

Module 5: Solving Linear Equations

Topic 4 Content: Practical Problems Involving Linear Equations

Introduction



Today's Lesson

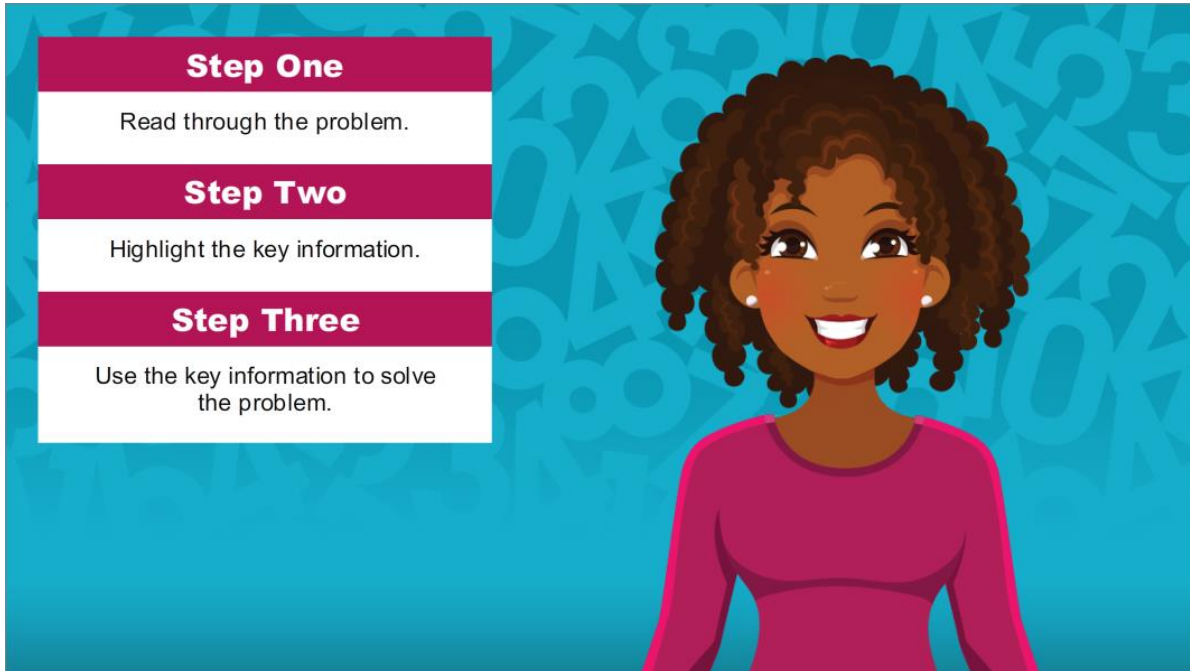
- You will learn how to use linear equations to model and solve practical problems.

Hi there! I'm so glad to have you here for this lesson in Algebra I, where you will learn how to use linear equations to model and solve practical problems.

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Anticipatory Set



The illustration features a woman with dark skin and curly hair, wearing a pink long-sleeved top, smiling. To her left is a vertical list of three steps, each in a white box with a pink header. The background is a blue pattern of mathematical symbols.

Step One
Read through the problem.
Step Two
Highlight the key information.
Step Three
Use the key information to solve the problem.

Use the following steps to guide you in the process of using linear equations to solve real-world problems.

Step 1: Read through the problem.

Step 2: Highlight the key information.

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

Keep these steps in mind while you work through the following examples.

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Practical Problems Involving Linear Equations

**PRACTICAL PROBLEMS
INVOLVING LINEAR EQUATIONS**

Click the Examples Below to Learn More

Example One

Self-Check

Example Two

Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

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Example 1



Example 1

A landscaper must use 56 feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is 12 feet, find the length of the garden.

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

Next

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

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Example 1 (continued)



Example 1

A landscaper must use 56 feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is 12 feet, find the length of the garden.

A landscaper must use 56 feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is 12 feet, find the length of the garden.

Did you highlight the important facts?

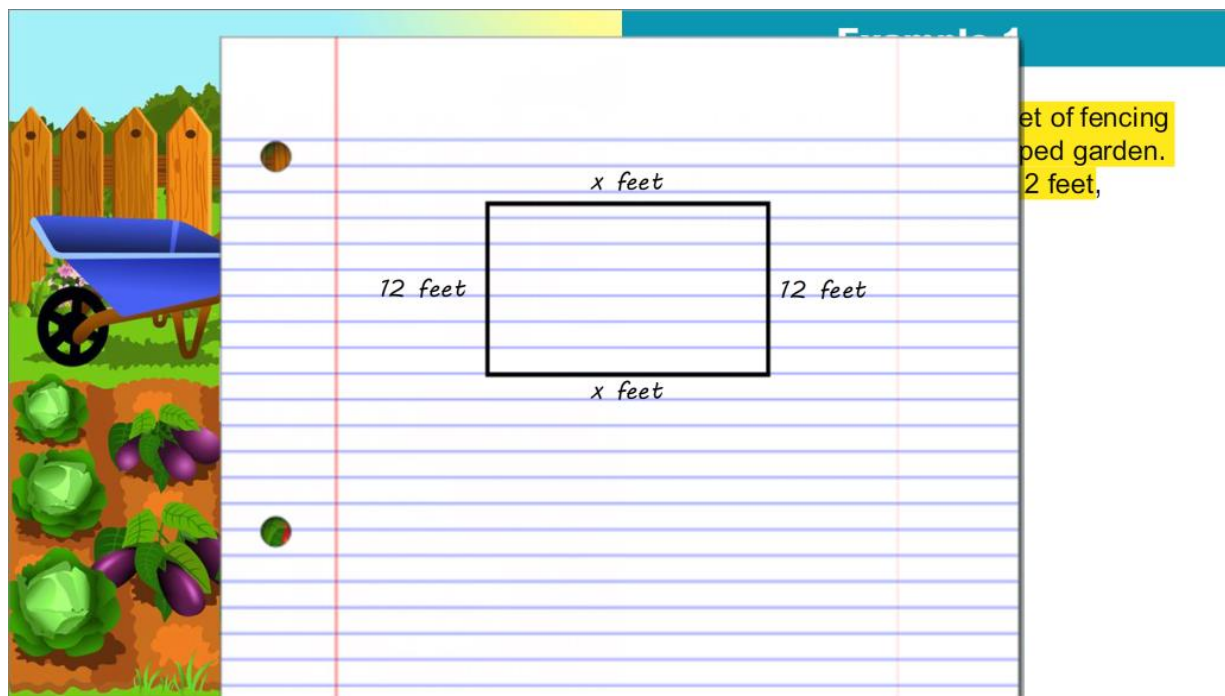
- 56 feet of fencing will be used to enclose a rectangular-shaped garden
- The width of the garden is 12 feet
- Find the length of the garden

You can use a linear equation to represent this situation and to solve for the unknown value.

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Example 1 (continued)



To start solving this problem, it would be helpful to begin with a rough sketch of the situation. The landscaper is planning a rectangular-shaped garden. On notebook paper, sketch a rectangle to represent the garden.

In the problem, you are also told that the width of the garden is 12 feet. Because you know that the opposite sides of a rectangle have the same measure, you can infer that two sides of the rectangle are 12 feet.

Use the variable, x , to represent the unknown length. These opposite sides will also have the same measure. So use x to represent the length of each of these sides.

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Example 1 (continued)

Example 1

12 feet = width of the garden
 x = length of the garden
56 feet = perimeter of the garden

$$12 + 12 + x + x = 56$$
$$24 + 2x = 56$$

A landscaper must use 56 feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is 12 feet, find the length of the garden.

$$12 + 12 + x + x = 56$$

$$24 + 2x = 56$$

Now it is time to set up the equation. In this scenario, the landscaper must use 56 feet of fencing to enclose the garden. The distance around the garden is equal to the perimeter of the rectangle. Therefore, you know that the perimeter of the rectangle is 56 feet. Remember, to calculate the perimeter of a rectangle, you must find the sum of lengths of the edges.

Therefore, the equation $12 + 12 + x + x = 56$ can be used to model the situation.

Solve for x to determine the length of the rectangular-shaped garden.

Combine like terms on the left side of the equation.

$$12 + 12 = 24$$

$$x + x = 2x$$

Bring down the equals sign and 56.

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Example 1 (continued)

Example 1	
<p>12 feet = width of the garden x = length of the garden 56 feet = perimeter of the garden</p> $12 + 12 + x + x = 56$ $\begin{array}{r} 24 + 2x = 56 \\ -24 \quad -24 \\ \hline 2x = 32 \\ \hline 2 \quad 2 \\ x = 16 \end{array}$	<p>A landscaper must use 56 feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is 12 feet, find the length of the garden.</p>

$$\begin{array}{r} 24 + 2x = 56 \\ -24 \quad -24 \\ \hline 2x = 32 \end{array}$$

Begin isolating the variable by subtracting 24 from each side.

$24 - 24 = 0$. So these terms are canceled out.

Bring down $2x$ and the equals sign.

$$56 - 24 = 32.$$

$$\begin{array}{r} 2x = 32 \\ \hline 2 \quad 2 \end{array}$$

Now divide each term by 2.

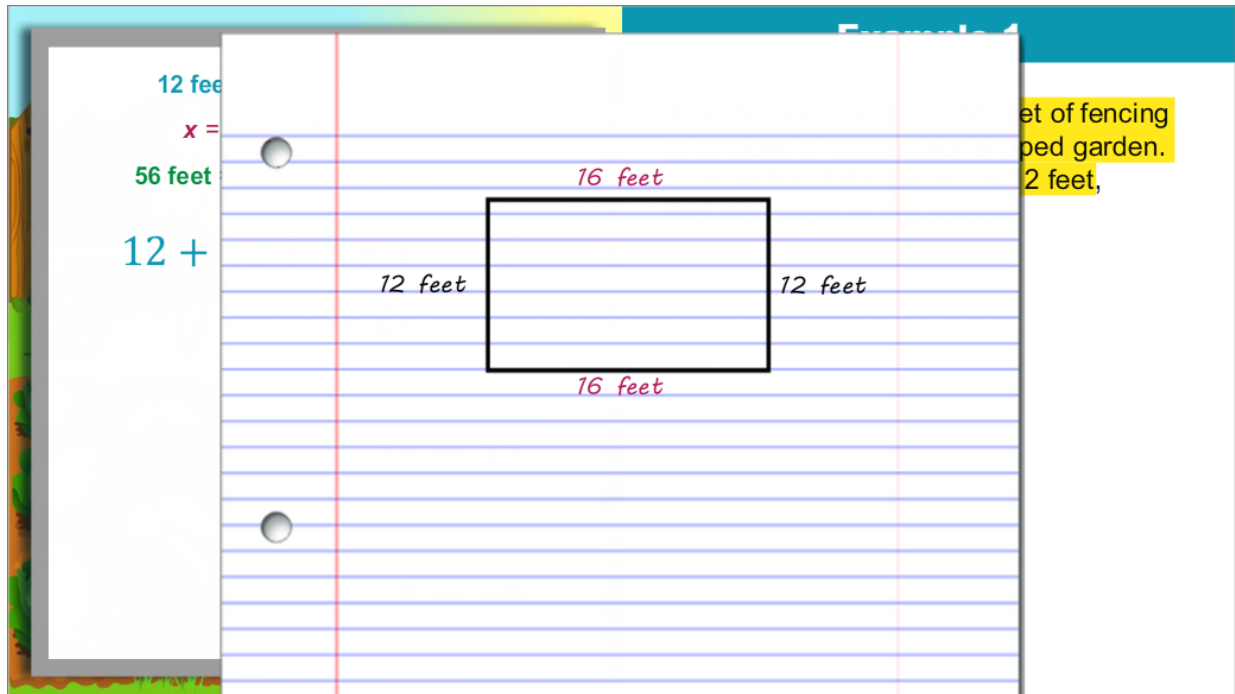
The result is $x = 16$.

$$x = 16$$

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Example 1 (continued)




So you can conclude that the length of the garden is 16 feet.

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Example 2



Example 2

Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?


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

Next

Take a few moments to read Example 2. Highlight the information you think is necessary to solve the problem.

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Example 2 (continued)



Example 2

Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?

Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?

Did you highlight the important facts?

- Bethany paid a one-time fee of \$18
- Sessions with a personal trainer are \$25 per hour
- Bethany has paid a total of \$343
- How many hours has Bethany worked out with a personal trainer?

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Example 2 (continued)

Example 2	
<p style="text-align: center;">\$18 one-time fee</p> <p style="text-align: center;">\$25 cost per hour of personal training</p> <p style="text-align: center;">\$343 total paid</p> <p style="text-align: center;">x number of hours of personal training</p>	<p>Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?</p> <p>Which equation represents the scenario?</p> <div style="text-align: center; margin-top: 10px;"><div style="background-color: #800040; color: white; border-radius: 10px; padding: 5px 20px; display: inline-block; margin-bottom: 5px;">$25x + 18 = 343$</div><div style="background-color: #800040; color: white; border-radius: 10px; padding: 5px 20px; display: inline-block; margin-bottom: 5px;">$18x + 25 = 343$</div><div style="background-color: #800040; color: white; border-radius: 10px; padding: 5px 20px; display: inline-block; margin-bottom: 5px;">$43x = 343$</div><div style="background-color: #800040; color: white; border-radius: 10px; padding: 5px 20px; display: inline-block;">$x + 43 = 343x$</div></div>

Now that you have highlighted the information needed to solve the problem, write an equation to model the situation. Let x represent the unknown value, the number of hours Bethany worked out with a personal trainer.

Which equation represents the scenario?

- A) $25x + 18 = 343$
- B) $18x + 25 = 343$
- C) $43x = 343$
- D) $x + 43 = 343x$

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Example 2 (continued)

Bethany paid \$25 for each personal training session, plus a one-time fee of \$18. This part of the problem can be represented by the expression:

$$25x + 18$$

As of last month, she paid a total of \$343. Therefore, the scenario can be represented by the equation:

$$25x + 18 = 343$$

Example 2

Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?

$25x + 18 = 343$ represents the scenario.

$25x + 18 = 343$

Next

Bethany paid \$25 for each personal training session, plus a one-time fee of \$18. This part of the problem can be represented by the expression:

$$25x + 18$$

As of last month, she has paid a total of \$343. Therefore, the scenario can be represented by the equation:

$$25x + 18 = 343$$

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Example 2 (continued)

$25x + 18 = 343$	<p style="text-align: center;">Example 2</p> <p>Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?</p> <p>Bethany worked with a personal trainer for a total of _____ hours.</p> <div style="text-align: center;"><input type="text"/></div> <p>Enter the value above and click submit.</p> <p style="text-align: right;">Submit</p>
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$$25x + 18 = 343$$

Now that you have written an equation to represent the situation, solve the equation for x to determine the number of hours Bethany worked out with a personal trainer.

After solving for x , you know that Bethany worked with a personal trainer for a total of _____ hours.

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Example 2 (continued)

Example 2	
<p>Begin by subtracting 18 from each side of the equation.</p> $\begin{array}{r} 25x + 18 = 343 \\ -18 \quad -18 \\ \hline 25x = 325 \end{array}$ <p>Divide each term by 25.</p> $\begin{array}{r} 25x = 325 \\ \hline 25 \quad 25 \\ \hline x = 13 \end{array}$	<p>Bethany paid a one-time fee of \$18 to join a local recreation center last year. The center offers sessions with a personal trainer for \$25 per hour. As of this month, Bethany has paid the center a total of \$343. How many hours has Bethany worked out with a personal trainer?</p> <p style="text-align: center; color: #800040;">Bethany worked with a personal trainer for a total of 13 hours.</p> <p style="text-align: center; font-size: 24pt; color: #800040;">13</p> <div style="text-align: right; margin-top: 10px;"> Menu </div>

$$25x + 18 = 343$$

$$25x + 18 = 343$$

$$\begin{array}{r} -18 \quad -18 \\ \hline 25x = 325 \end{array}$$

Begin by subtracting 18 from each side of the equation.

$$25x = 325$$

$$\begin{array}{r} \hline 25 \quad 25 \\ \hline \end{array}$$

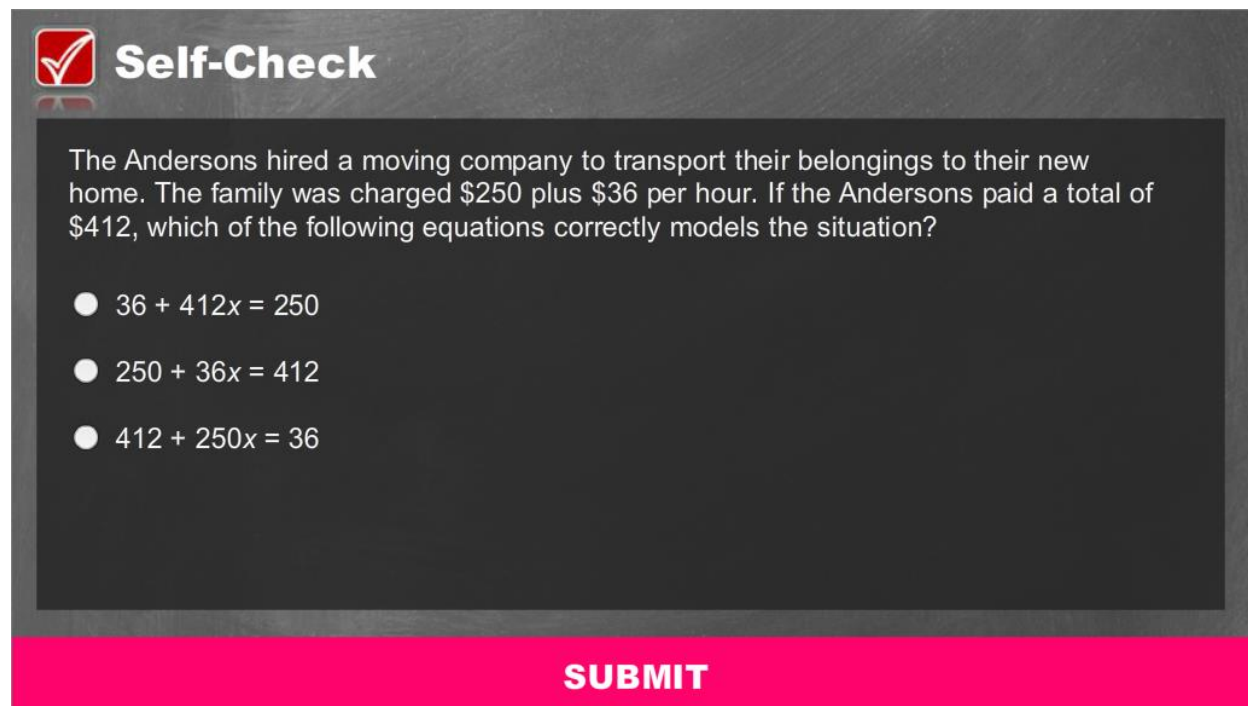
$$x = 13$$

Divide each term by 25.

Bethany worked with a personal trainer for 13 hours.

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Self-Check 1



The interface features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a white text box contains the problem description and three radio button options. At the bottom, a bright pink bar contains the word "SUBMIT" in white capital letters.

Self-Check

The Andersons hired a moving company to transport their belongings to their new home. The family was charged \$250 plus \$36 per hour. If the Andersons paid a total of \$412, which of the following equations correctly models the situation?

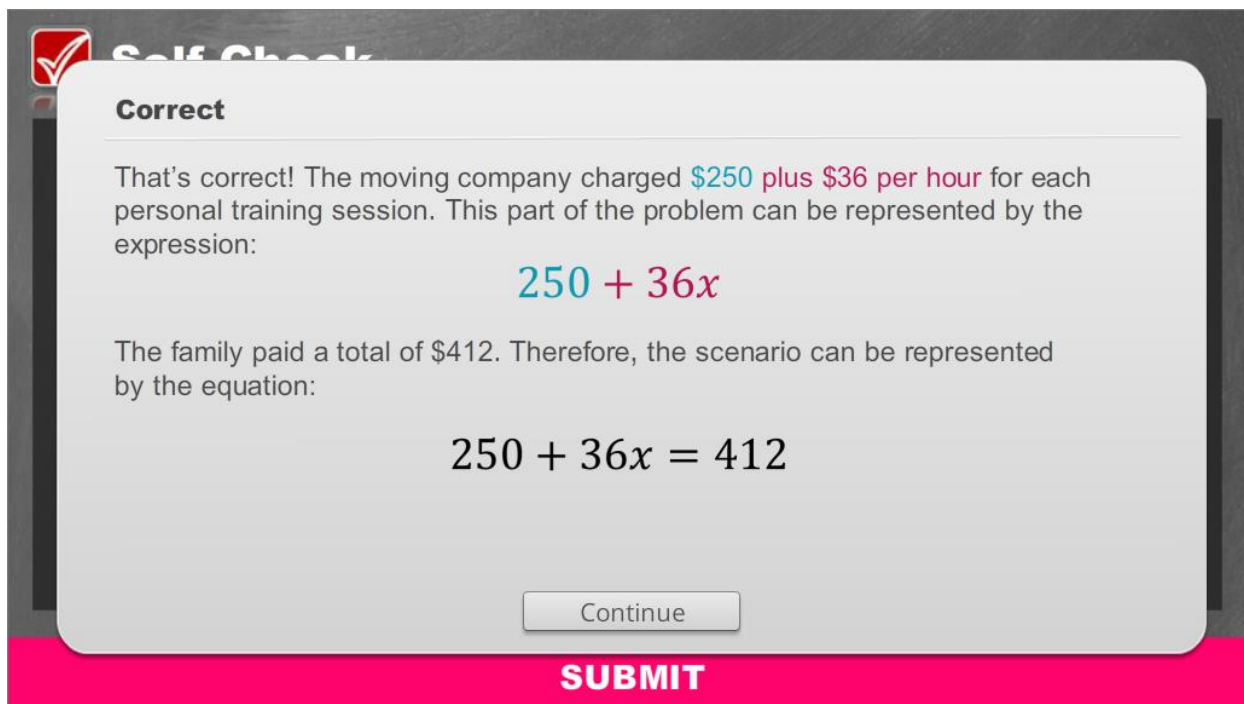
- $36 + 412x = 250$
- $250 + 36x = 412$
- $412 + 250x = 36$

SUBMIT

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

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Self-Check 1: Answer



Correct

That's correct! The moving company charged \$250 plus \$36 per hour for each personal training session. This part of the problem can be represented by the expression:

$$250 + 36x$$

The family paid a total of \$412. Therefore, the scenario can be represented by the equation:

$$250 + 36x = 412$$

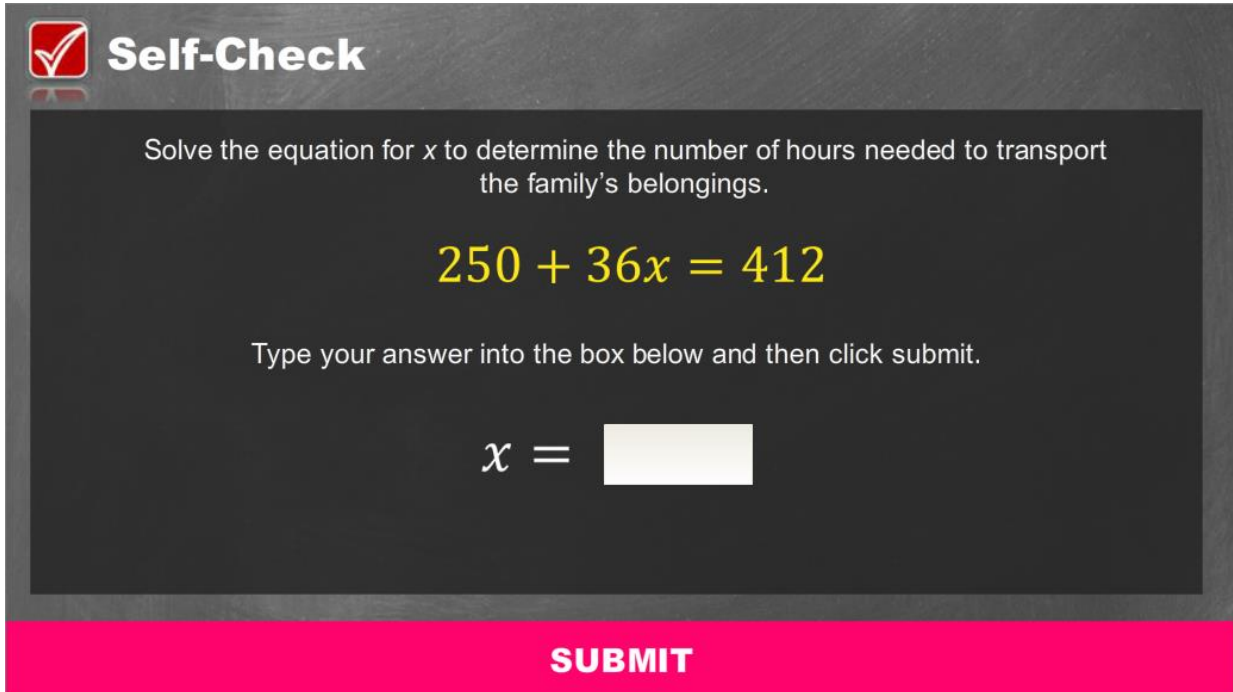
Continue

SUBMIT

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

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Self-Check 2



Self-Check

Solve the equation for x to determine the number of hours needed to transport the family's belongings.

$$250 + 36x = 412$$

Type your answer into the box below and then click submit.

$x =$

SUBMIT

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

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Self-Check 2: Answer

Correct

That's correct!

Begin by subtracting 250 from each side of the equation.

Divide each term by 36.

The moving company spent 4.5 hours transporting the Anderson's belongings.

$$\begin{array}{r} 250 + 36x = 412 \\ -250 \quad -250 \\ \hline 36x = 162 \\ \underline{36} \quad \underline{36} \\ x = 4.5 \end{array}$$

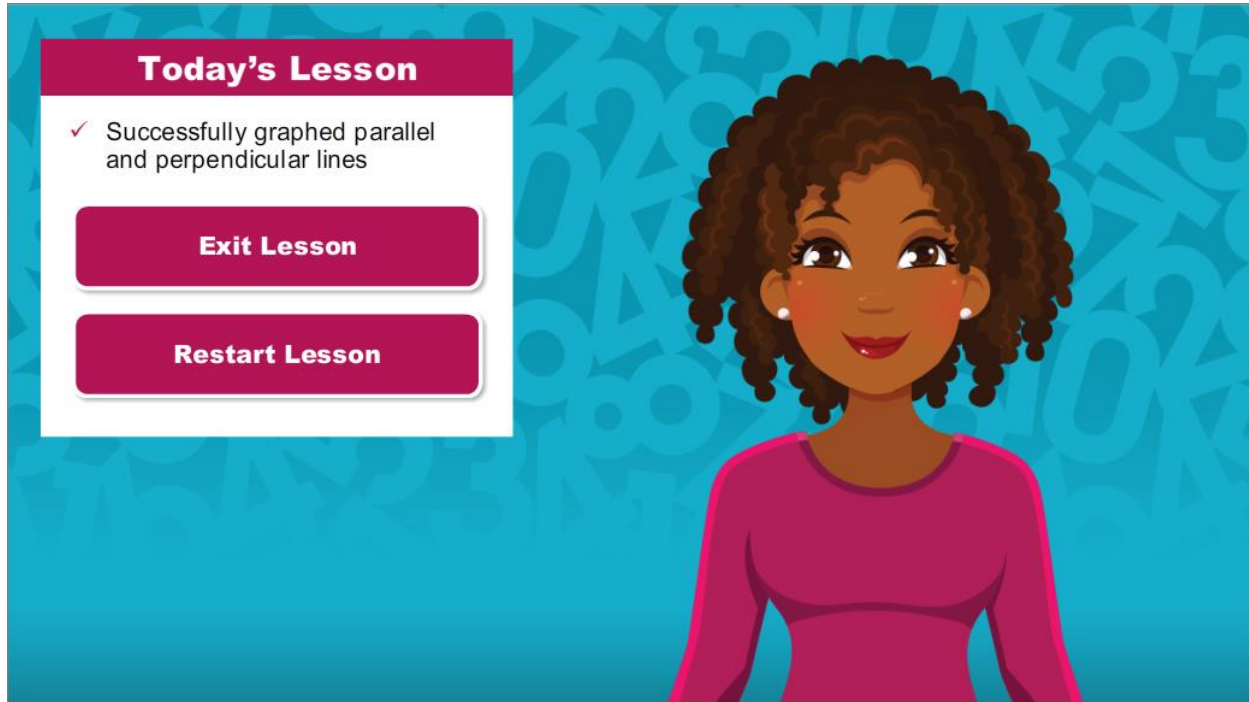
Continue

SUBMIT

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

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Conclusion



You have reached the conclusion of this lesson where you learned how to use linear equations to model and solve practical problems.