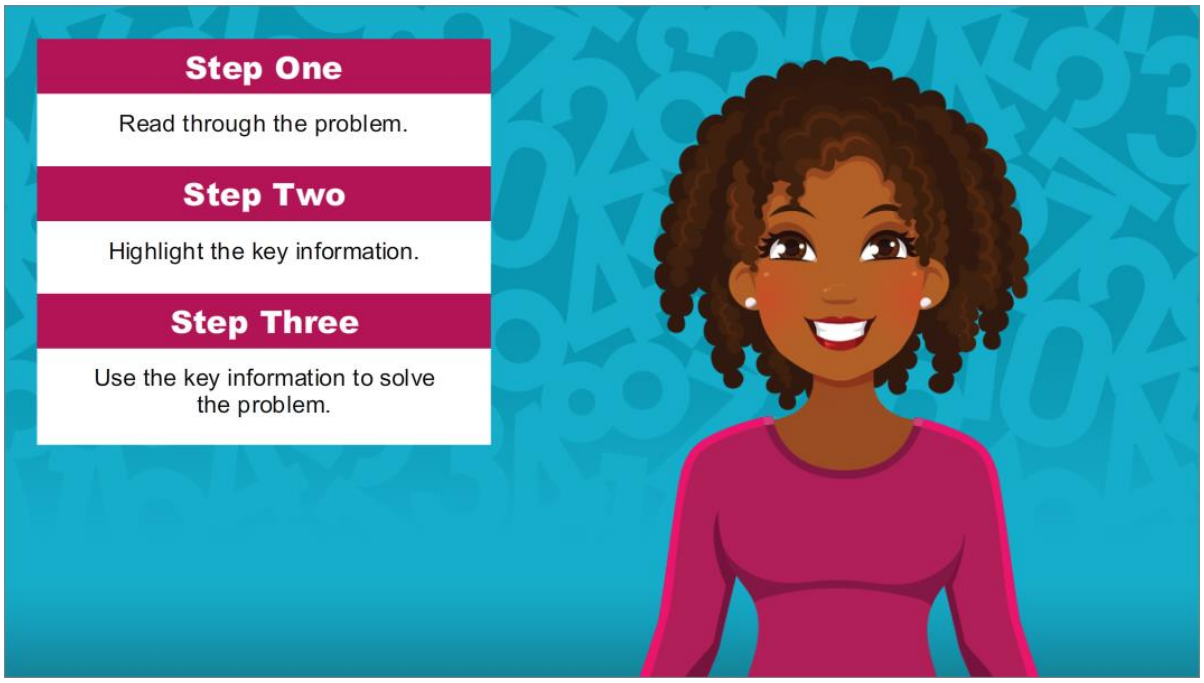
Module 5: Solving Linear Equations
Topic 4 Content: Practical Problems Involving Linear Equations

Introduction

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.

Anticipatory Set



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

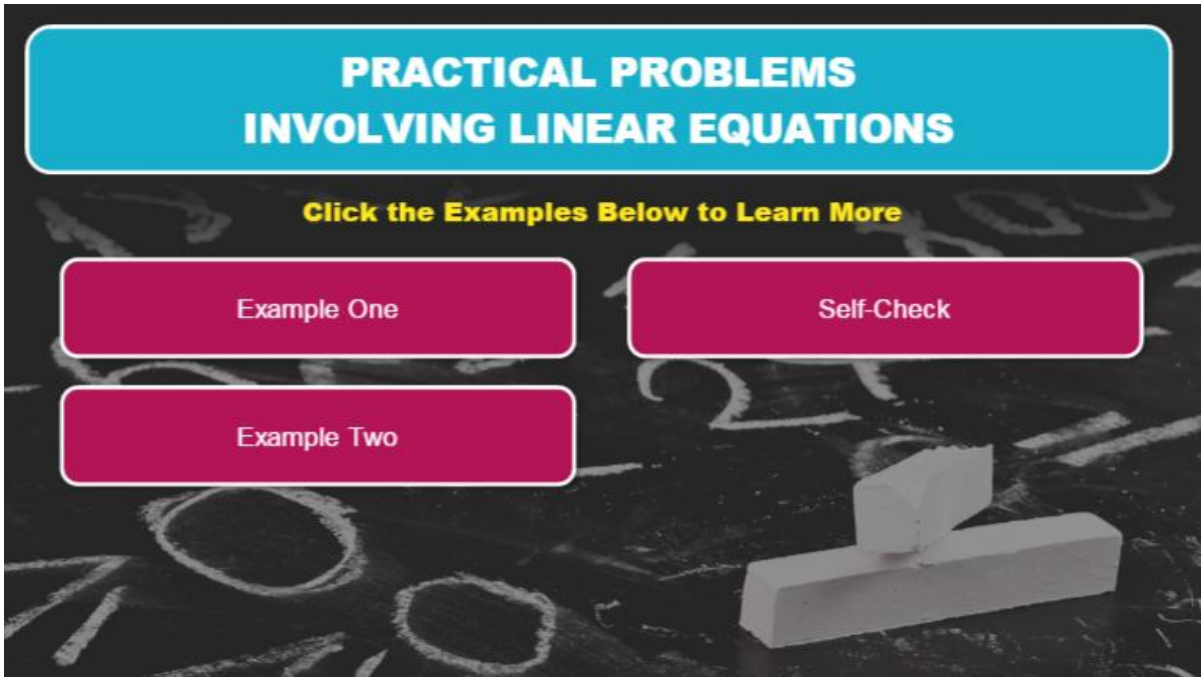
Step 1: Read through the problem.

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.

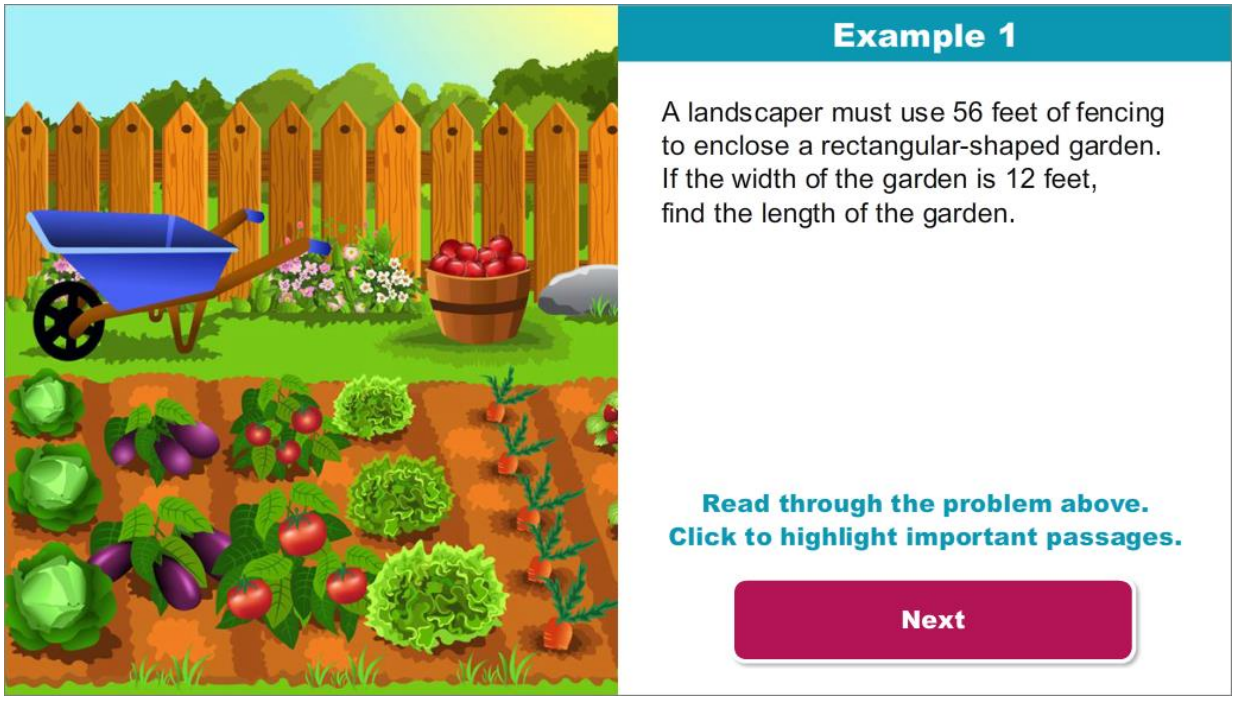
Practical Problems Involving Linear Equations



Click the examples below to learn more.

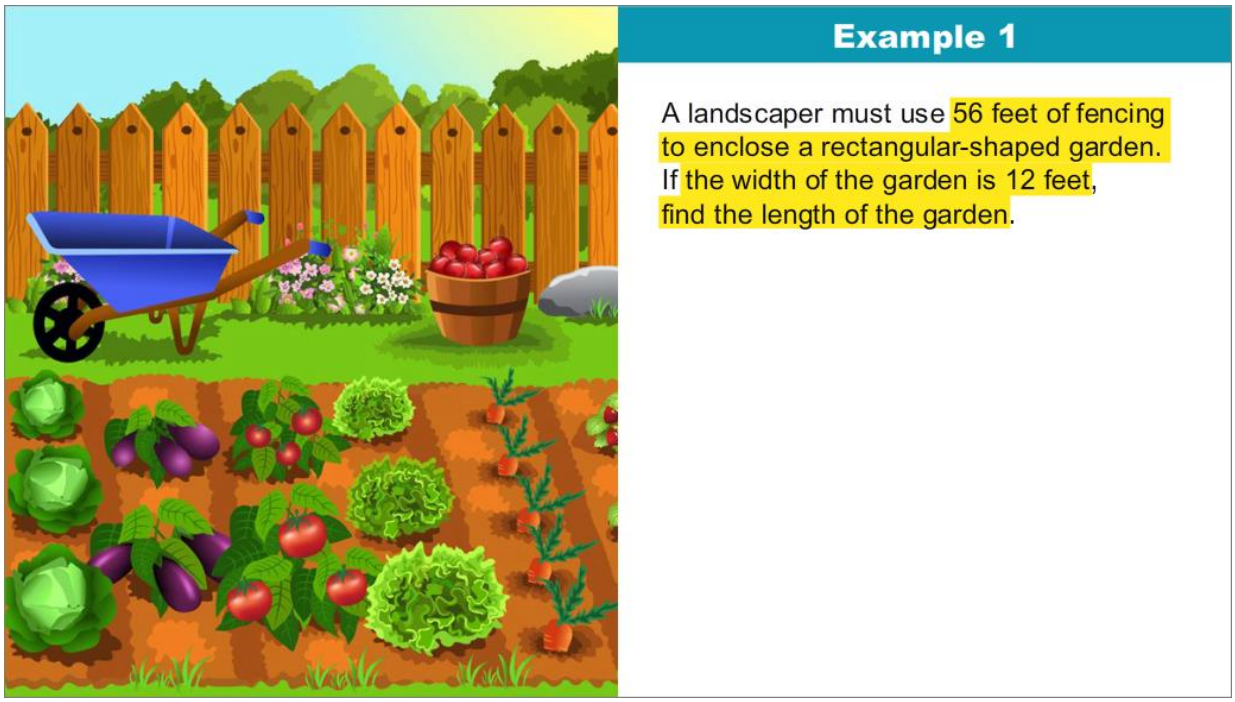
- Example One
- Example Two
- Self-Check

Example 1



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

Example 1 (continued)



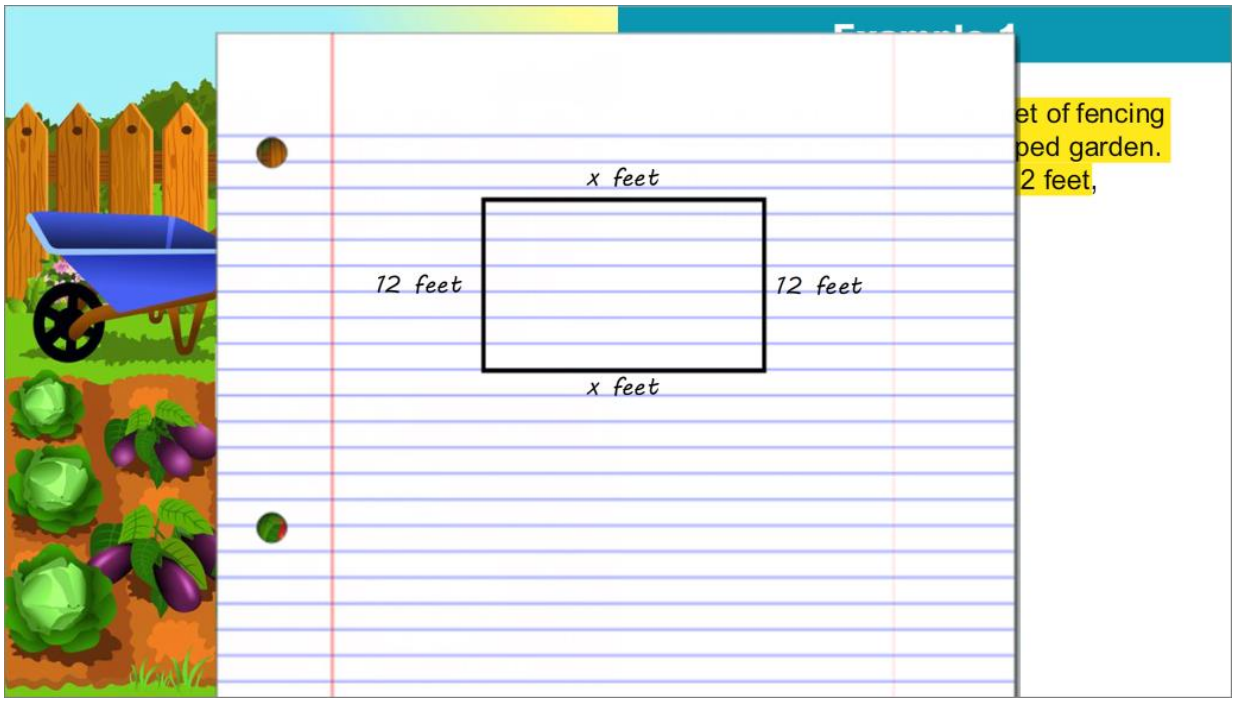
A landscaper must use 56 *feet of fencing to enclose a rectangular-shaped garden. If the width of the garden is* 12 *feet, find the length of the garden.*

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.

Example 1 (continued)

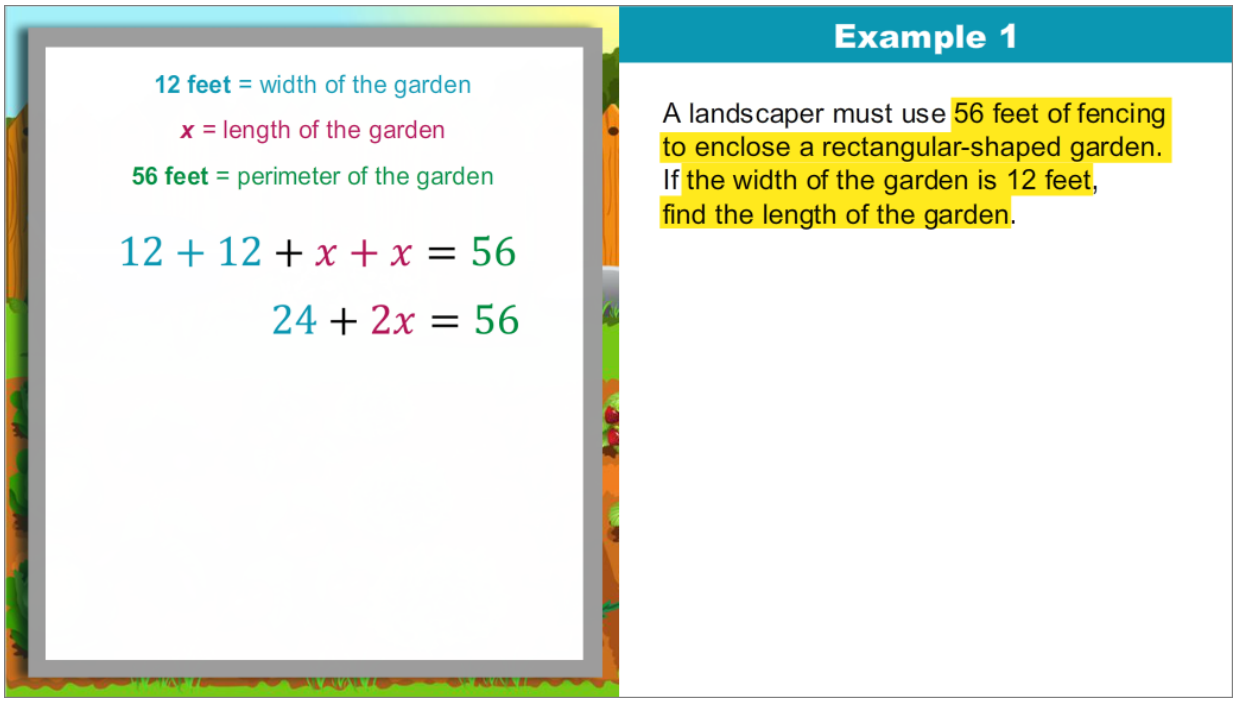


To start solving this problem, it would be helpful to begin with a rough sketch of the situation. The landscaper is planning a rectangular-shaped garden. On notebook paper, sketch a rectangle to represent the garden.

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.

Example 1 (continued)



$12 + 12 + x + x = 56$

$24 + 2x = 56$

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.

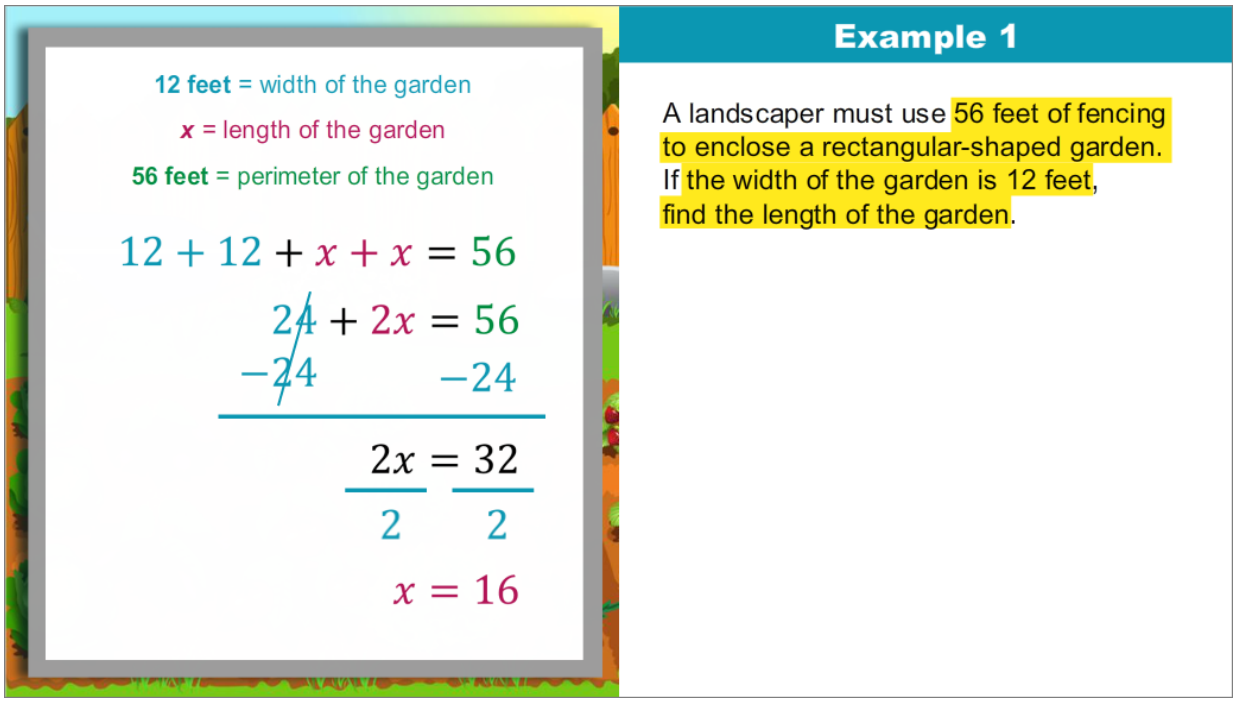
Solve for x to determine the length of the rectangular-shaped garden.

Combine like terms on the left side of the equation.

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

Bring down the equals sign and 56.

Example 1 (continued)



$24 + 2x = 56$

$-24 \qquad -24$

$2x = 32$

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.

$56 - 24 = 32$.

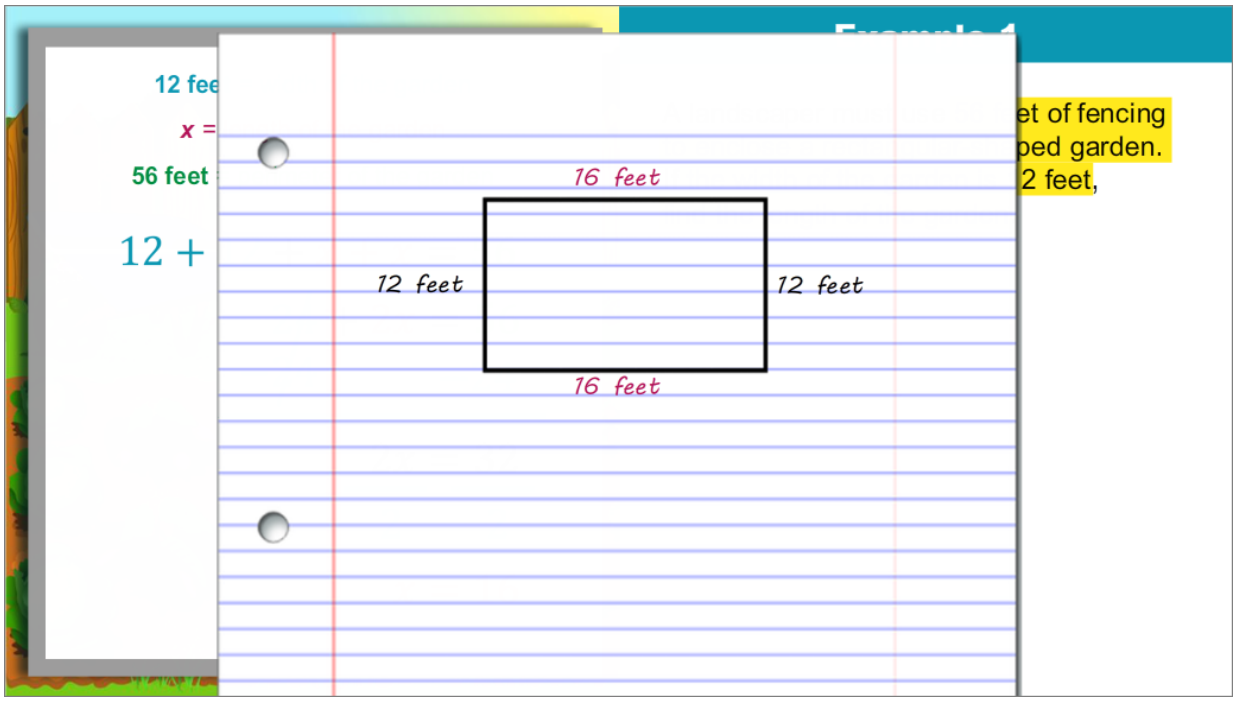
$\frac{2x}{2} = \frac{32}{2}$

$x = 16$

Now divide each term by 2.

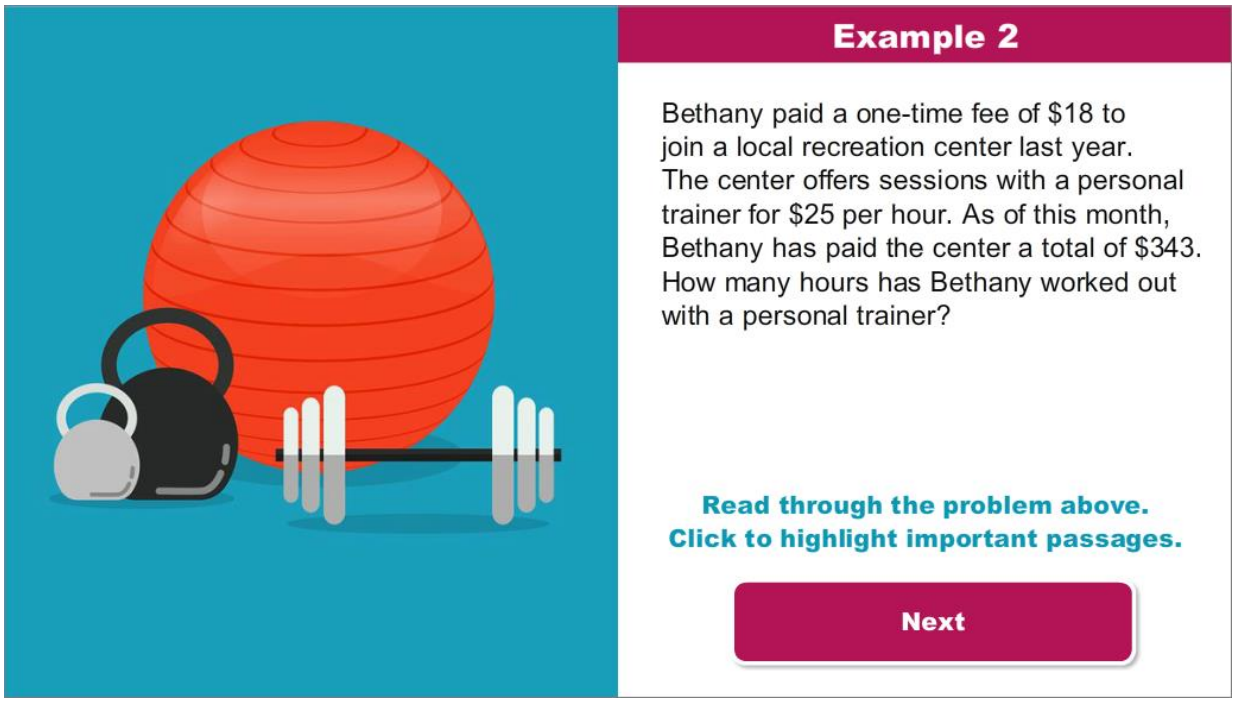
The result is $x = 16$.

Example 1 (continued)



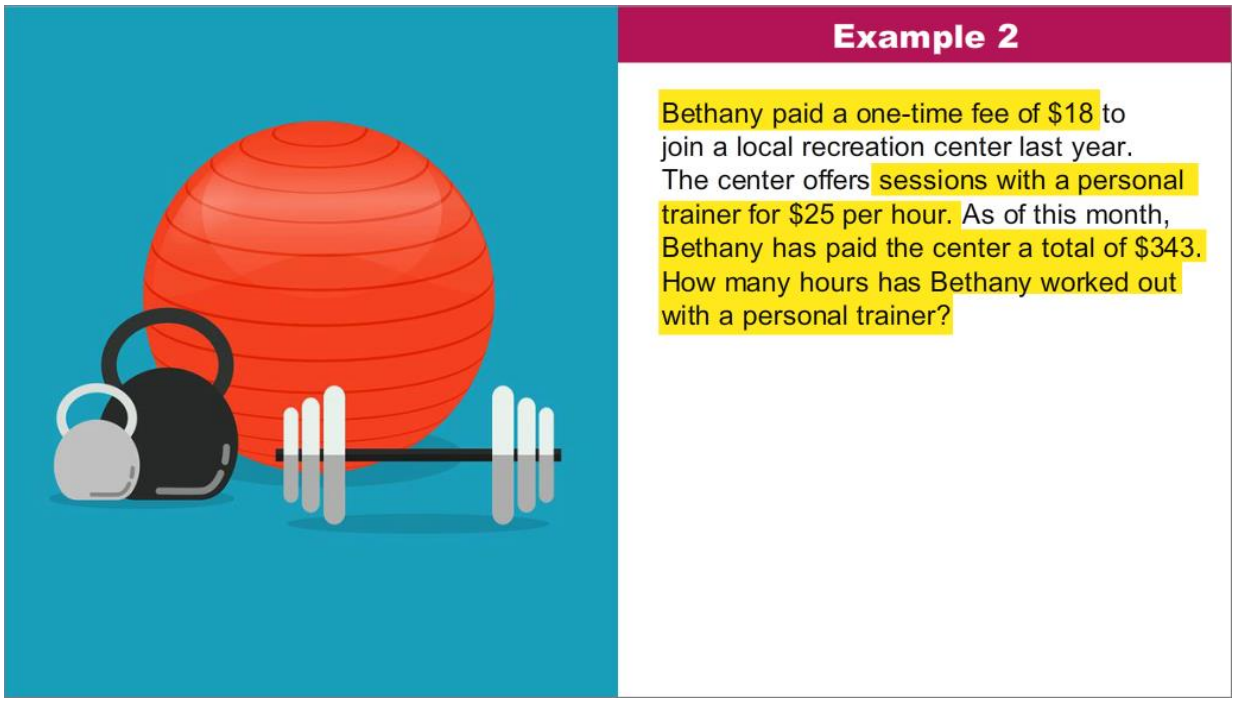
So you can conclude that the length of the garden is 16 feet.

Example 2



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

Example 2 (continued)

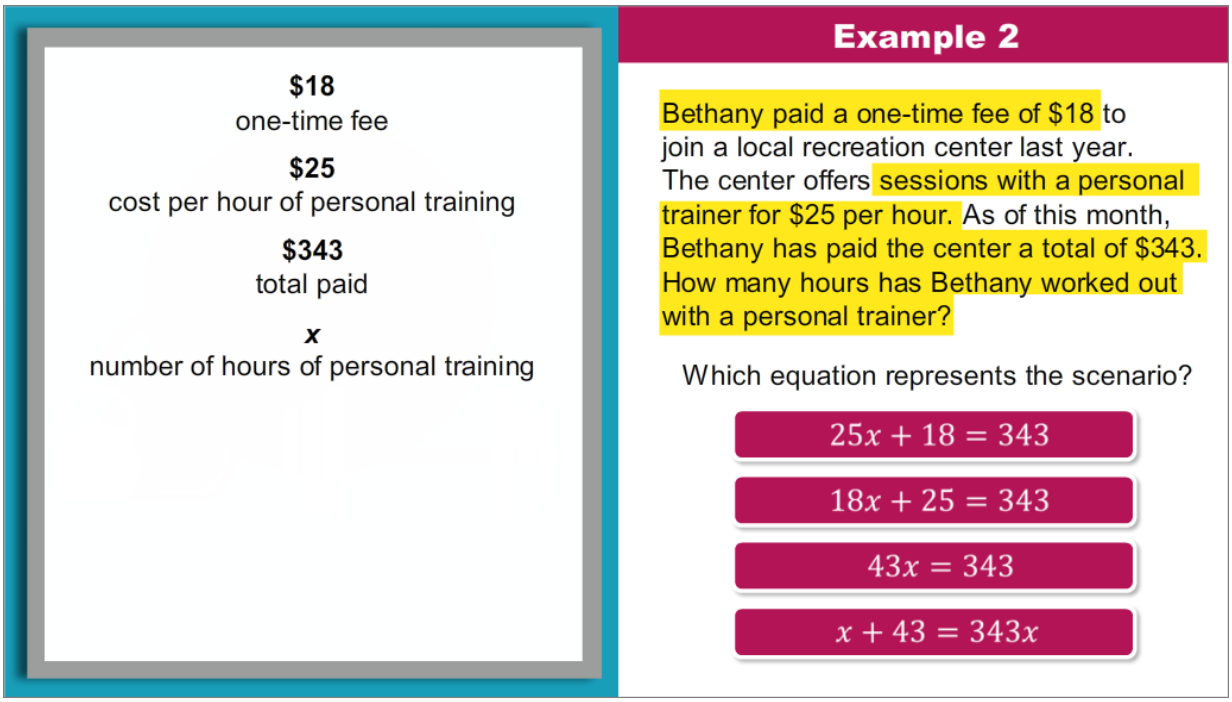


Bethany paid a one-time fee of $18 *to join a local recreation center last year. The center offers sessions with a personal trainer for* $25 *per hour. As of this month, Bethany has paid the center a total of* $343. *How many hours has Bethany worked out with a personal trainer?*

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?

Example 2 (continued)

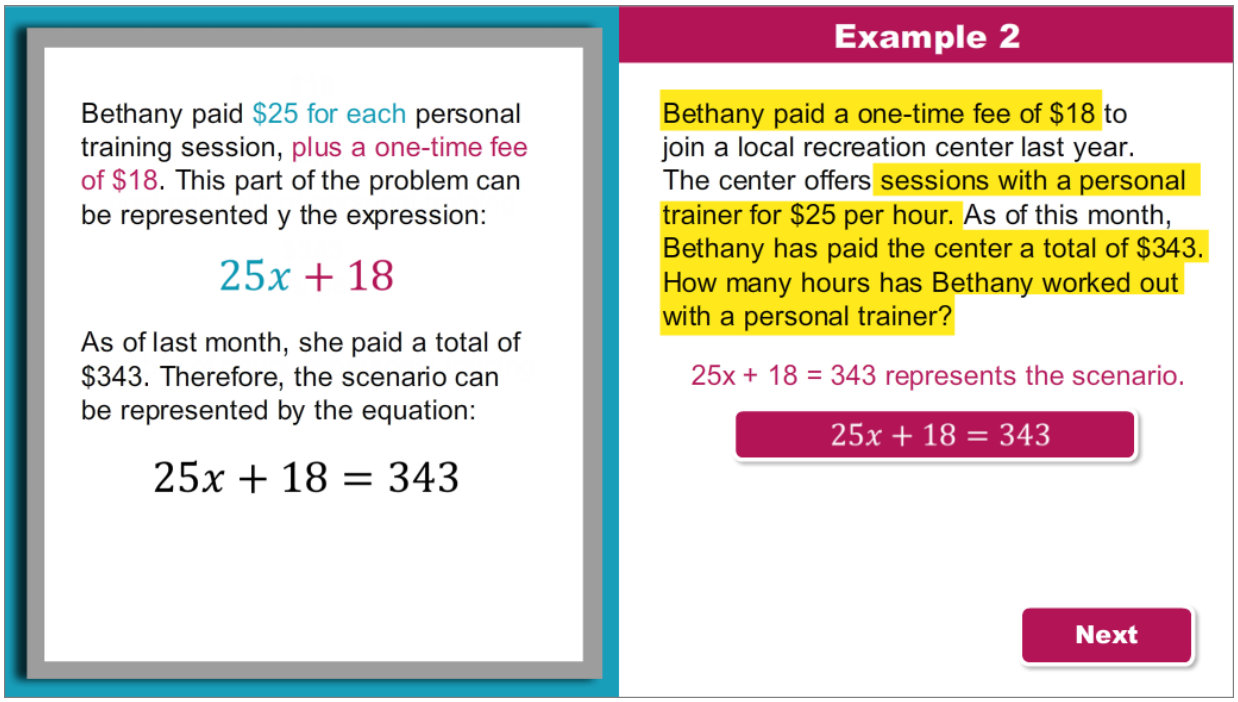


Now that you have highlighted the information needed to solve the problem, write an equation to model the situation. Let x represent the unknown value, the number of hours Bethany worked out with a personal trainer.

Which equation represents the scenario?

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

Example 2 (continued)



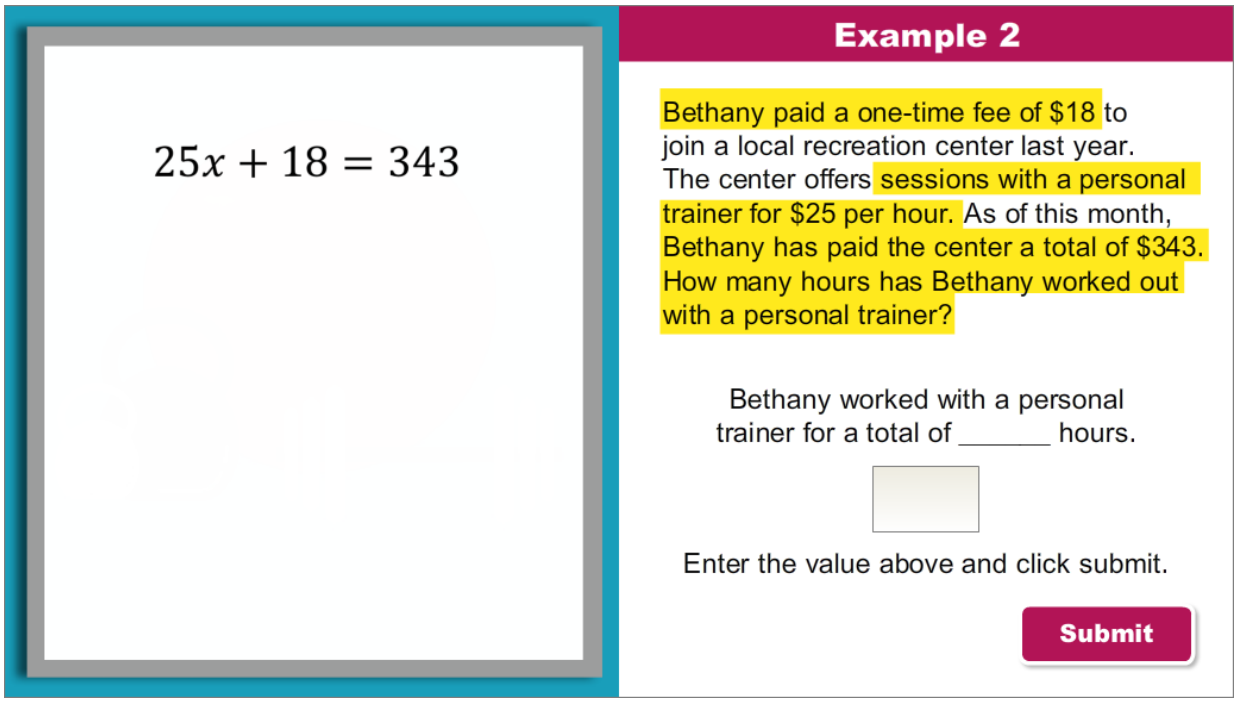
Bethany paid $25 for each personal training session, plus a one-time fee of $18. This part of the problem can be represented by the expression:

$$25x + 18$$

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

$$25x + 18 = 343$$

Example 2 (continued)

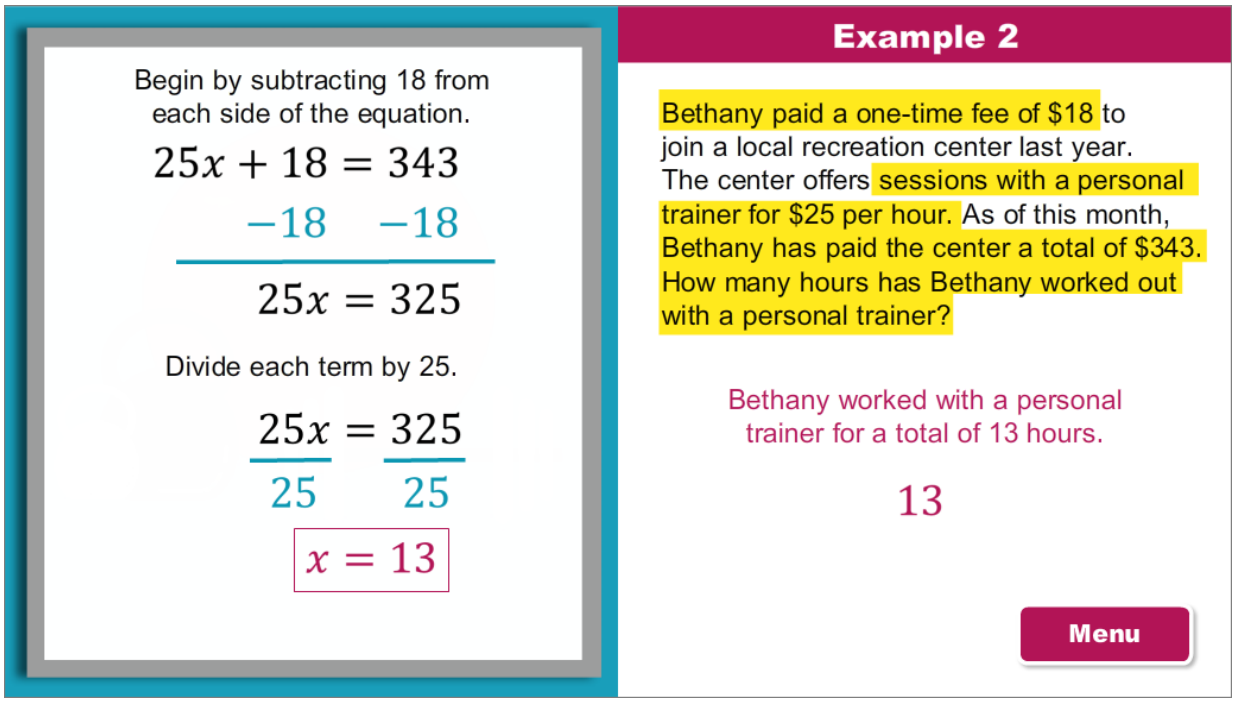


$$25x + 18 = 343$$

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.

Example 2 (continued)



$$25x + 18 = 343$$

$25x + 18 = 343$ — Begin by subtracting 18 from each side of the equation.

$-18 \quad -18$

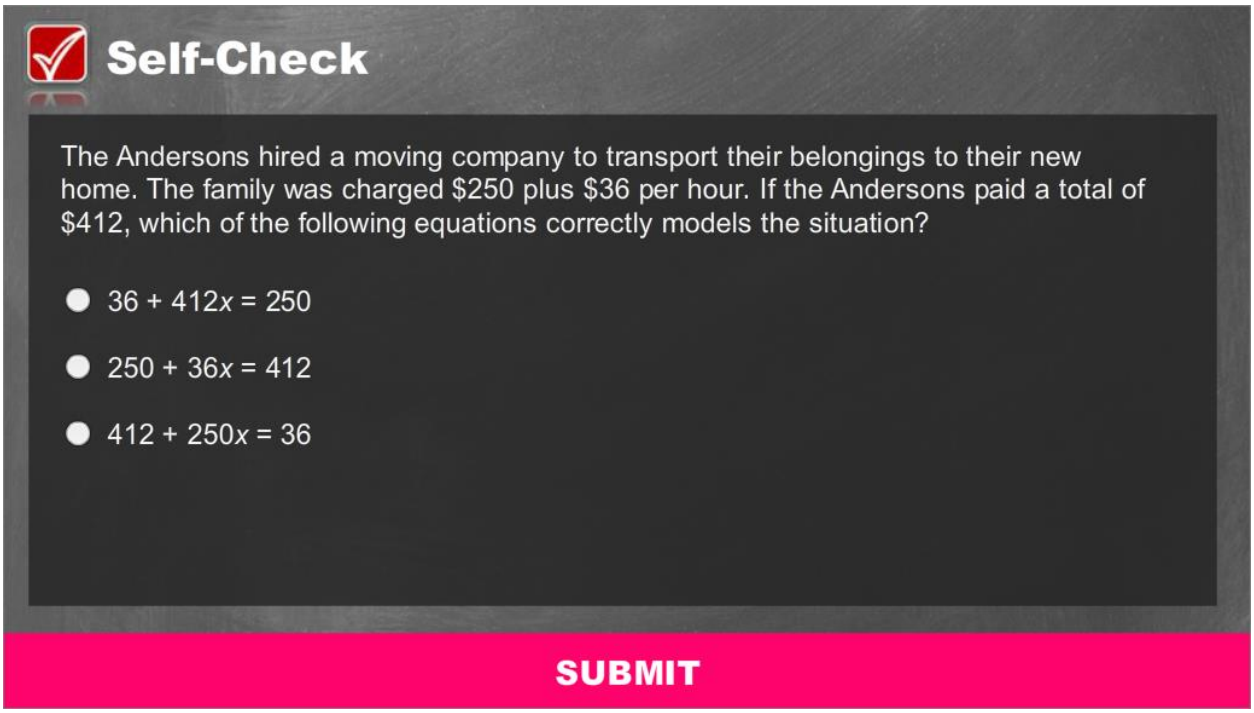
$25x = 325$

$\frac{25x}{25} = \frac{325}{25}$ — Divide each term by 25.

$x = 13$

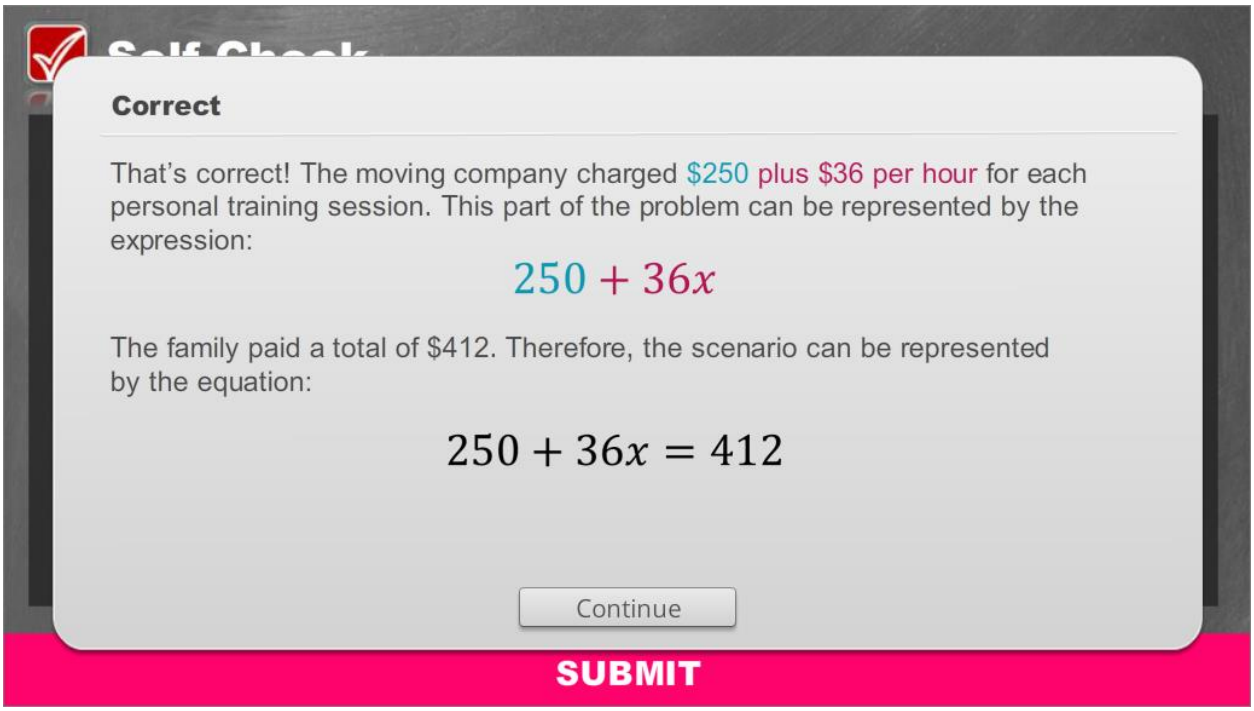
Bethany worked with a personal trainer for 13 hours.

Self-Check 1



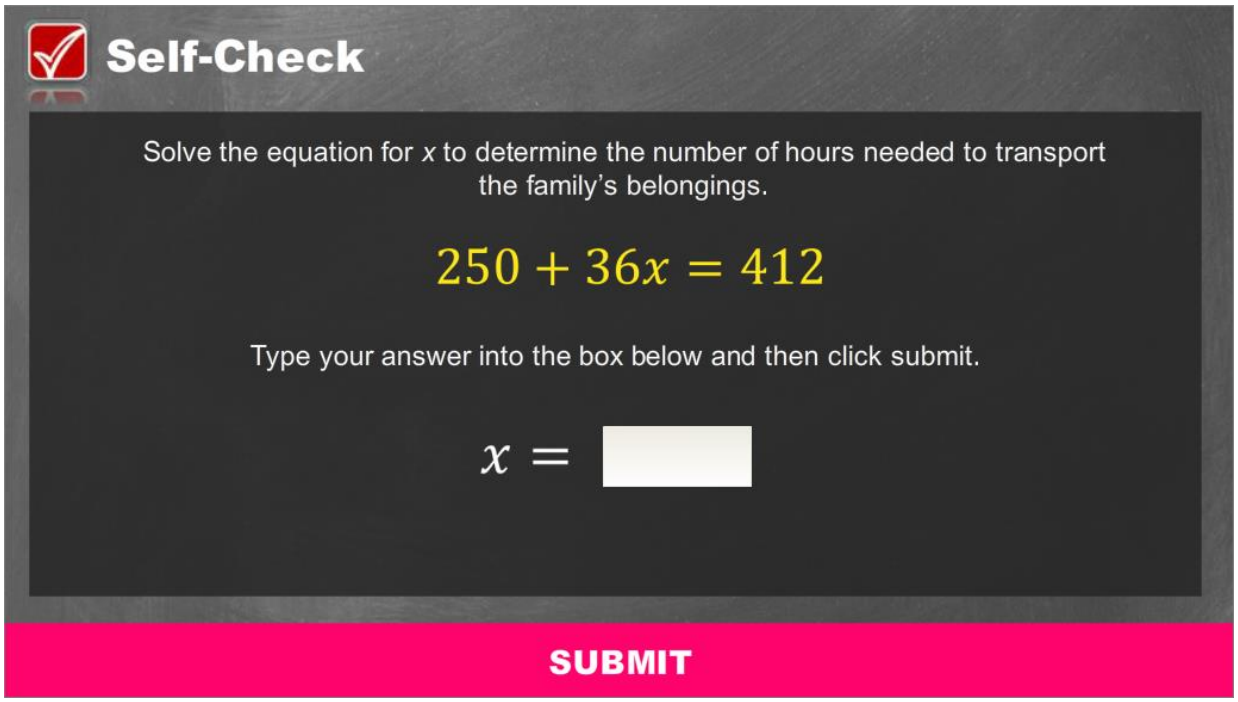
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



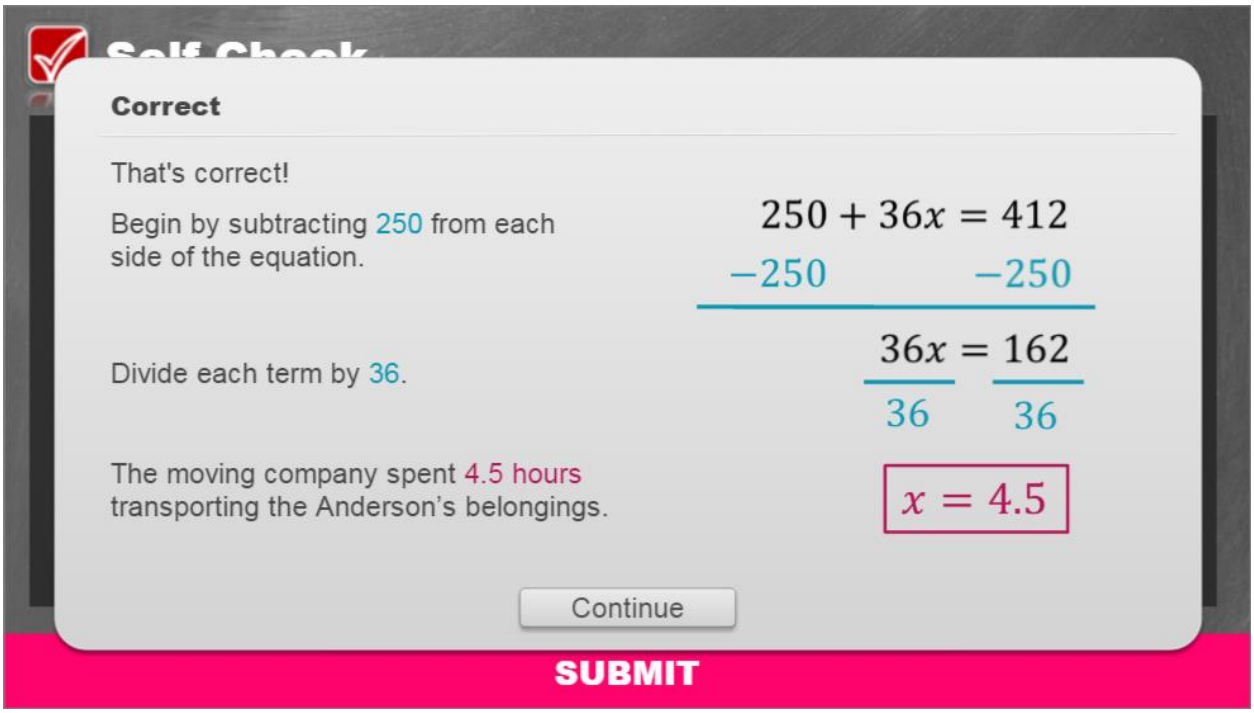
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



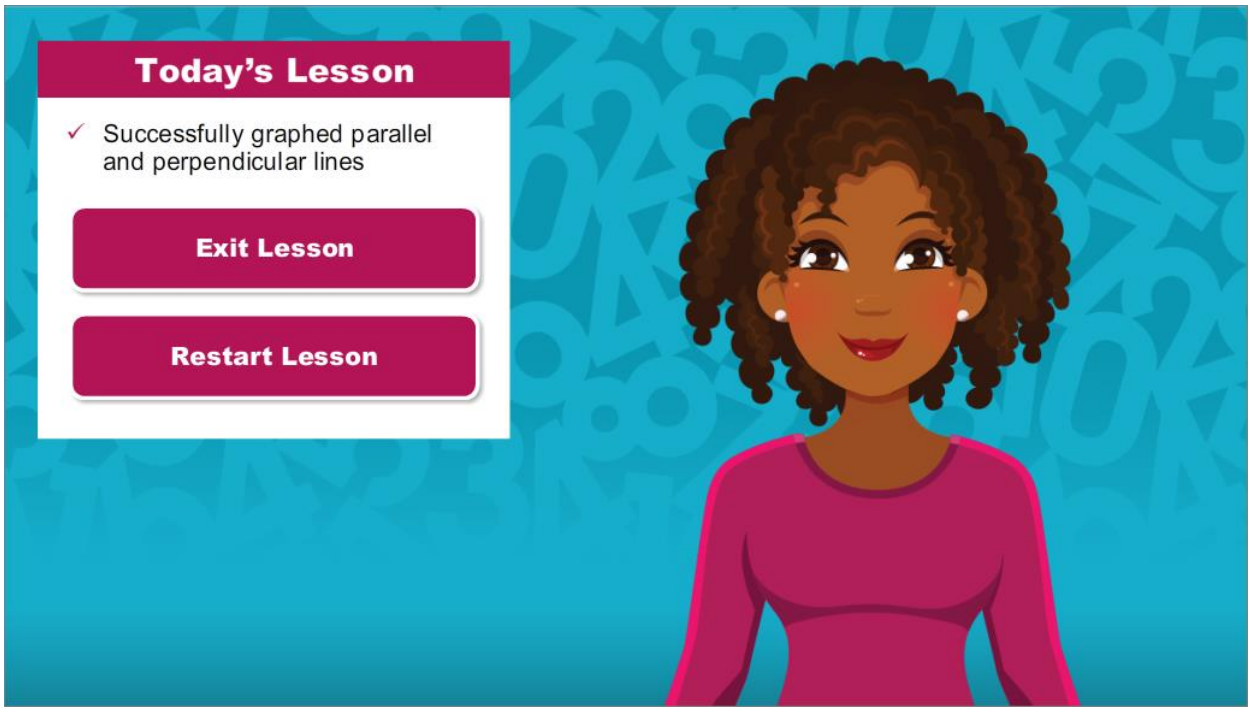
Solve the problem in the image above to check your understanding of the content.

Self-Check 2: Answer



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

Conclusion



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