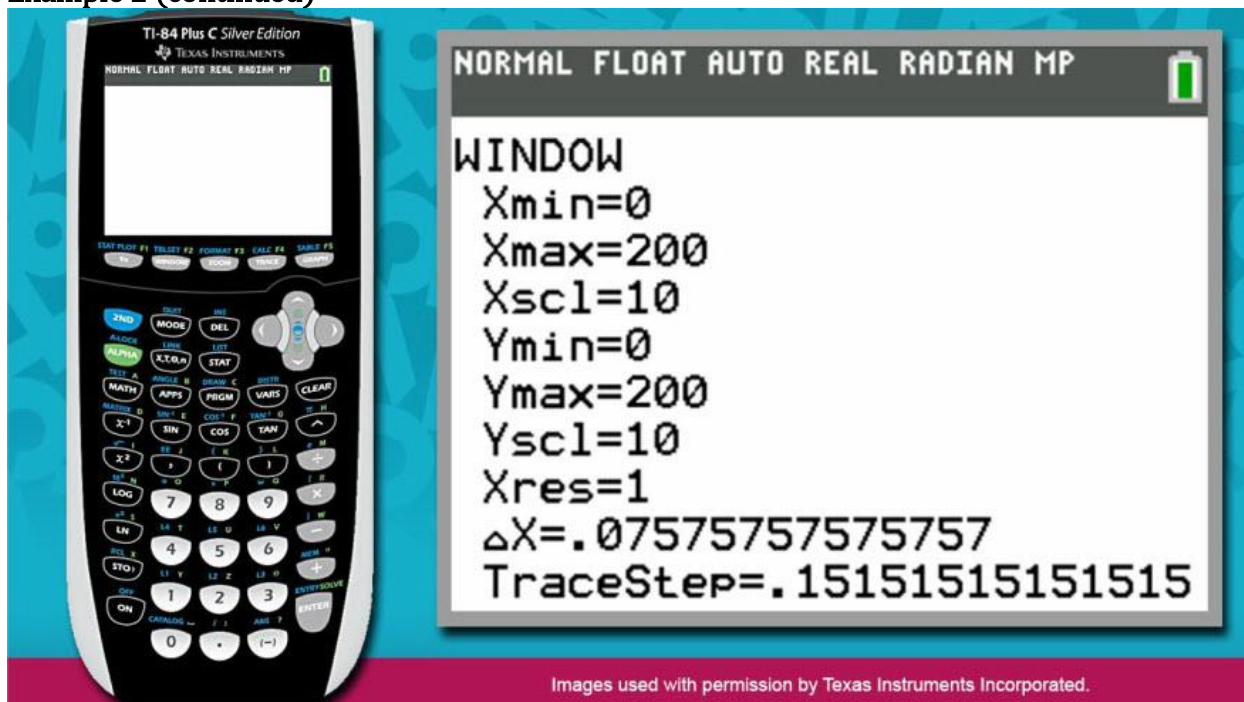
You aren't told how many t-shirts, in total, are available for sale. So you can't be certain exactly what the maximum  $y$ -value should be. You do know, however, that the goal is to sell at least 100 hats and t-shirts, in total. So set the  $y$ -max to a value more than 100; say 200. If you notice that this value is too small or too large, you can change it later.



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



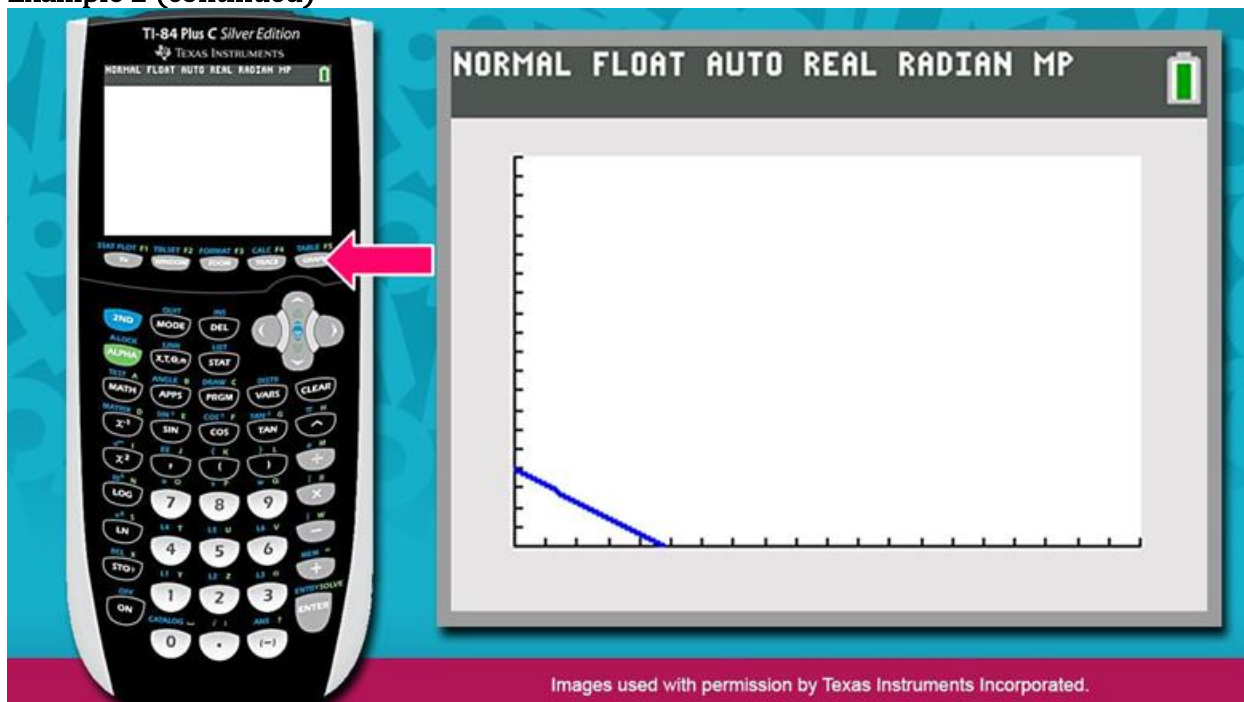
Because the y-min is set to 0 and the y-max is set to 200, it is appropriate to increase the y-scale, so that you will have a good view of the line once it is graphed. Change the y-scale from 1 to 10. Now, the y-axis will count off by tens, just as the x-axis.

Leave the remaining values as they are.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



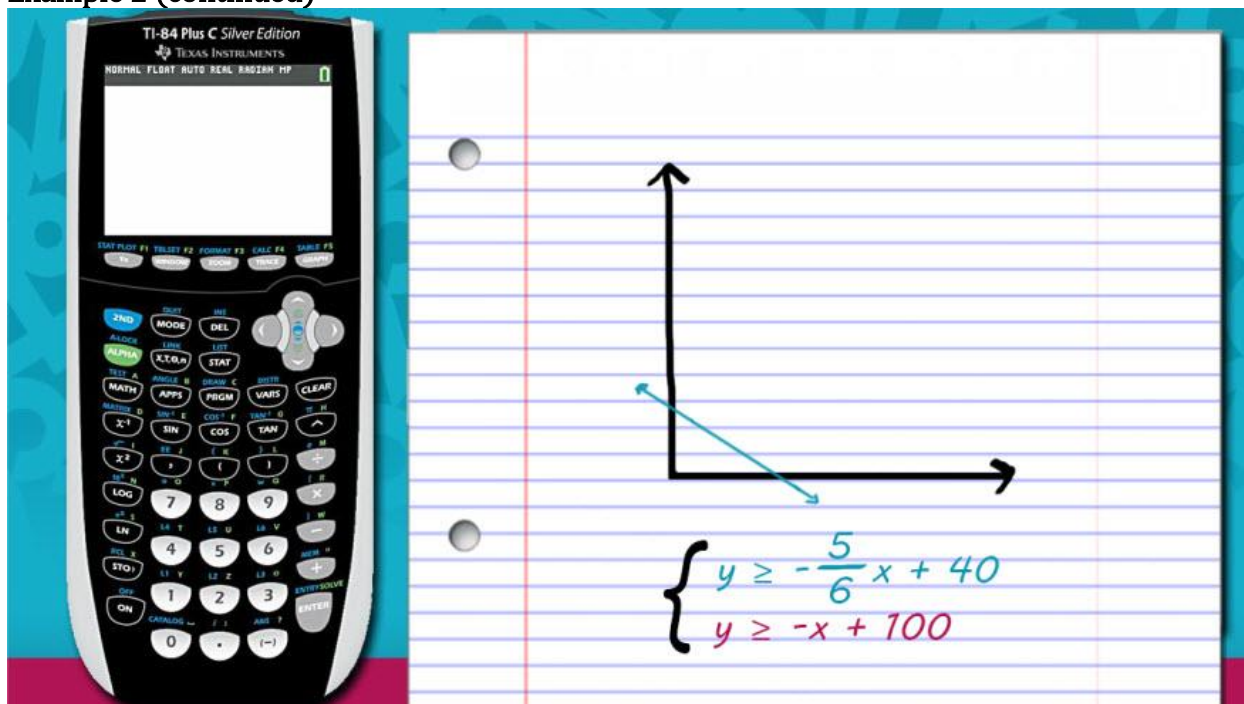
Press GRAPH

Notice that the calculator only shows the portion of the line included in the first quadrant. The minimum  $x$ -value is 0 and the maximum  $x$ -value is 200. The  $x$ -axis counts off by tens, beginning at 0 and ending at 200. The same pattern is true of the values along the  $y$ -axis.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

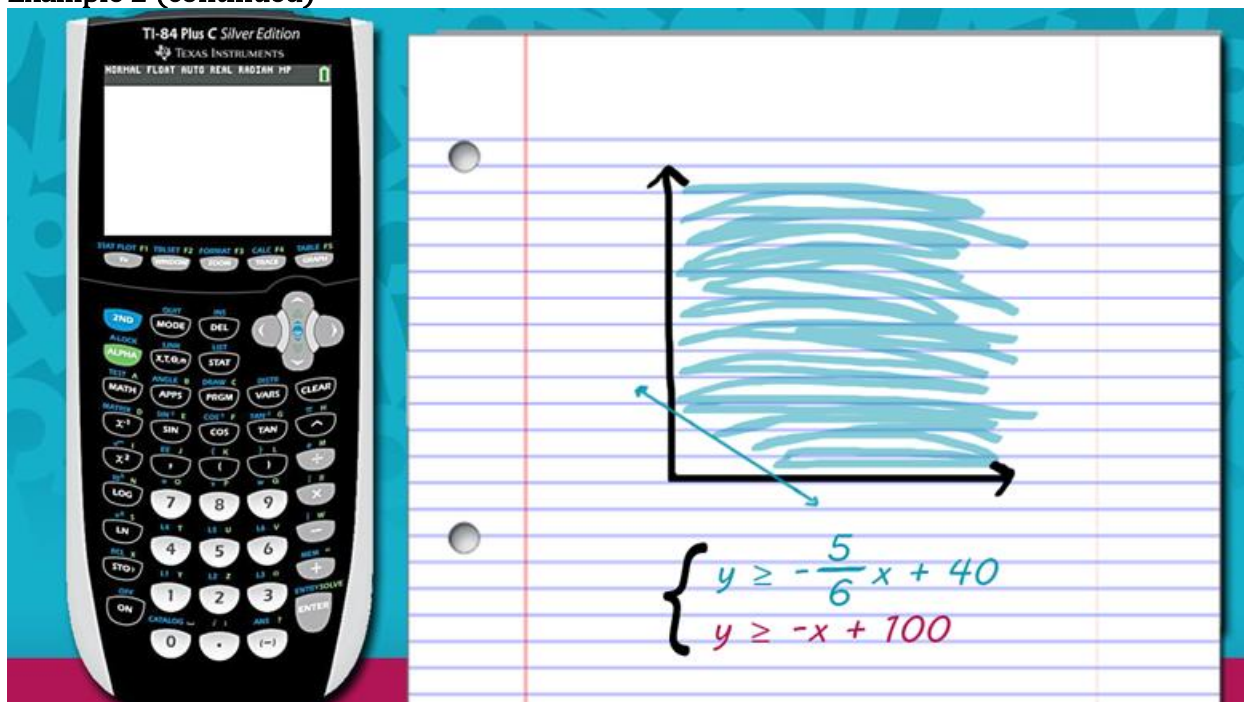


On a piece of paper, prepare a rough sketch of the graph. When roughly sketching a system of inequalities, you may find it helpful to use a different colored pencil for each inequality. Remember that the inequality  $y \geq -\frac{5}{6}x + 40$  is a non-strict inequality. So your rough sketch should include a solid boundary line.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

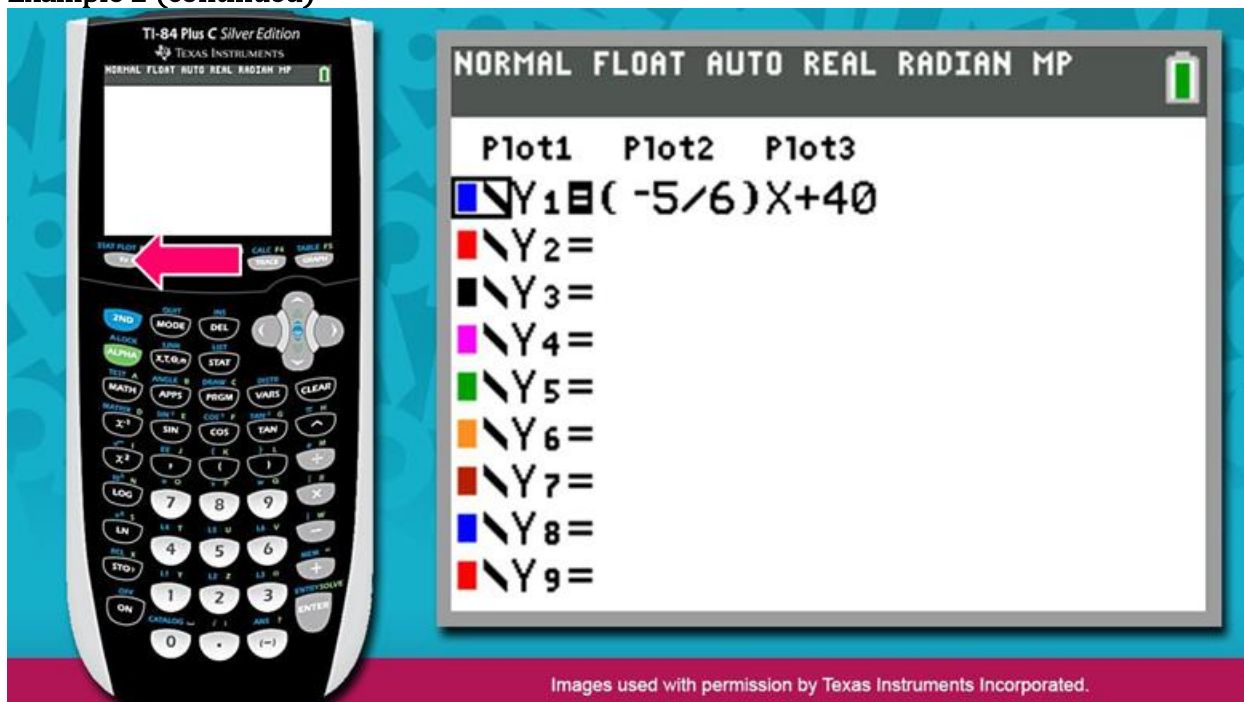


Now that you have roughly sketched the boundary line, you can move on to handle the shading. Because the inequality includes,  $\geq$ , you will need to shade above the boundary line. On your rough sketch, shade the region above the boundary line.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



To include the shading on the calculator, press the following keys:

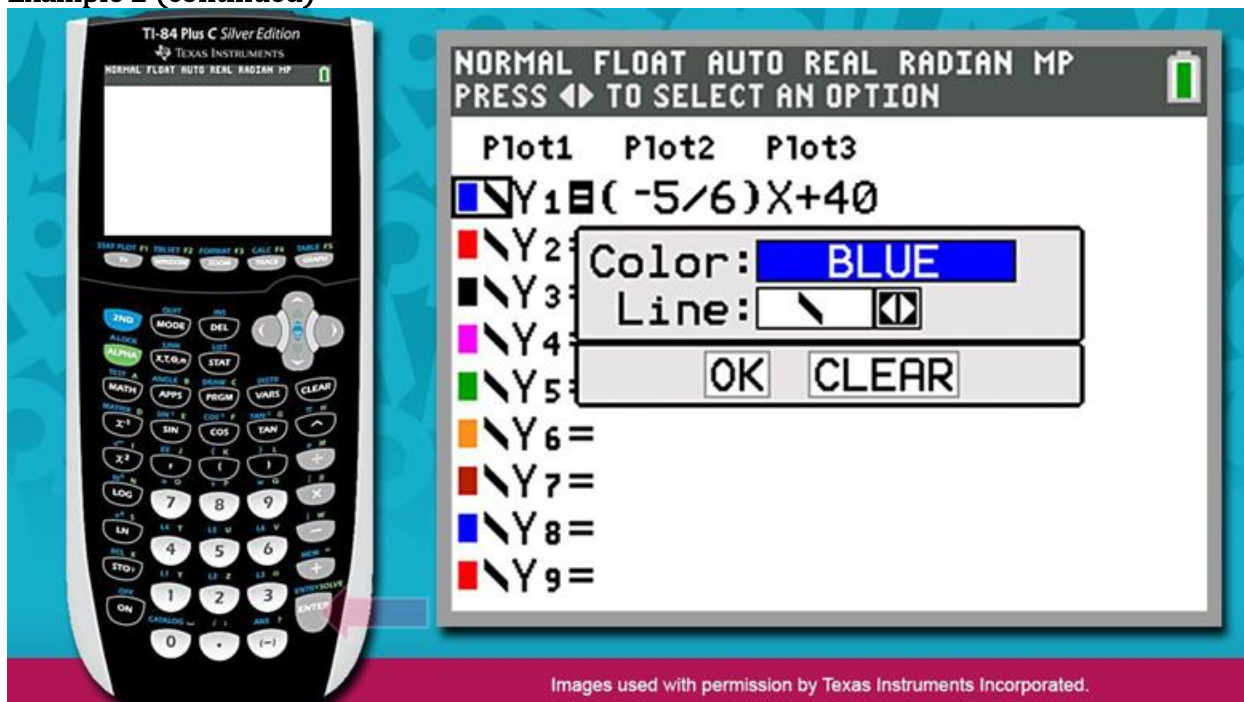
Press  $\text{Y=}$

Then press the left arrow until the cursor is blinking on the line beside  $\text{Y}_1$ .

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



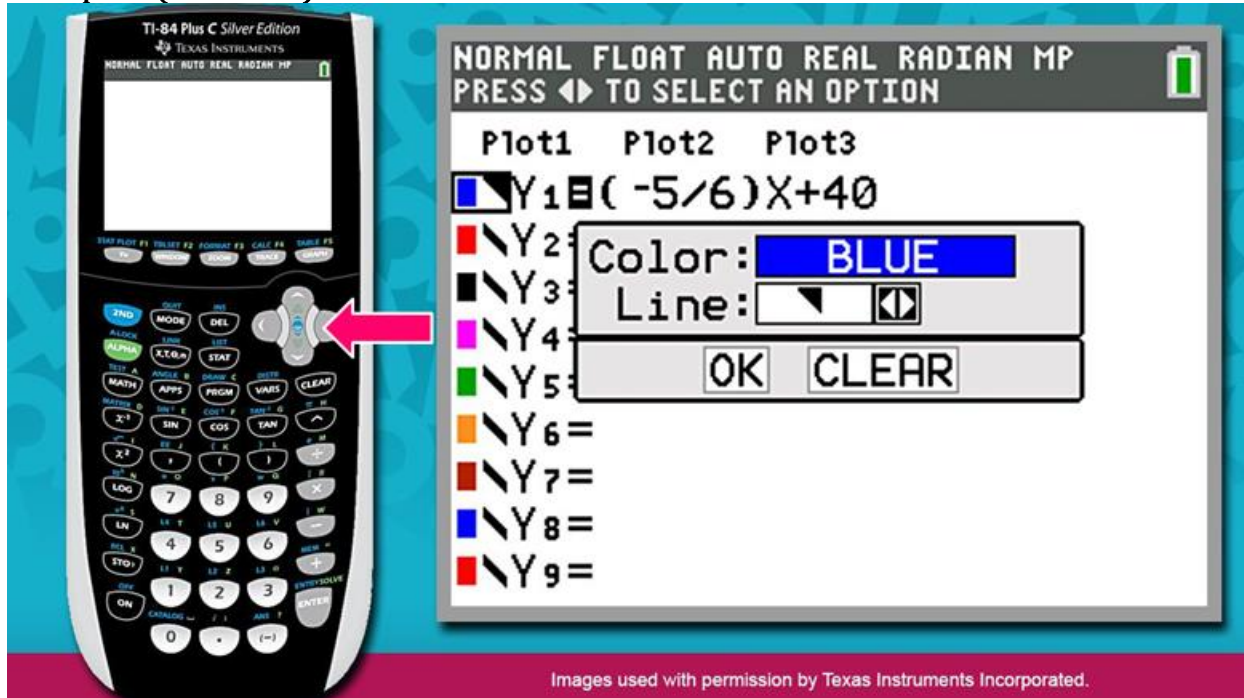
Press enter

Then press the down arrow until the cursor is blinking beside the “Line” prompt.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



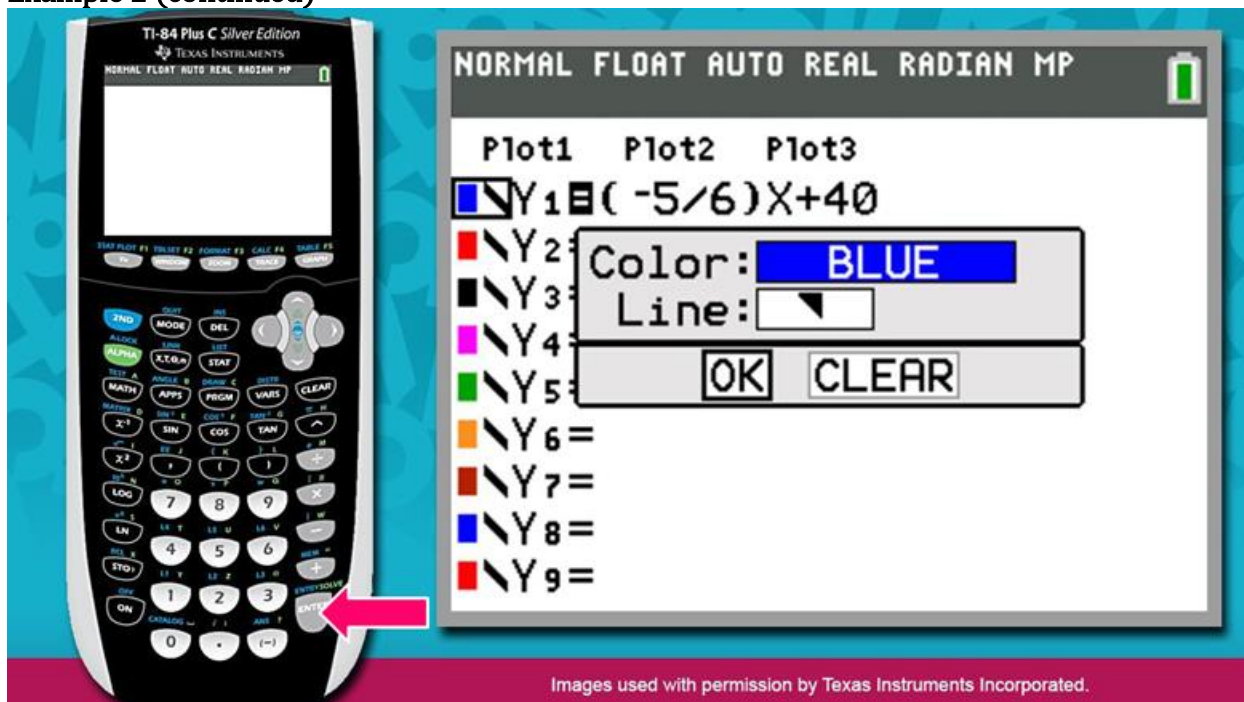
Press the right arrow until the option for shading above the line appears.

Press enter to select the shading option.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



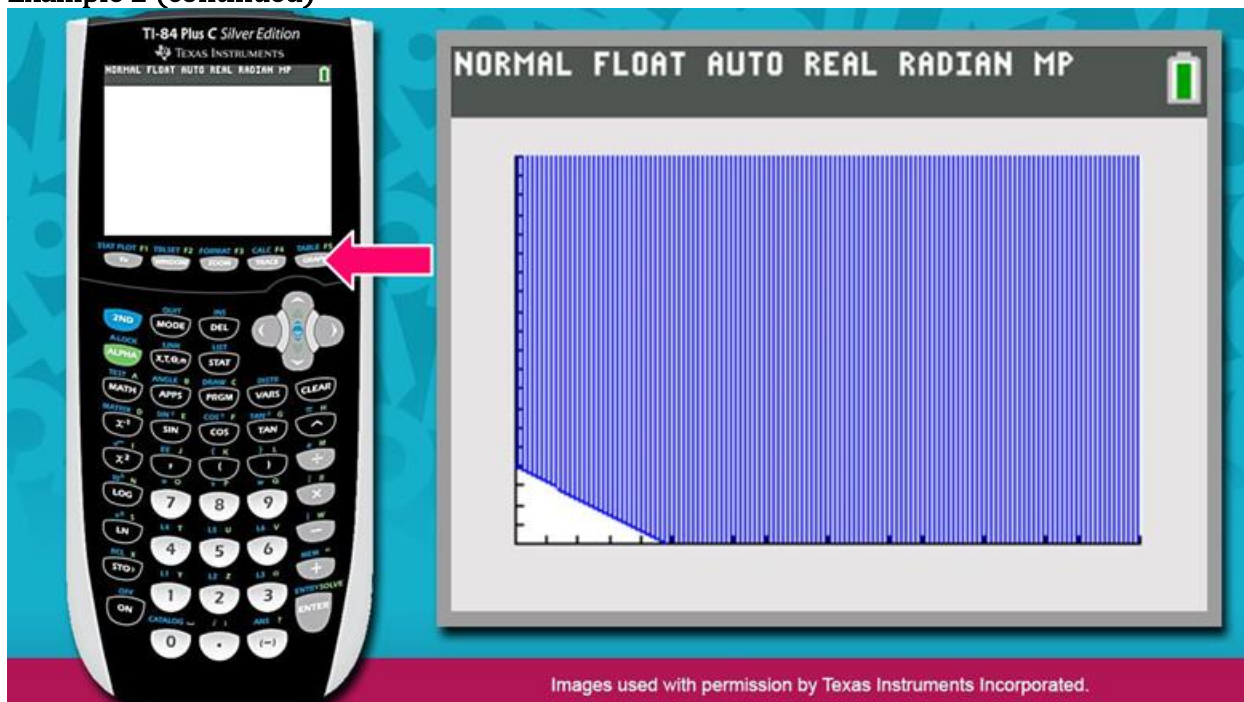
Then press enter again once the cursor moves to OK



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



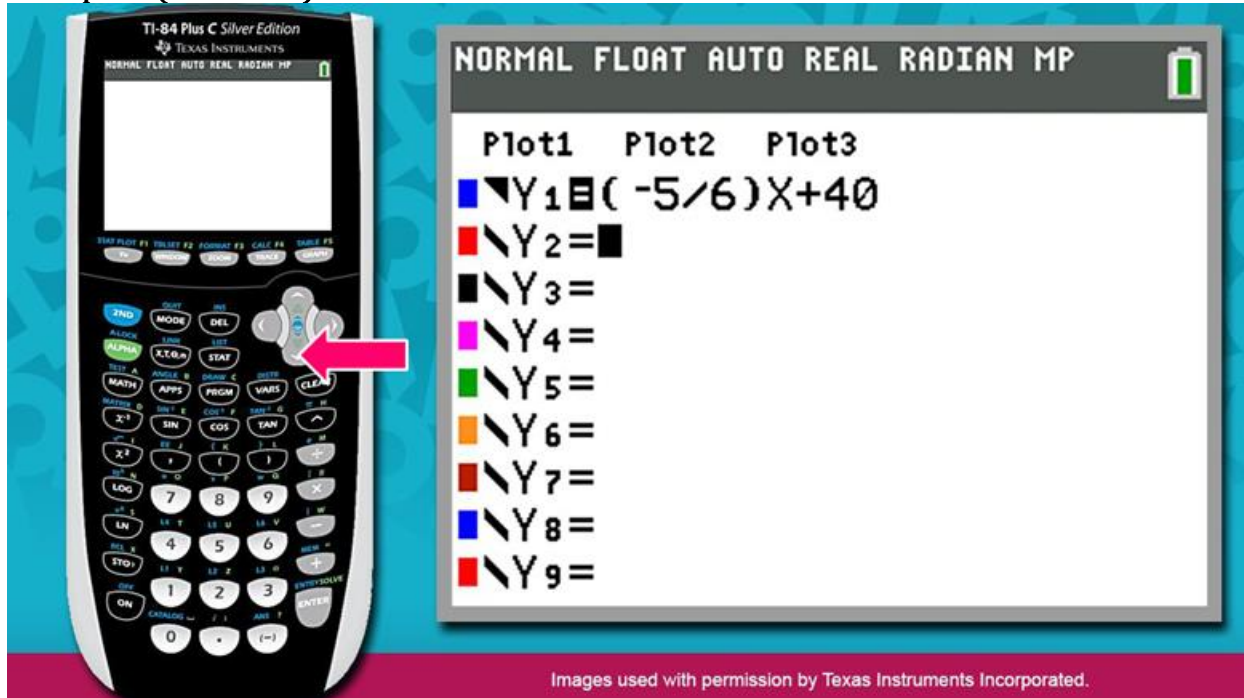
Now press GRAPH.

The graph of the first inequality will appear with the appropriate shading.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



Now that you have graphed the first inequality, it is time to graph the second one,  $y \geq -x + 100$ . You'll begin by first viewing its boundary line.

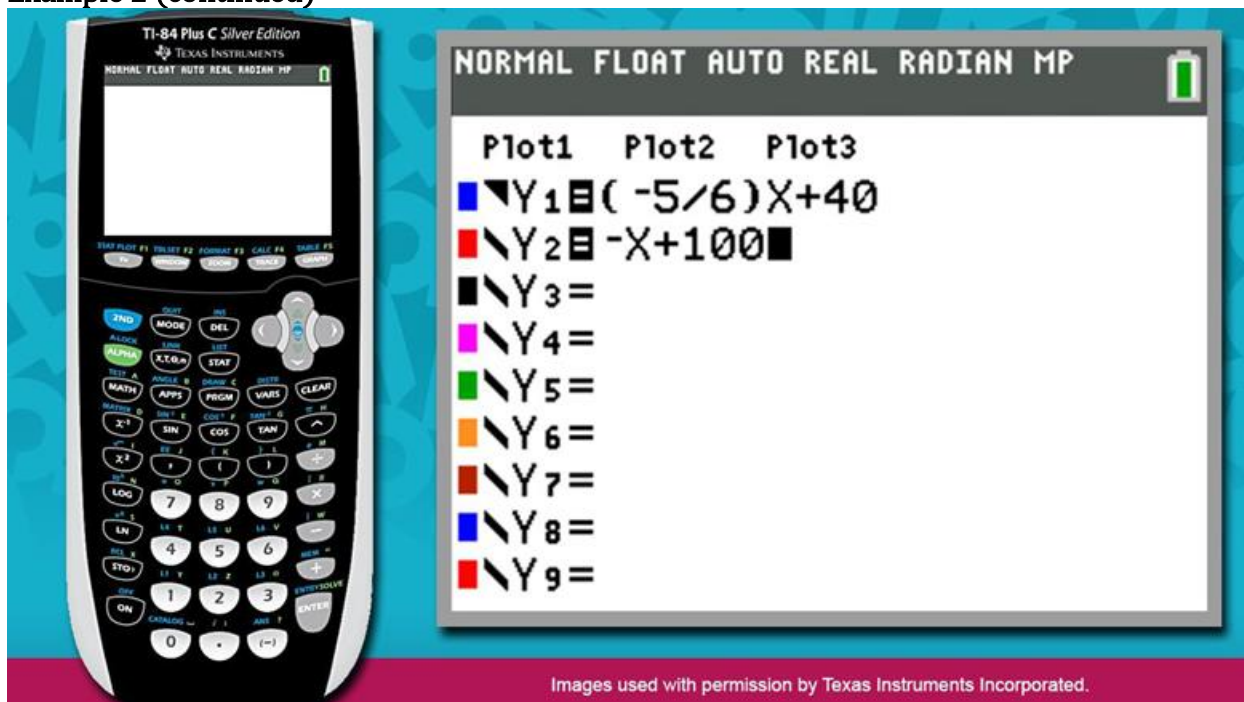
Press  $Y=$

Then press the down arrow so that the cursor is blinking to the right of  $Y_2$ .

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and its display screen on the right. The display screen is in the Y= editor mode, showing the following equations:

NORMAL FLOAT AUTO REAL RADIAN MP

Plot	Equation
Plot1	$Y_1 = (-5/6)X + 40$
Plot2	$Y_2 = -X + 100$
Plot3	$Y_3 =$
Plot4	$Y_4 =$
Plot5	$Y_5 =$
Plot6	$Y_6 =$
Plot7	$Y_7 =$
Plot8	$Y_8 =$
Plot9	$Y_9 =$

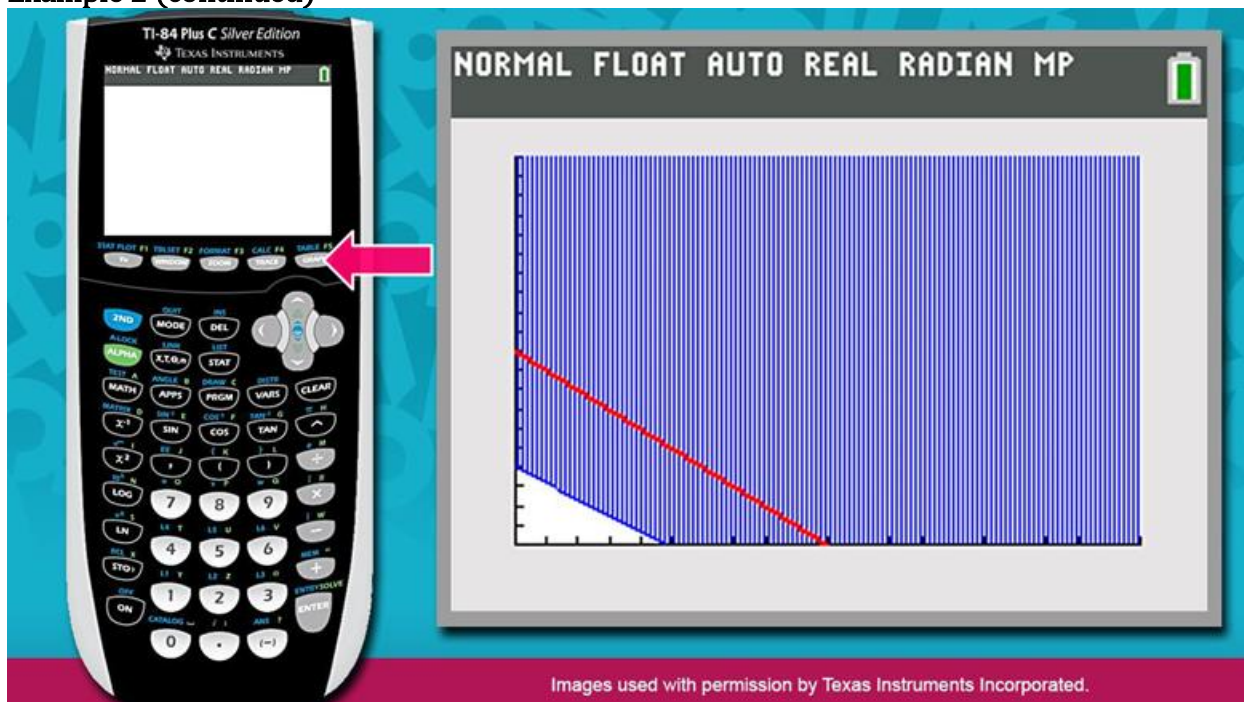
Images used with permission by Texas Instruments Incorporated.

Enter the right side of second inequality to the right of Y2.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

Example 2 (continued)

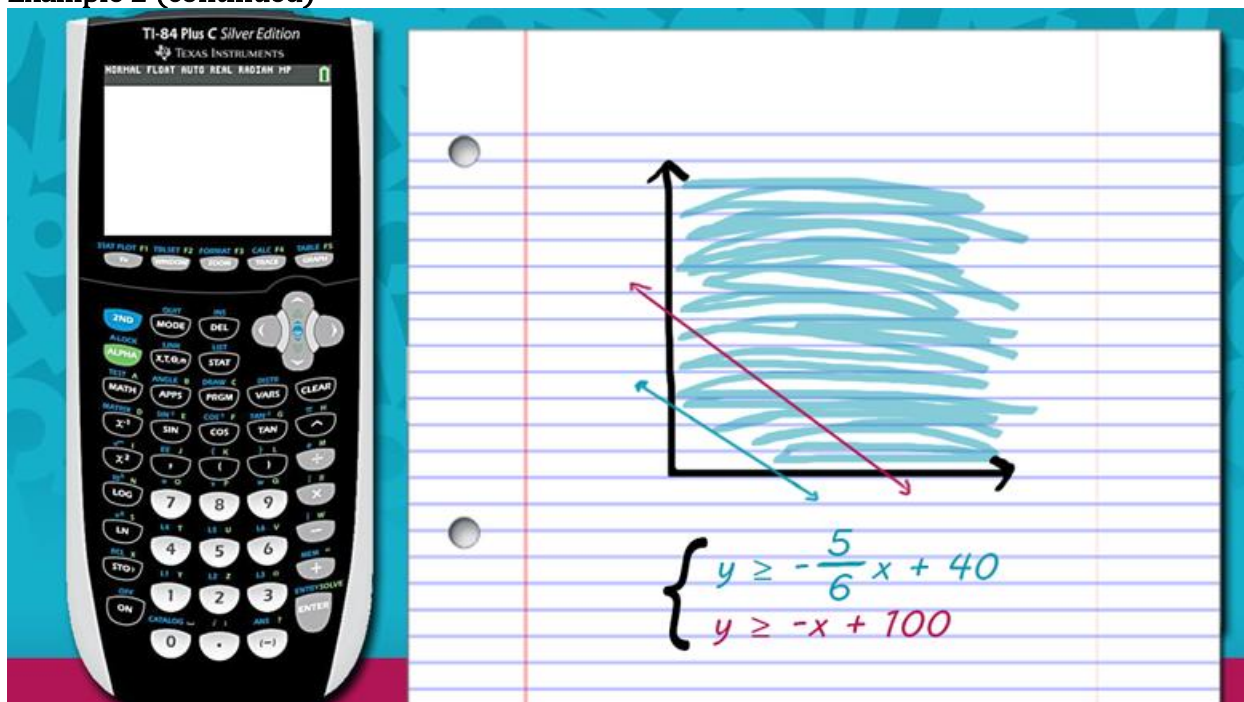


Now press GRAPH.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

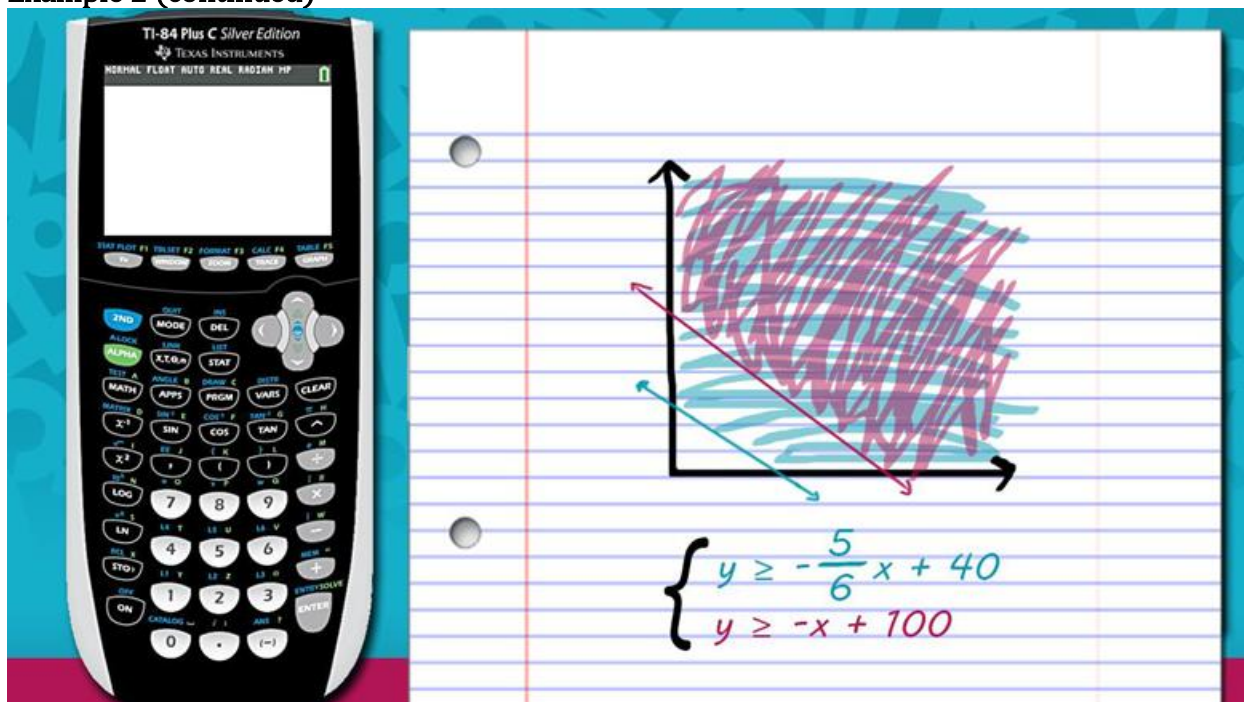


On your rough sketch, include the boundary line of the second inequality. The inequality,  $y \geq -x + 100$ , is a non-strict inequality, so you should include a solid boundary line. Also, make sure to use a different colored pencil when sketching this time, so that you will be able to differentiate between the two inequalities.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

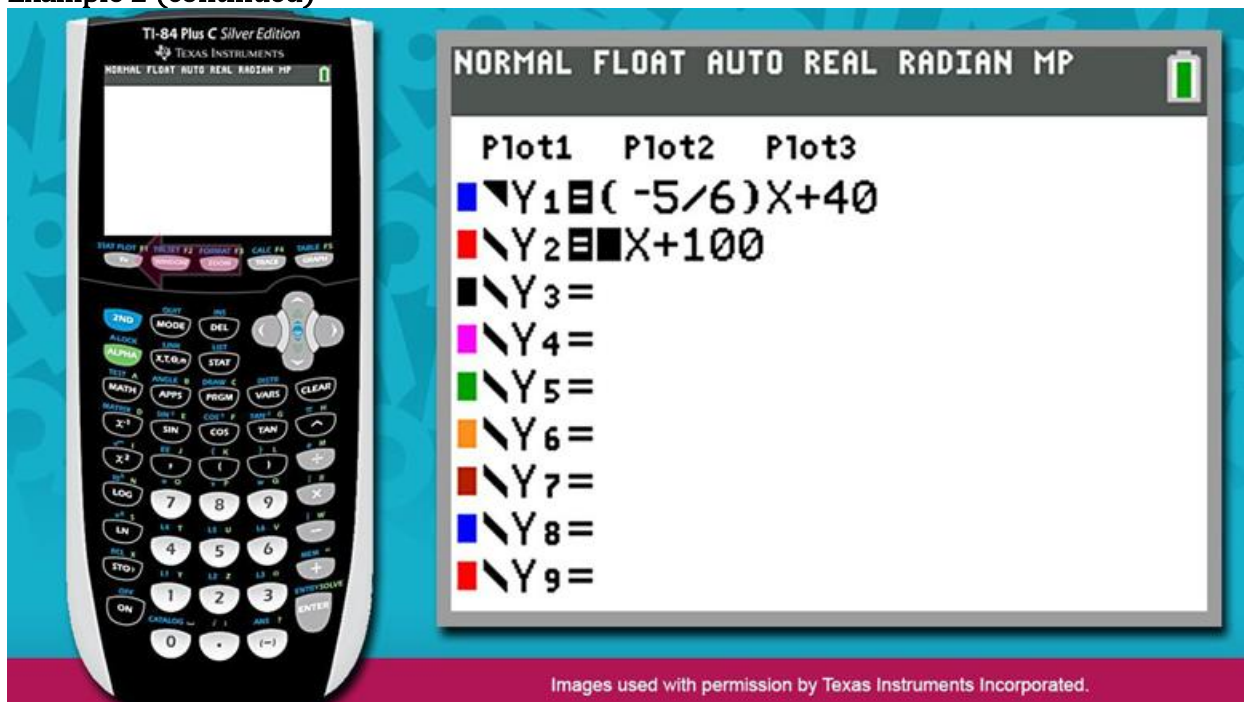


It's time to move on to the shading. The inequality,  $y \geq -x + 100$ , includes  $\geq$ . So, you will need to shade above the boundary line. On your rough sketch, shade above the boundary line of the second inequality. You'll notice that the shaded regions overlap.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



To view the shading on the graphing calculator:

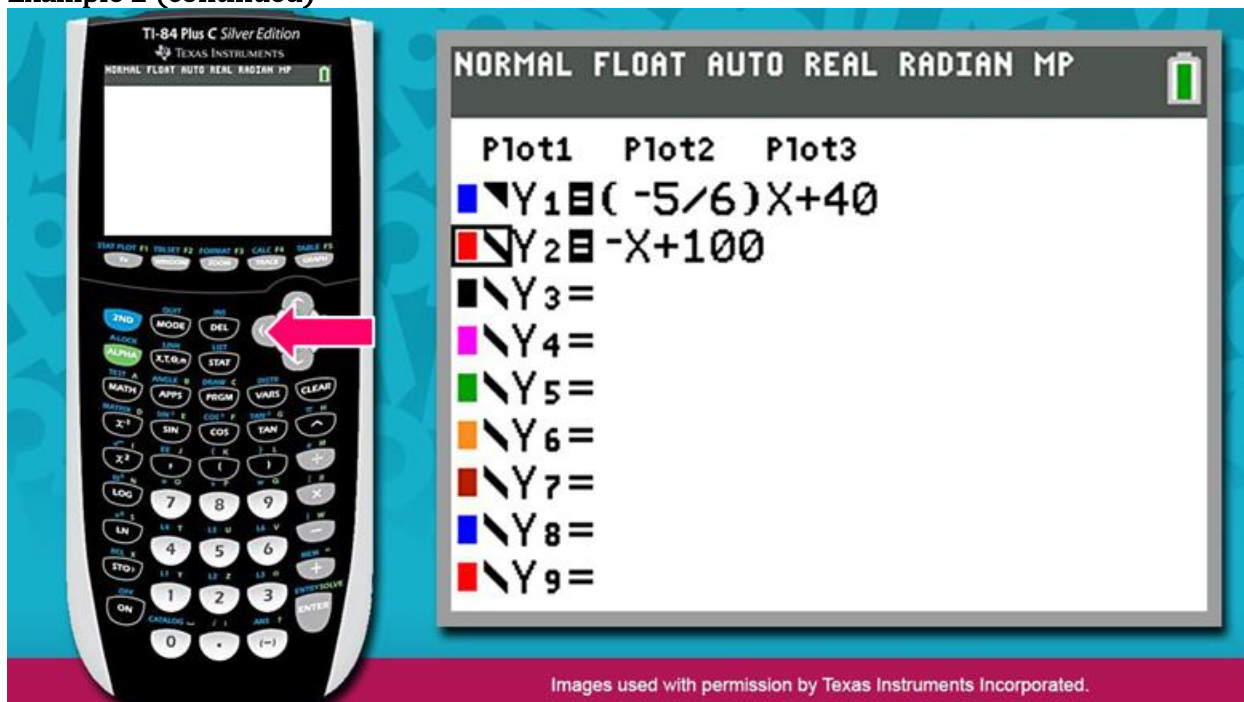
Press  $Y=$

Then press the down arrow until the cursor is blinking to the right of  $Y_2$ .

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and its screen on the right. The screen displays the Y= editor with the following content:

NORMAL FLOAT AUTO REAL Radian MP

Plot	Equation
Plot1	$Y_1 = (-5/6)X + 40$
Plot2	$Y_2 = -X + 100$
Plot3	$Y_3 =$
Plot4	$Y_4 =$
Plot5	$Y_5 =$
Plot6	$Y_6 =$
Plot7	$Y_7 =$
Plot8	$Y_8 =$
Plot9	$Y_9 =$

A pink arrow points to the left arrow key on the calculator's keypad, which is used to move the cursor to the left of the equation in the Y= editor.

Images used with permission by Texas Instruments Incorporated.

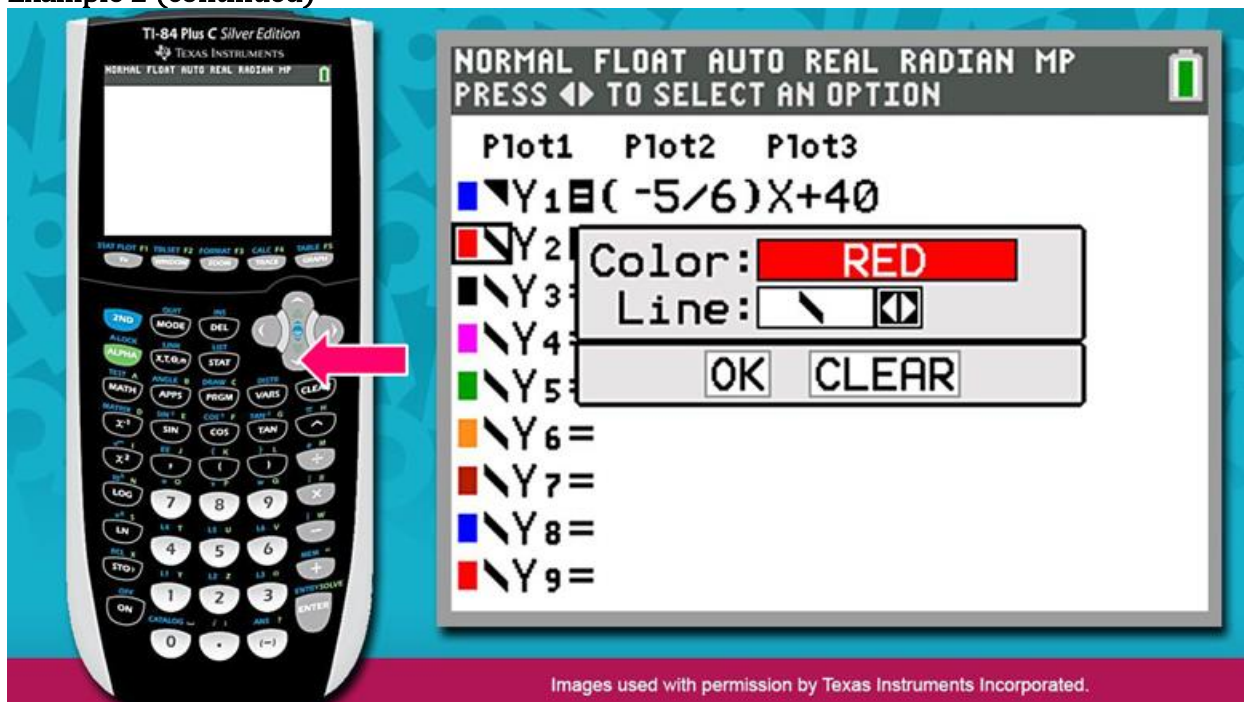
Now press the left arrow until the cursor is blinking to the left of  $Y_2$ .



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



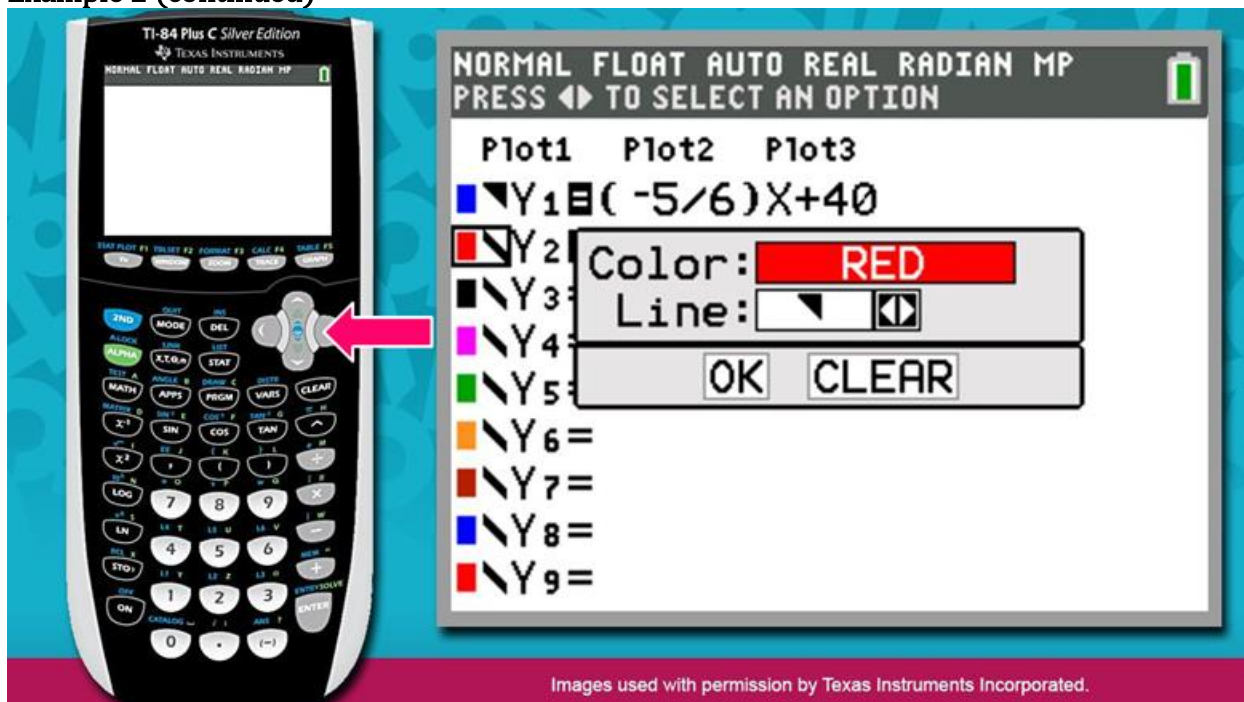
Press ENTER

Then press the down arrow so that the cursor is blinking beside the “Line” prompt.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



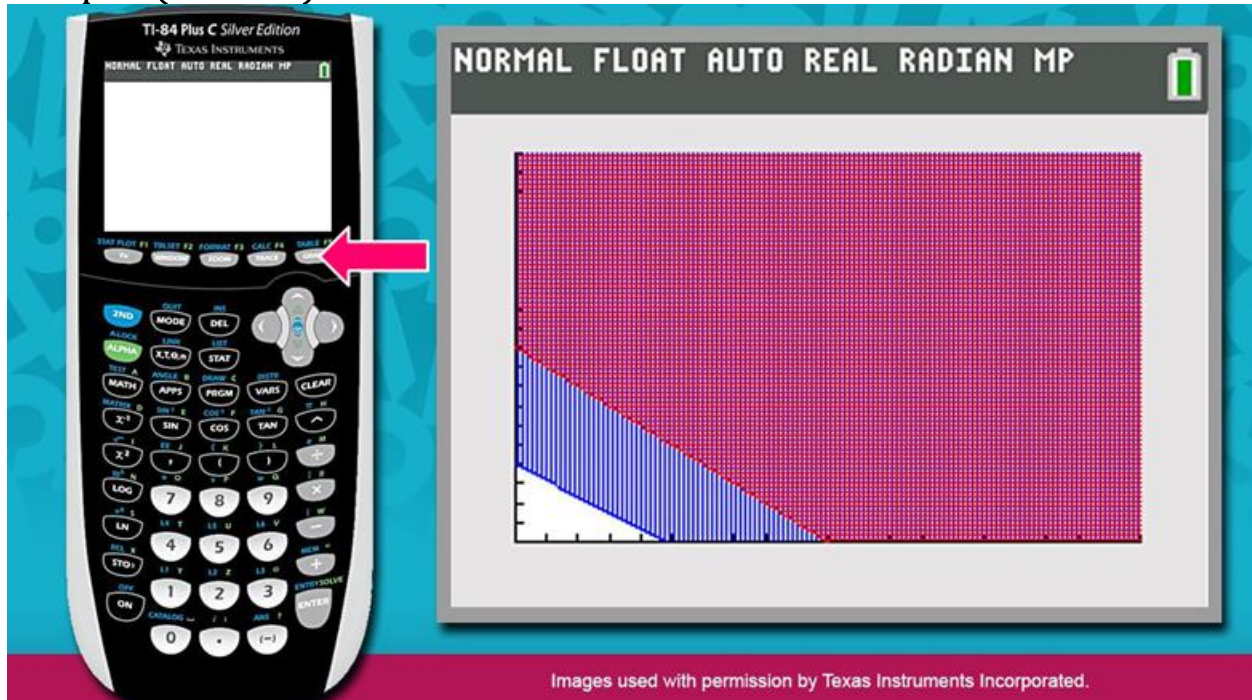
Press the right arrow until the option for shading above the line appears.

Press enter to select the shading option.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



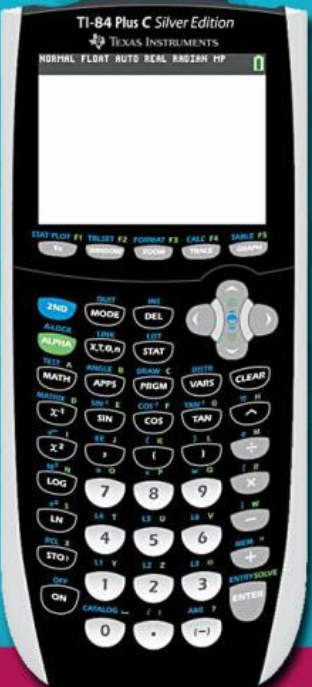
Press enter again once the cursor moves to OK.

Now press GRAPH.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator. The screen is blank, and the calculator is set to the MODE menu. The background is a teal and blue pattern.

**Solutions to a system of inequalities are found in two areas:**

1. at the intersection of solid lines; and
2. in the overlap of the shaded regions.

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Now that you have graphed the system of inequalities in the calculator, with the appropriate shading, you are ready to identify a solution. Recall that solutions to a system of inequalities are found in two areas:

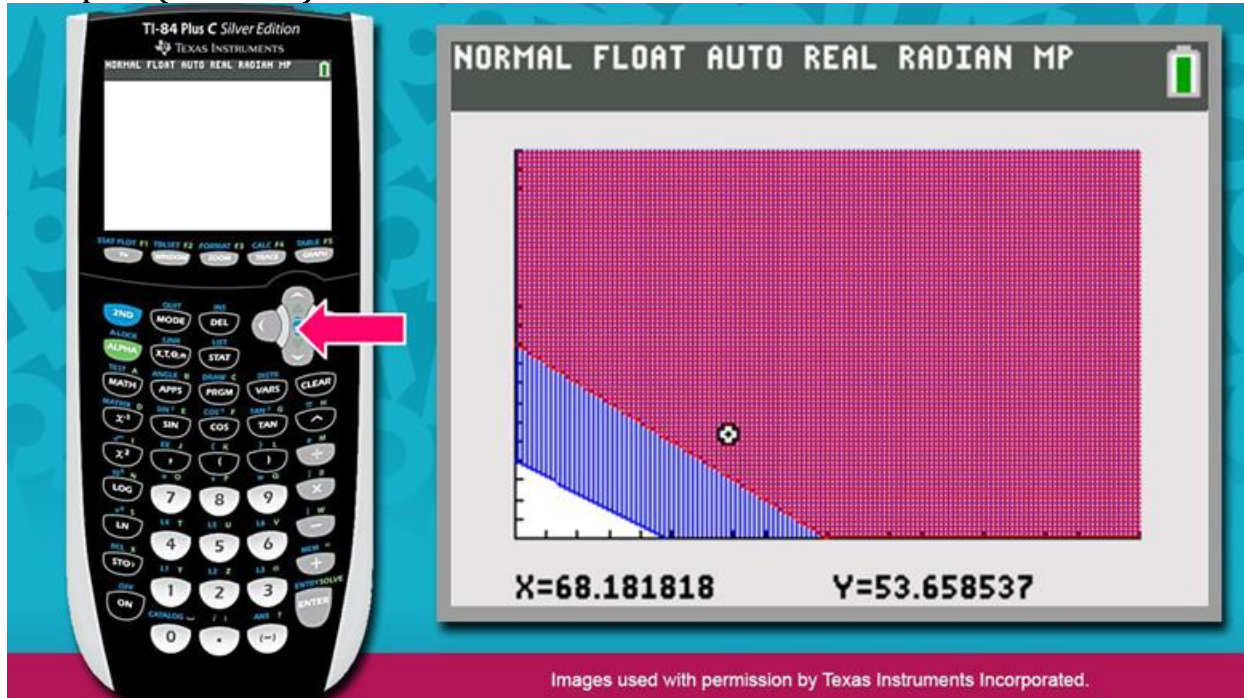
1. at the intersection of solid lines; and
2. in the overlap of the shaded regions.

The inequalities in this system each include a solid boundary line; however, the lines do not intersect. Solutions for this system will only be found in the overlap of the shaded regions.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



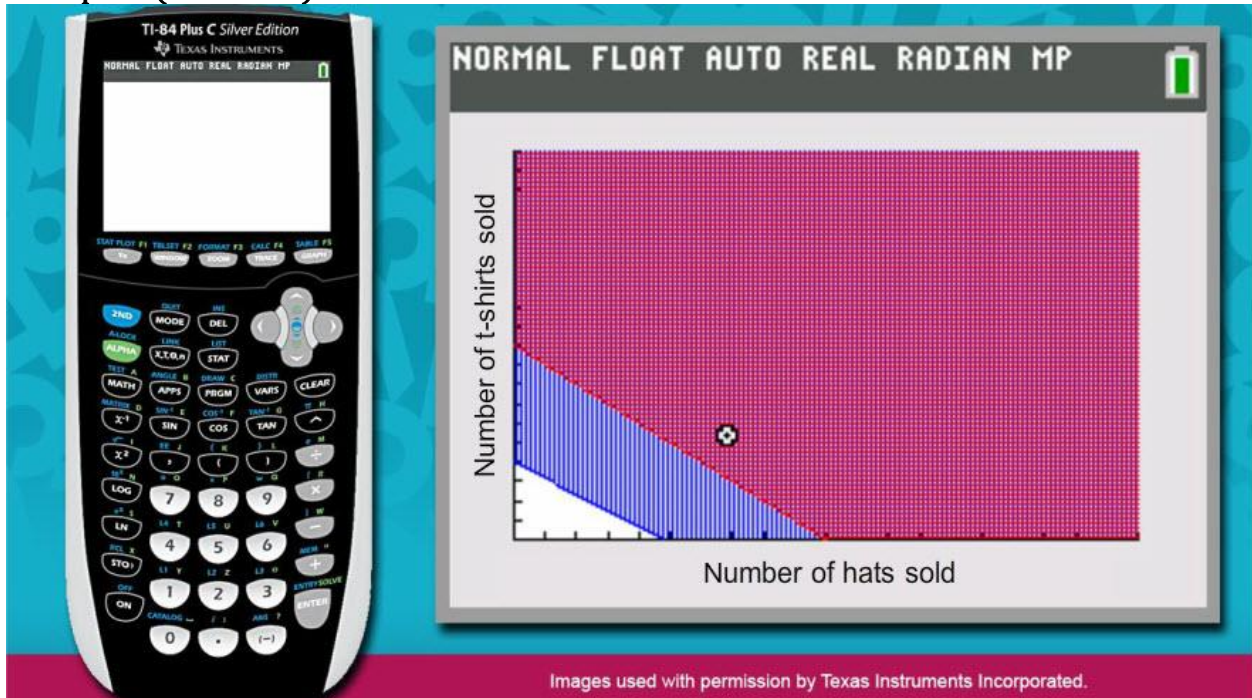
Press the right, left, up, and down arrow keys in order to locate points included in the overlap of the shaded regions

As you press the arrow keys to move around the shaded area, you will notice that the cursor will most likely move to points that include decimal values. Because you are searching for points that are appropriate for this real-world situation, you must determine if decimal values are appropriate for  $x$  and  $y$ .

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

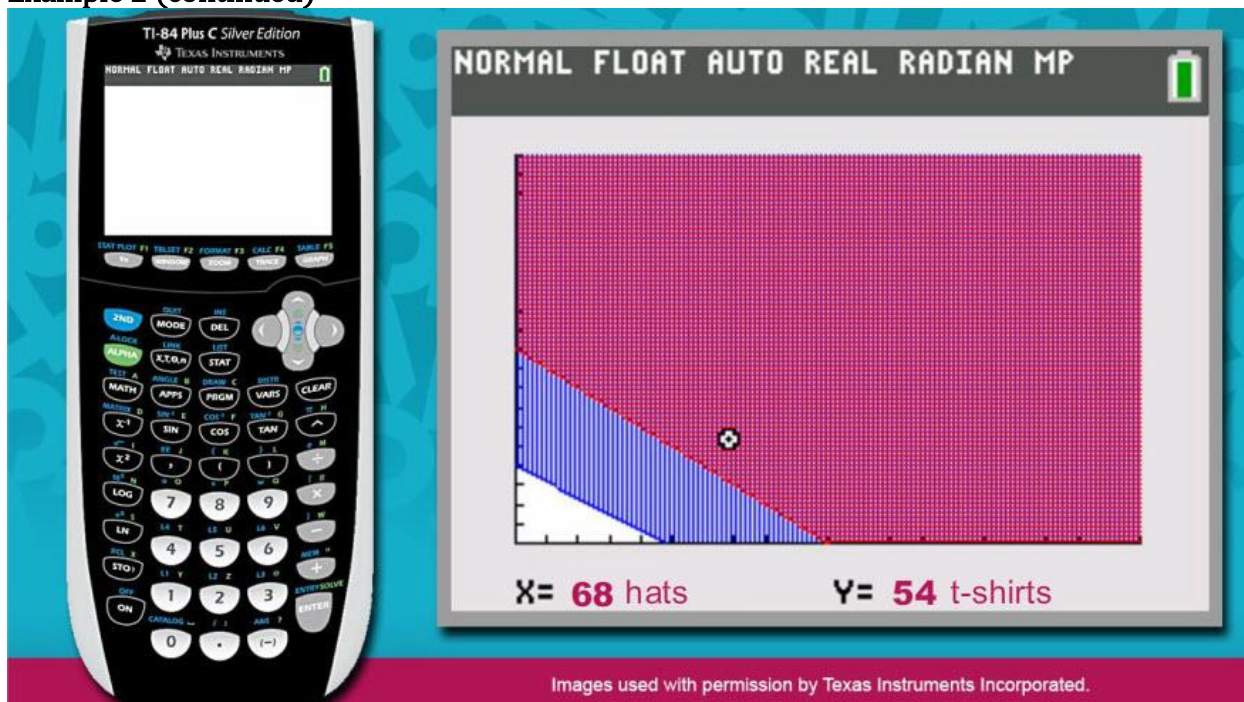


Remember that in the given scenario,  $x$  represents the number of hats sold and  $y$  represents the number of t-shirts sold. It isn't possible to sell a portion of a hat or a portion of a t-shirt. So decimal values of  $x$  and  $y$ -values are not appropriate. You must round any decimal value to the nearest whole number that is included in the solution set.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)



Notice this point included in the solution set of the system. If you round the  $x$ - and  $y$ -values to the nearest whole numbers included in the solution set, the result is  $(68, 54)$ . This means that the sophomores could sell 68 hats and 54 t-shirts and meet the class goal.

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Example 2 (continued)

You can verify this algebraically, by substituting the values into the original inequalities that make up the system:

$$\begin{cases} 10x + 12y \geq 480 \\ x + y \geq 100 \end{cases}$$

(68, 54)

$$10x + 12y \geq 480$$

$$10(68) + 12(54) \geq 480$$

$$680 + 648 \geq 480$$

$$1328 \geq 480$$

$$x + y \geq 100$$

$$68 + 54 \geq 100$$

$$122 \geq 100$$

$$122 \geq 100$$

You have now verified, algebraically, that (68, 54) is a solution to the system of inequalities. Any other points, included in the overlap of the shaded regions, that include whole-number values for  $x$  and  $y$  are also solutions to this real-world scenario.



## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Self-Check



#### Self-Check

Alana is shopping online for new clothes. She notices that one website is offering a special: jeans are \$14 each and sweatshirts are \$11 each. If Alana buys at least 12 items, totaling more than \$150, she will receive a discount on a future order.

Let  $x$  represent the number of jeans purchased and let  $y$  represent the number of sweatshirts purchased. Which of the following systems correctly models the scenario?

$\begin{cases} x + y \leq 12 \\ 14x + 11y \leq 150 \end{cases}$

$\begin{cases} x + y \geq 12 \\ 14x + 11y > 150 \end{cases}$

$\begin{cases} x + y \leq 12 \\ 14x + 11y < 150 \end{cases}$

$\begin{cases} x + y \geq 12 \\ 14x + 11y \geq 150 \end{cases}$

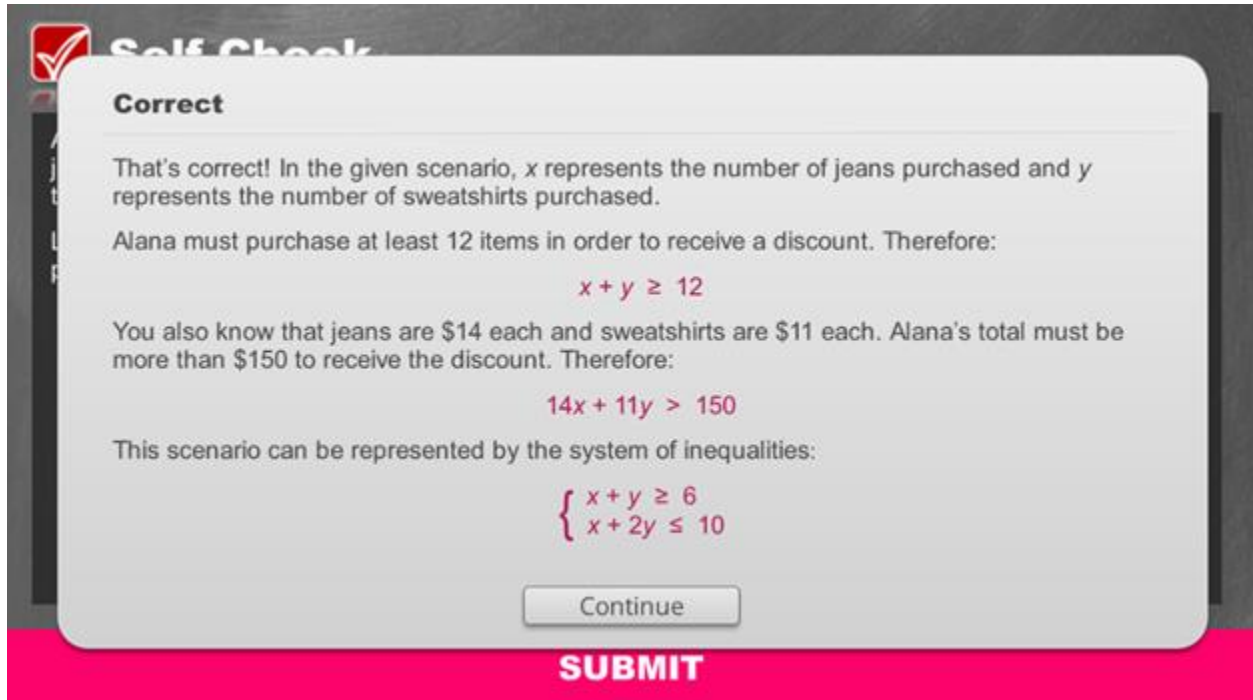
**SUBMIT**

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

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Self-Check: Answer



**Correct**

That's correct! In the given scenario,  $x$  represents the number of jeans purchased and  $y$  represents the number of sweatshirts purchased.

Alana must purchase at least 12 items in order to receive a discount. Therefore:

$$x + y \geq 12$$

You also know that jeans are \$14 each and sweatshirts are \$11 each. Alana's total must be more than \$150 to receive the discount. Therefore:

$$14x + 11y > 150$$

This scenario can be represented by the system of inequalities:

$$\begin{cases} x + y \geq 12 \\ 14x + 11y > 150 \end{cases}$$

Continue

**SUBMIT**

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

## Module 7: Solving Linear Inequalities

### Topic 4: Real-World Systems of Inequalities

#### Conclusion



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checkmark and the text: "Successfully used your reading skills, your knowledge of systems, and the graphing calculator to solve problems". Below this text are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of the box is a cartoon illustration of a smiling woman with dark curly hair, wearing a pink long-sleeved top. The background is a blue pattern of mathematical symbols like pi, infinity, and numbers.

Congratulations! You have reached the conclusion of this lesson on solving practical problems involving systems of inequalities. Your reading comprehension skills, along with your knowledge of systems, and the use of the graphing calculator, each played a role in helping you to successfully complete this lesson.