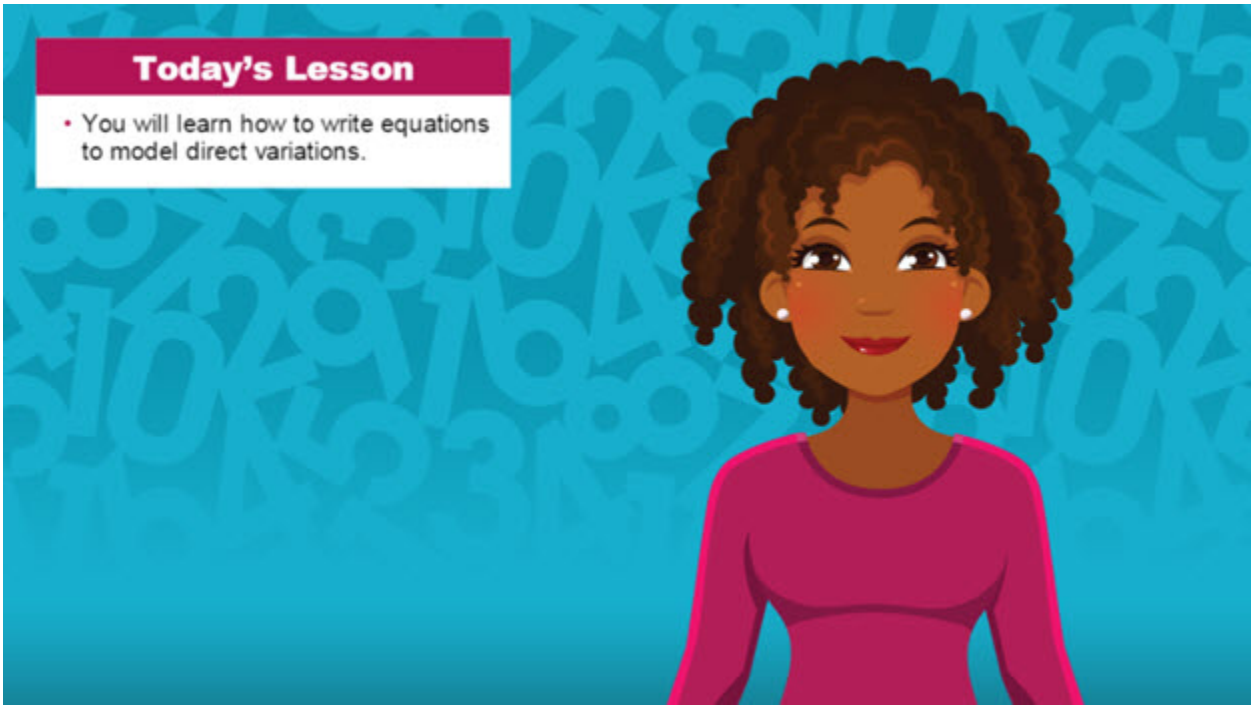
# Module 11: Direct and Inverse Variation
## Topic 2 Content: Writing Direct Variation Equations Notes

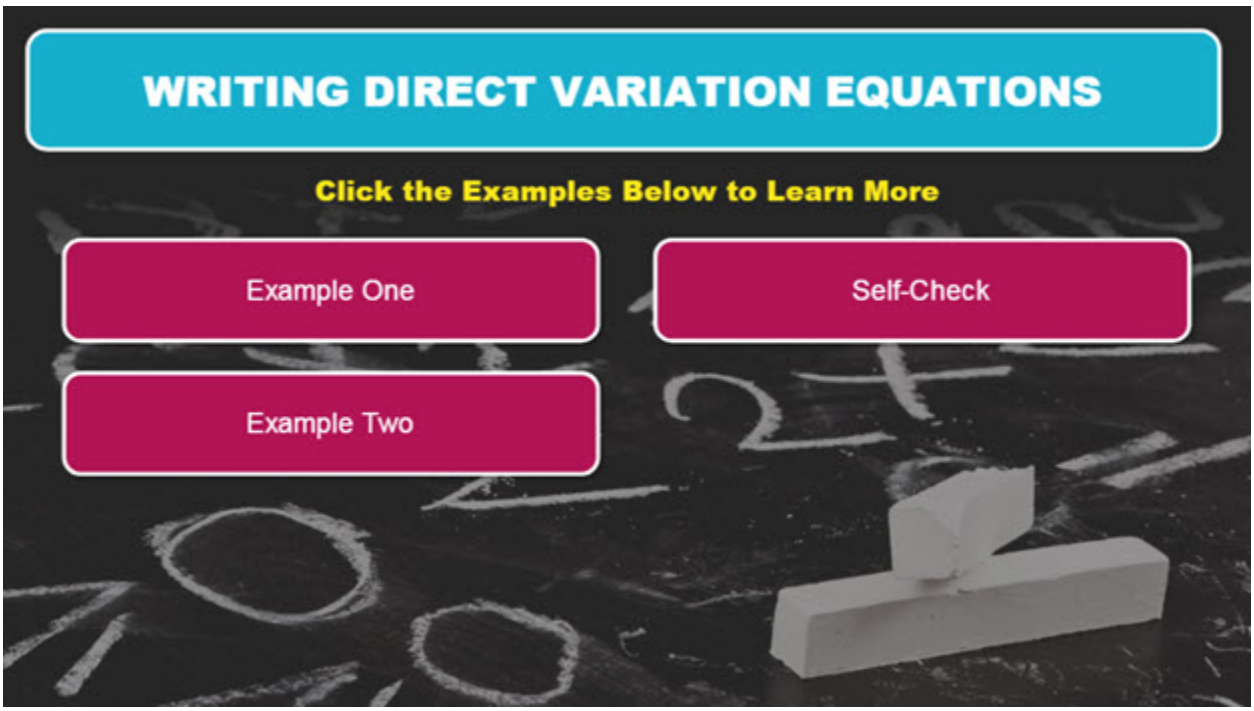
### Introduction




Hello and welcome! I'm so glad to have you here for this lesson in Algebra I, where you will learn how to write equations to model direct variations.

# Module 11: Direct and Inverse Variation
## Topic 2 Content: Writing Direct Variation Equations Notes

### Writing Direct Variation Equations

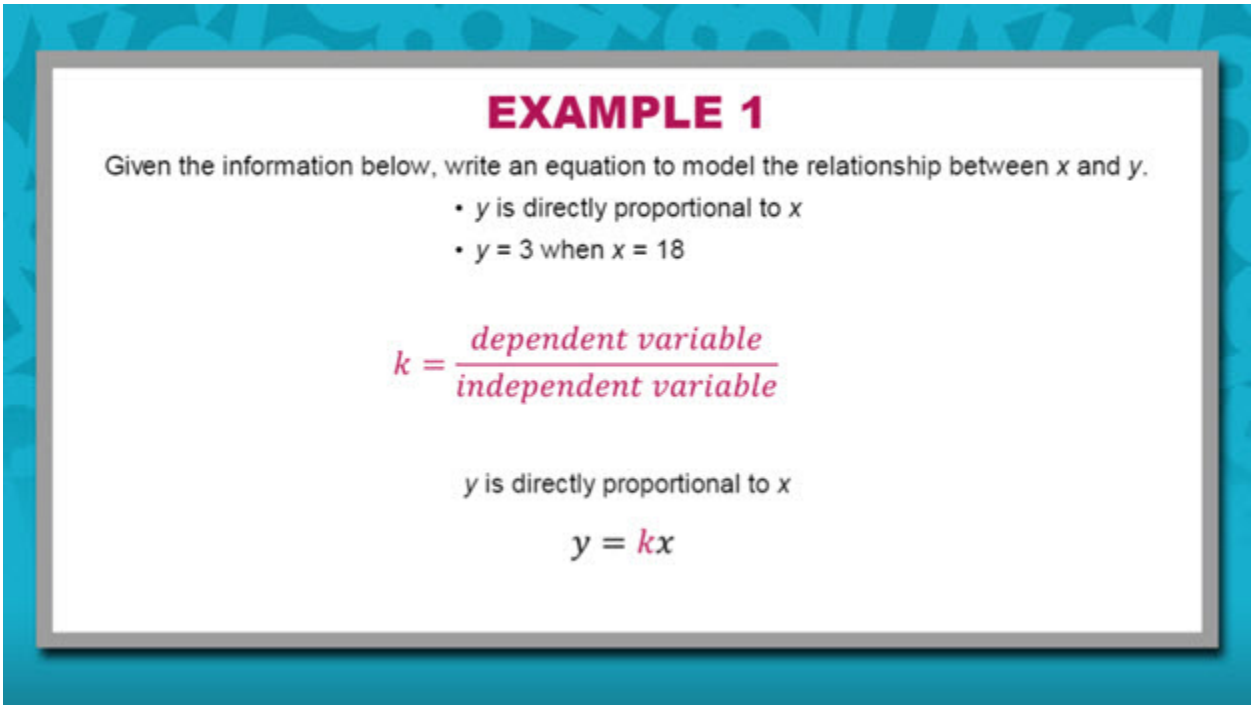



Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

# Module 11: Direct and Inverse Variation
## Topic 2 Content: Writing Direct Variation Equations Notes

**Example One**




Given the information below, write an equation to model the relationship between $x$ and $y$.

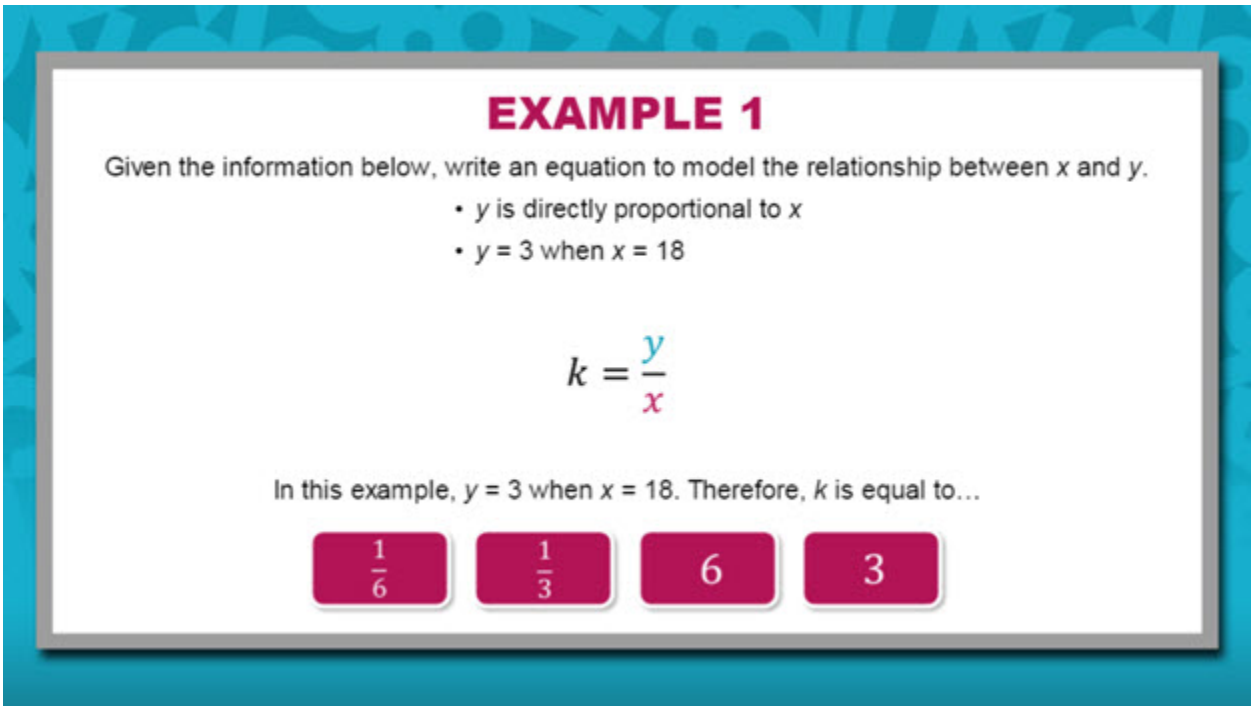
- $y$ is directly proportional to $x$
- $y = 3$ when $x = 18$

In a direct variation, the constant of proportionality is a ratio of the dependent variable to the independent variable. The value is represented by the variable, $k$.

$$k = \frac{dependent\ variable}{independent\ variable}$$

The statement "$y$ is directly proportional to $x$" can be modeled by the equation $y = kx$.

**Example One (continued)**




Given the information below, write an equation to model the relationship between $x$ and $y$.

- $y$ is directly proportional to $x$
- $y = 3$ when $x = 18$

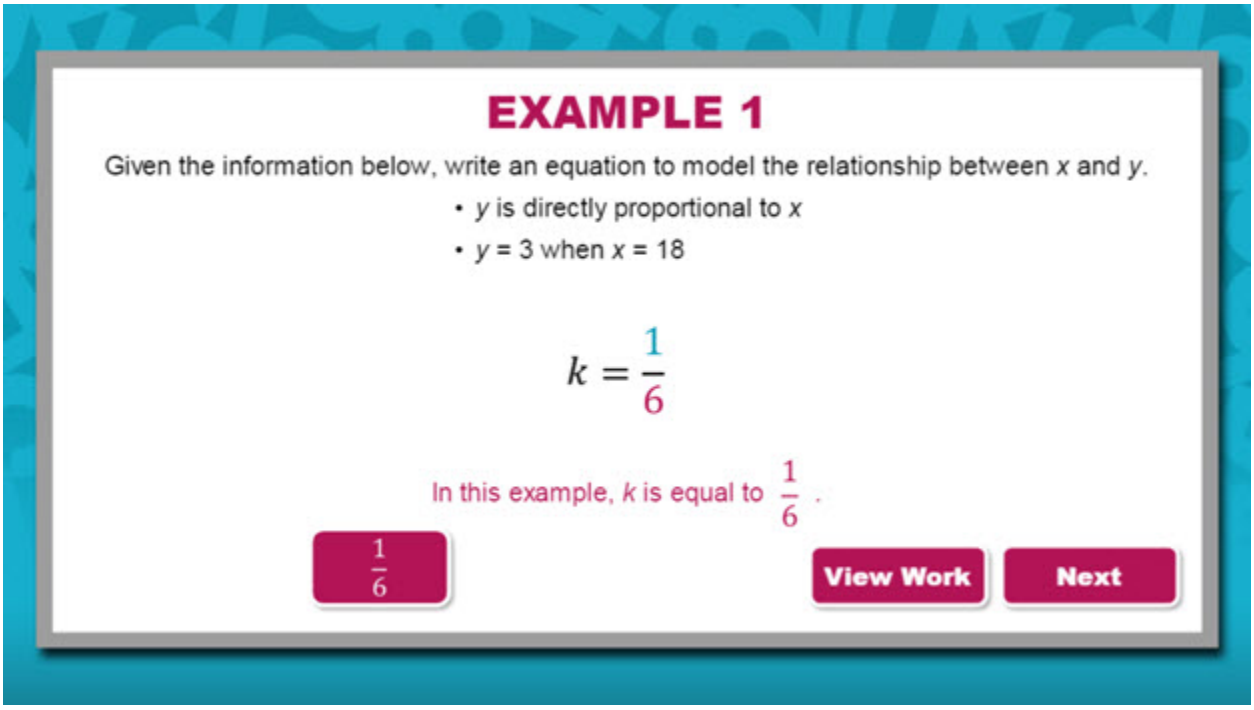
$$k = \frac{y}{x}$$

To write a direct variation equation to model the given situation, begin by finding $k$. Remember, $k$ is a ratio of the dependent variable, $y$, to the independent variable, $x$.

In this example, $y = 3$, when $x = 18$. Therefore, $k$ is equal to…

A) $\frac{1}{6}$
B) $\frac{1}{3}$
C) 6
D) 3

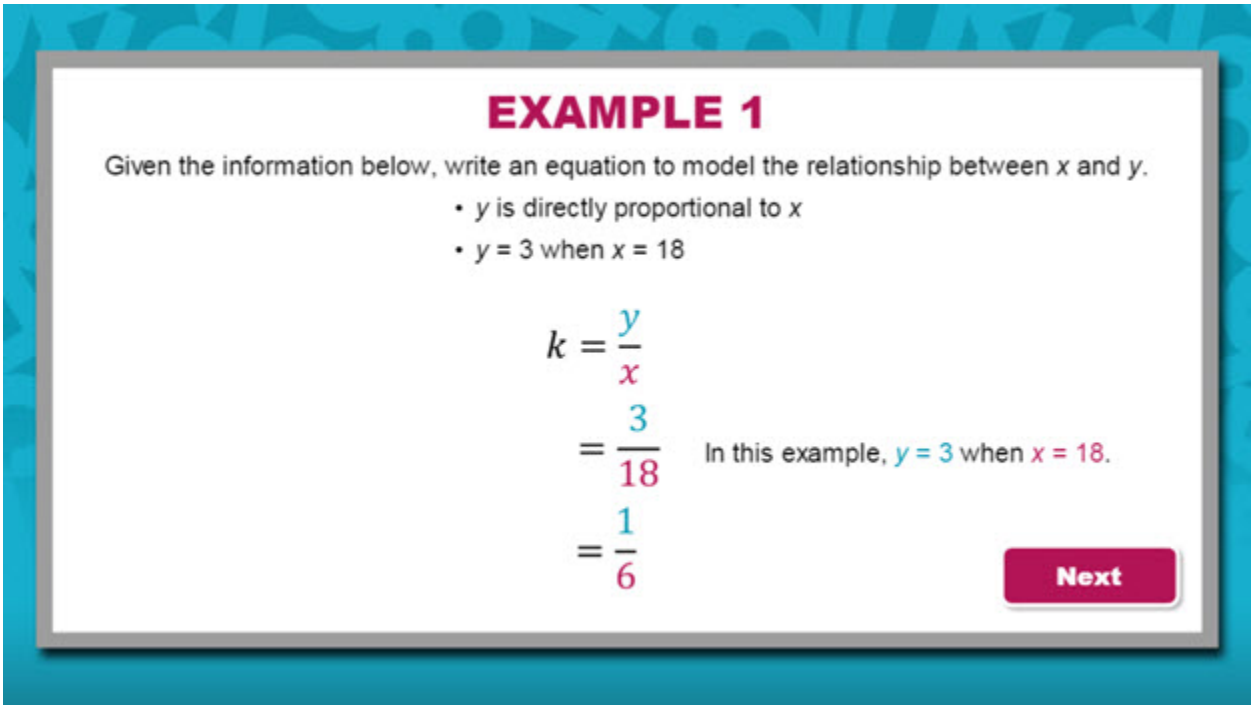
Example One (continued)




$$k = \frac{1}{6}$$

In this example, $k$ is equal to $\frac{1}{6}$.

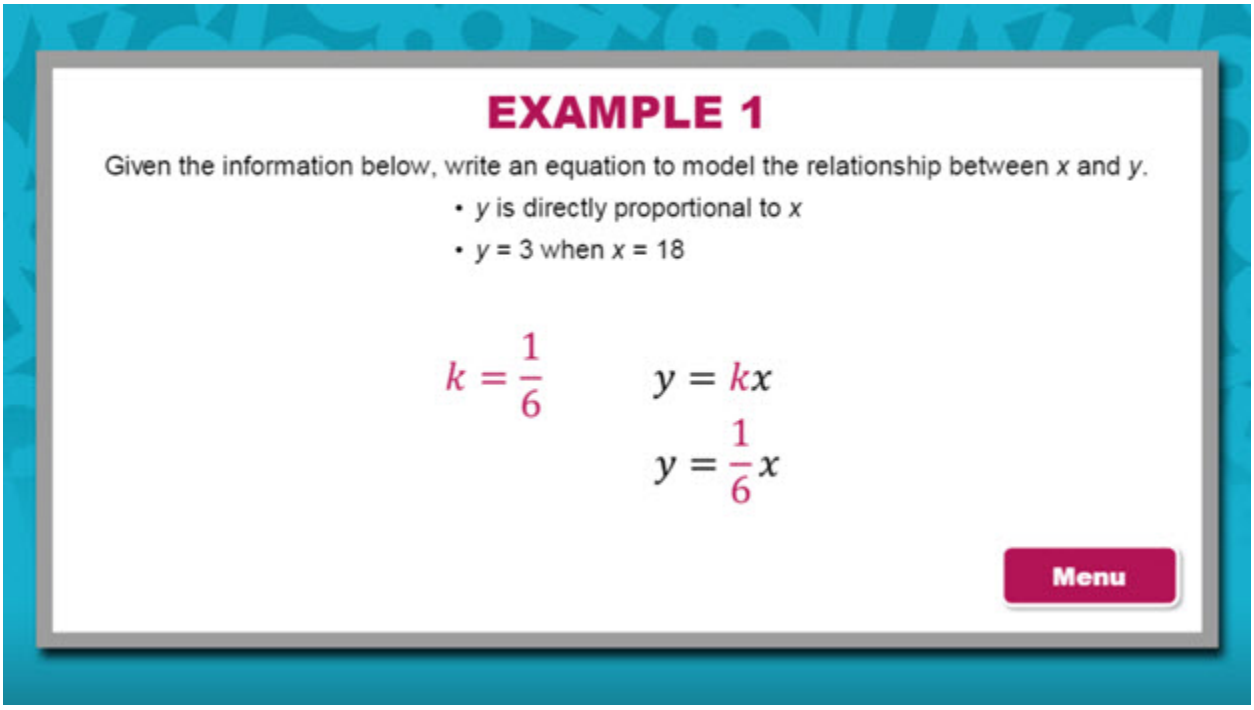
Example One (continued)




In this example, $y = 3$, when $x = 18$.

$$k = \frac{y}{x}$$
$$= \frac{3}{18}$$
$$= \frac{1}{6}$$

Example One (continued)




Given the information below, write an equation to model the relationship between $x$ and $y$.

- $y$ is directly proportional to $x$
- $y = 3$ when $x = 18$

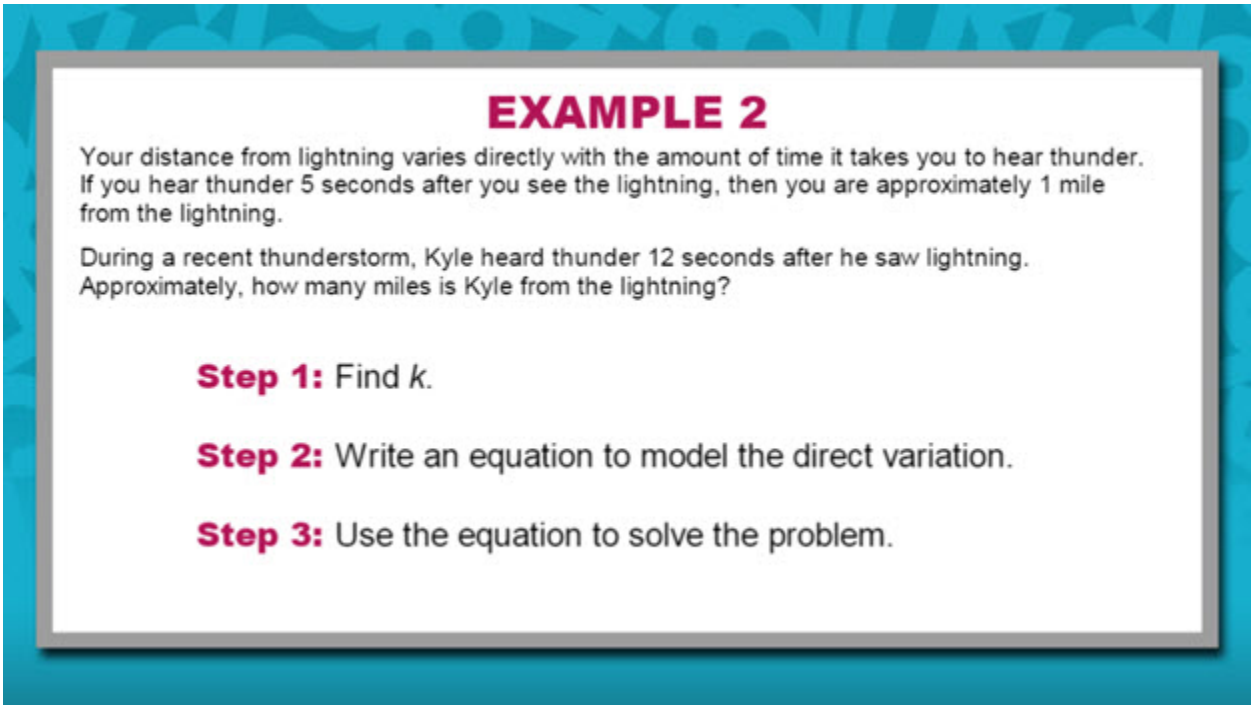
$$k = \frac{1}{6} \qquad y = kx$$

$$y = \frac{1}{6}x$$

Now that you know that $k = \frac{1}{6}$, you have the information needed to write the equation.

Substitute $\frac{1}{6}$ for $k$. The equation to model this direct variation is $y = \frac{1}{6}x$.

Example Two




*Your distance from lightning varies directly with the amount of time it takes you to hear thunder. If you hear thunder 5 seconds after you see the lightning, then you are approximately 1 mile from the lightning.*

*During a recent thunderstorm, Kyle heard thunder 12 seconds after he saw lightning. Approximately, how many miles is Kyle from the lightning?*

In the given situation, your distance from lightning varies directly with the amount of time it takes you to hear thunder. Therefore, the situation is a direct variation.

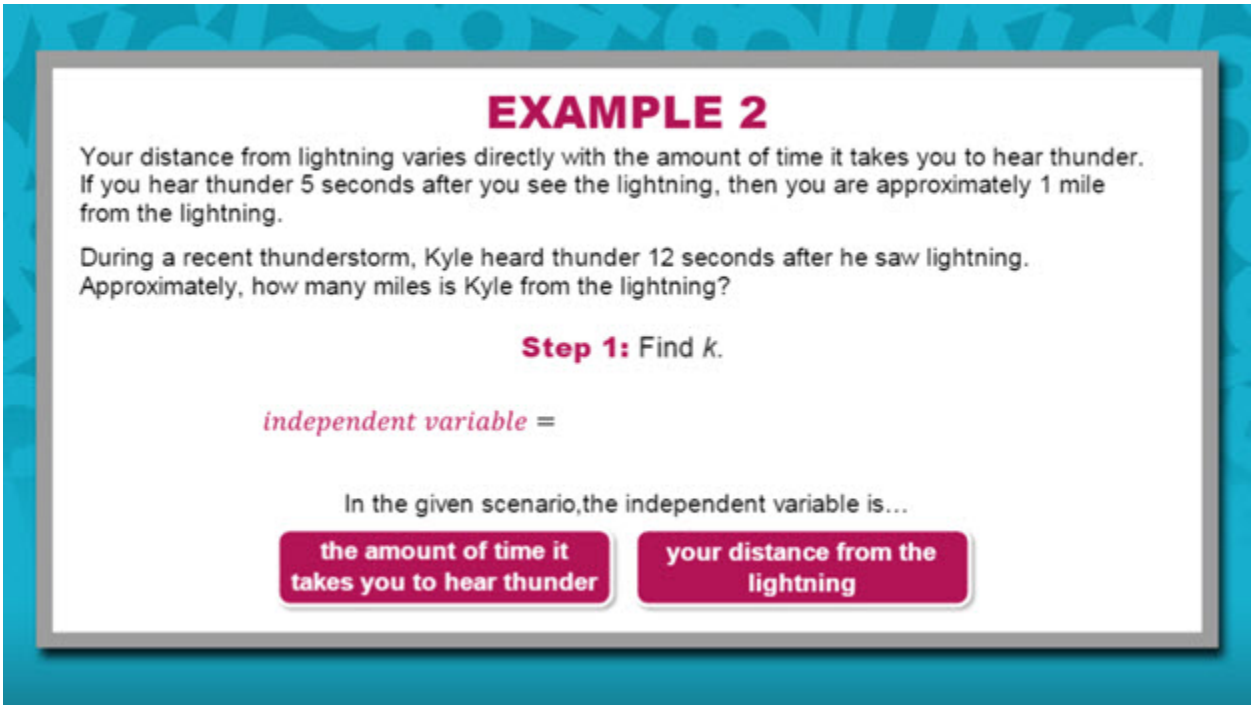
You can use the following steps to solve a practical problem involving a direct variation:

**Step 1**: Find $k$.

**Step 2**: Write an equation to model the direct variation.

**Step 3**: Use the equation to solve the problem.

Example Two (continued)




*Your distance from lightning varies directly with the amount of time it takes you to hear thunder. If you hear thunder 5 seconds after you see the lightning, then you are approximately 1 mile from the lightning.*

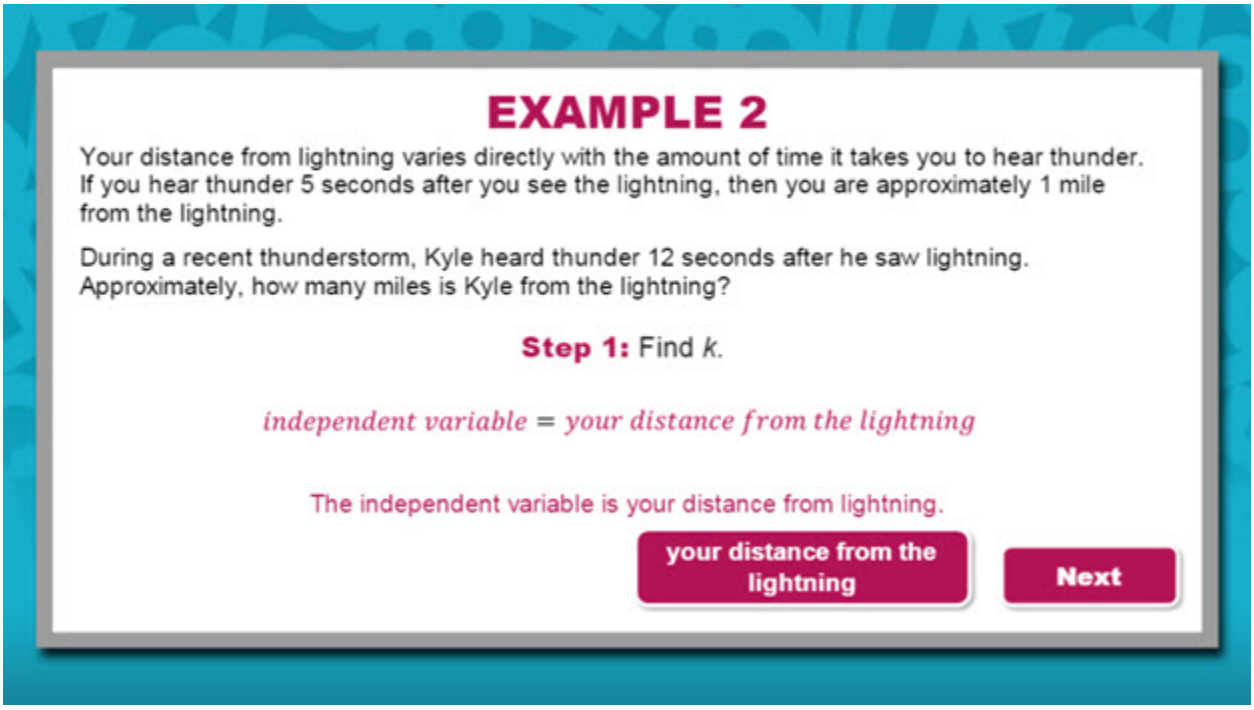
*During a recent thunderstorm, Kyle heard thunder 12 seconds after he saw lightning. Approximately, how many miles is Kyle from the lightning?*

**Step 1:** Find $k$

In the given scenario, the independent variable is….

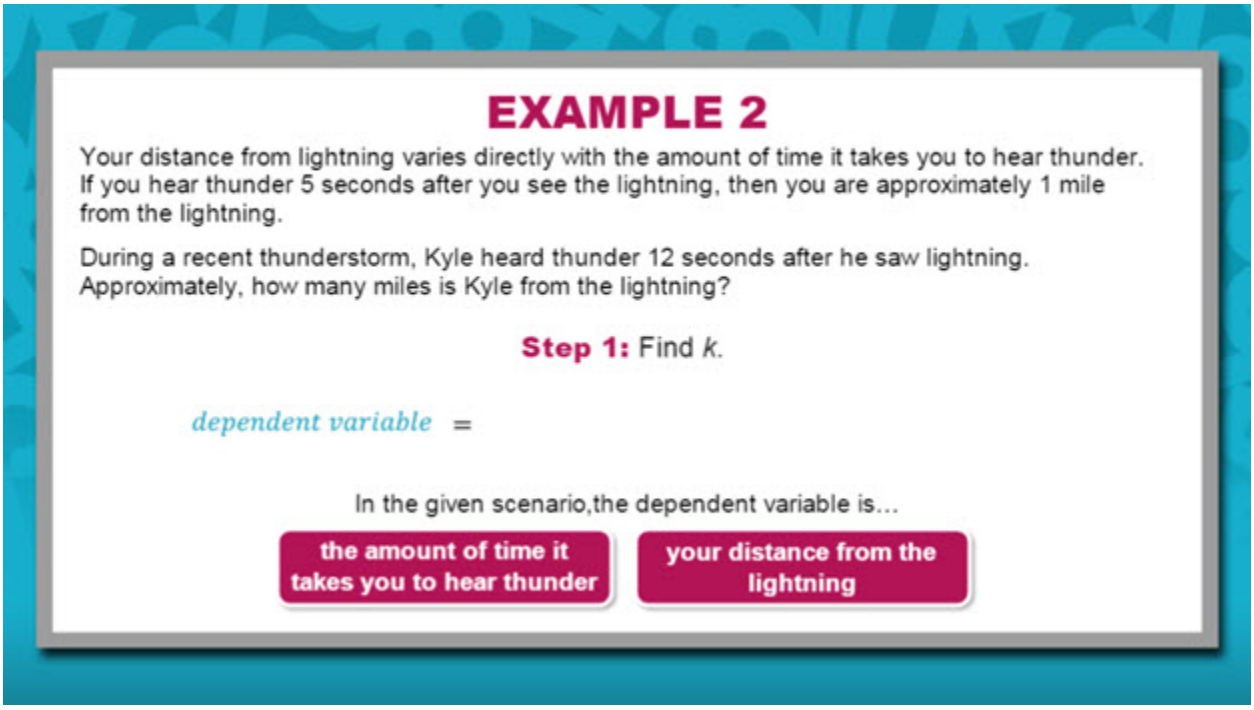
A) the amount of time it takes you to hear thunder
B) your distance from the lightning

Example Two (continued)




The independent variable is your distance from the lightning.

Example Two (continued)



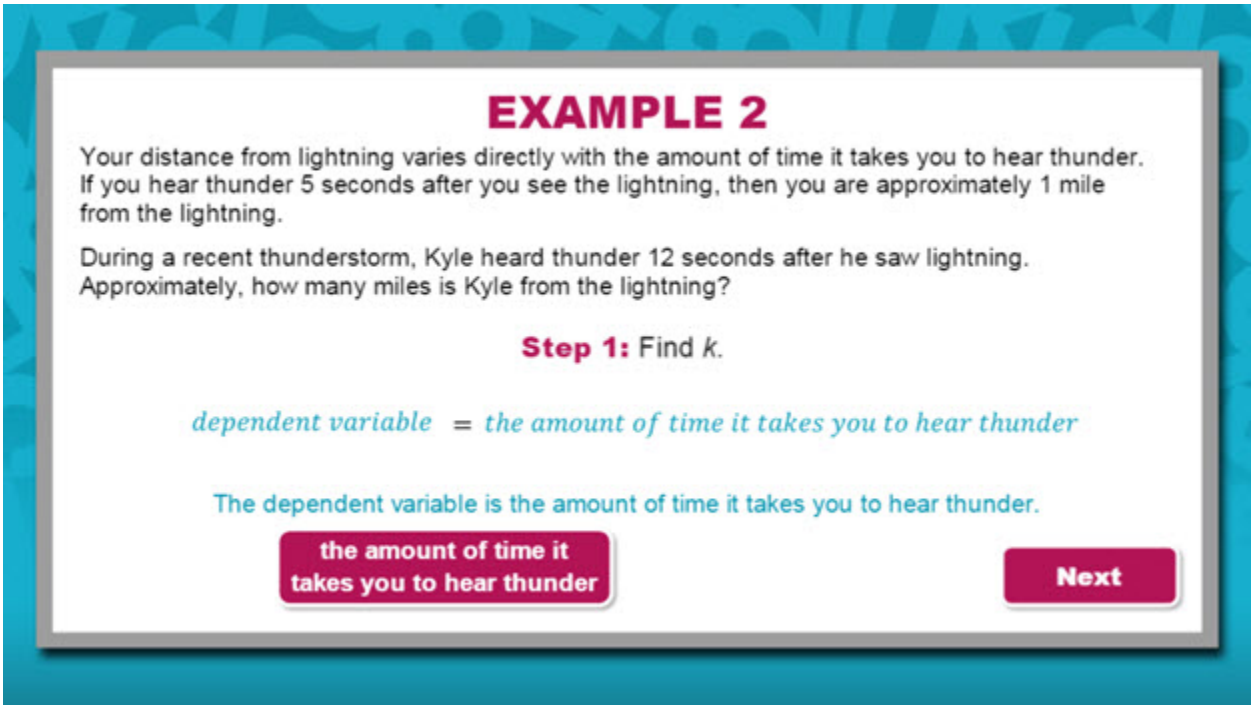

*Your distance from lightning varies directly with the amount of time it takes you to hear thunder. If you hear thunder 5 seconds after you see the lightning, then you are approximately 1 mile from the lightning.*

*During a recent thunderstorm, Kyle heard thunder 12 seconds after he saw lightning. Approximately, how many miles is Kyle from the lightning?*

In the given scenario, the dependent variable is….

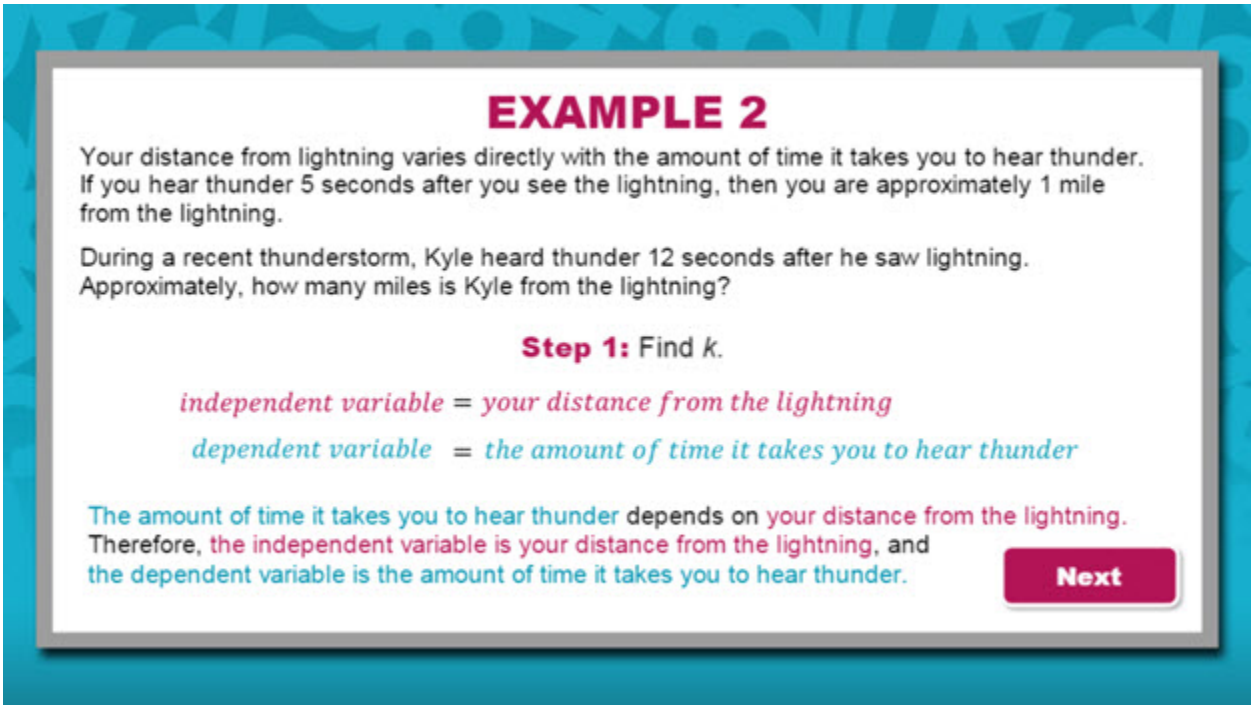
A) the amount of time it takes you to hear thunder
B) your distance from the lightning

Example Two (continued)




The independent variable is the amount of time it takes you the hear thunder.

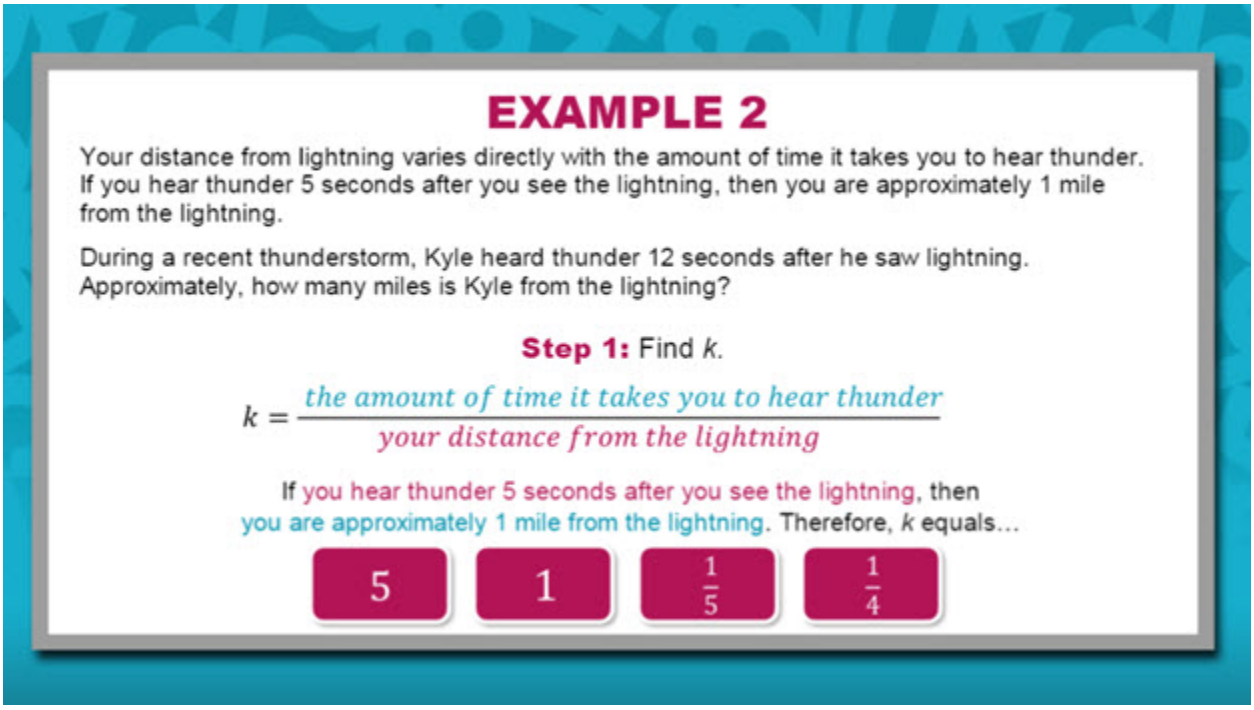
Example Two (continued)




The amount of time it takes you to hear thunder depends on your distance from the lightning. Therefore,

- the independent variable is your distance from the lightning; and
- the dependent variable is the amount of time it takes you to hear thunder.

**Example Two (continued)**




**Step 1:** Find $k$

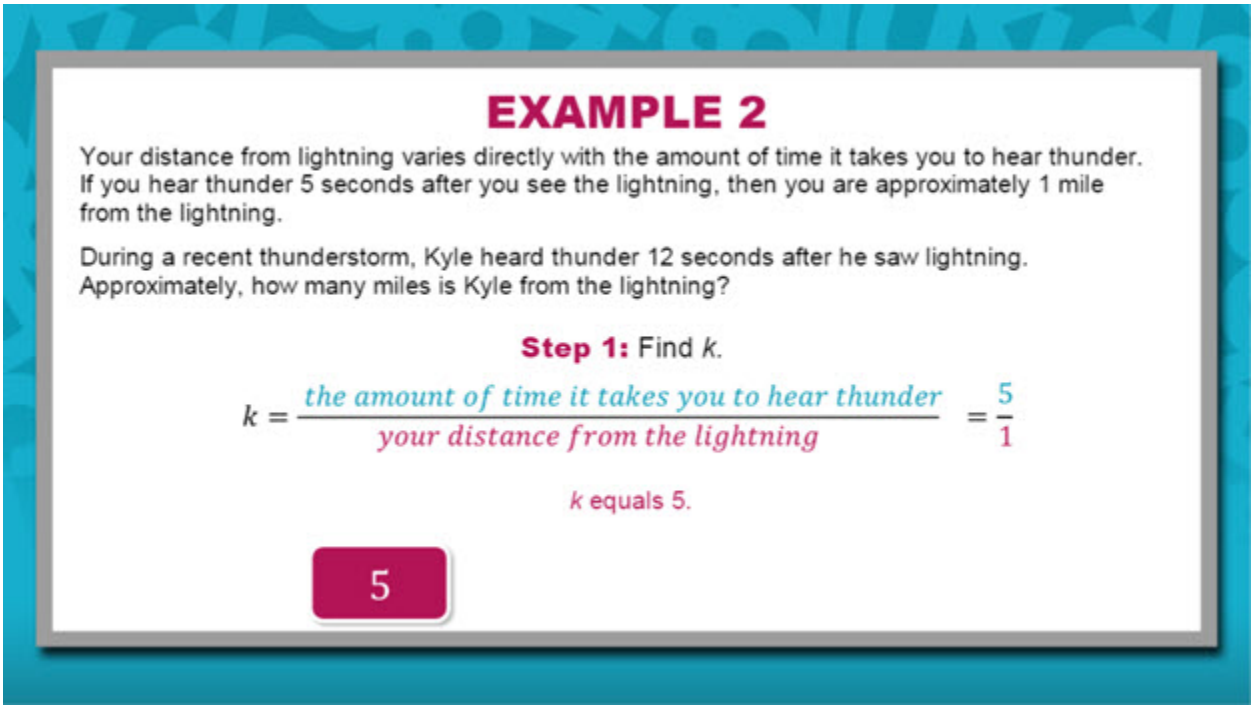
$$k = \frac{dependent\ variable}{independent\ variable} = \frac{the\ amount\ of\ time\ it\ takes\ you\ to\ hear\ thunder}{your\ distance\ from\ the\ lightning}$$

Now that you have identified the dependent and independent variables, you can use the given information to find $k$.

If you hear thunder 5 seconds after you see the lightning, then you are approximately 1 mile from the lightning. Therefore, $k$ equals…

A) 5
B) 1
C) $\frac{1}{5}$
D) $\frac{1}{4}$

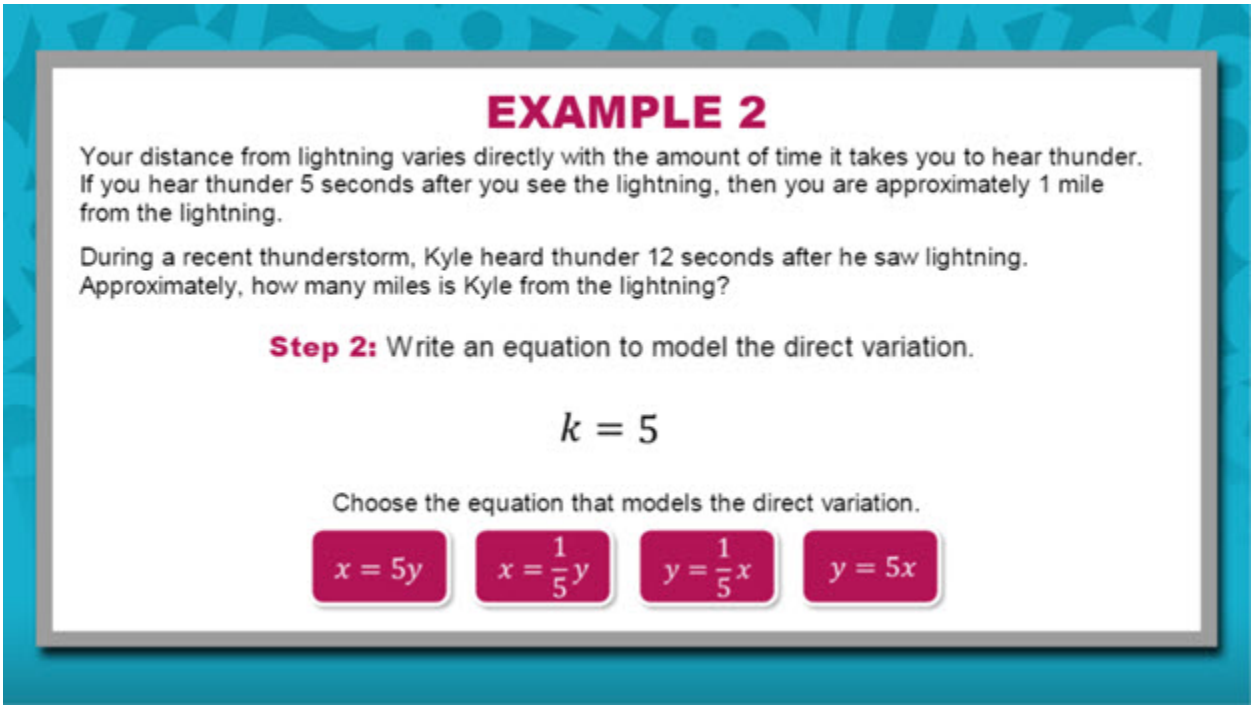
Example Two (continued)




$$k = \frac{\textit{the amount of time it takes you to hear thunder}}{\textit{your distance from the lightning}} = \frac{5}{1}$$

$k$ equals 5.

Example Two (continued)



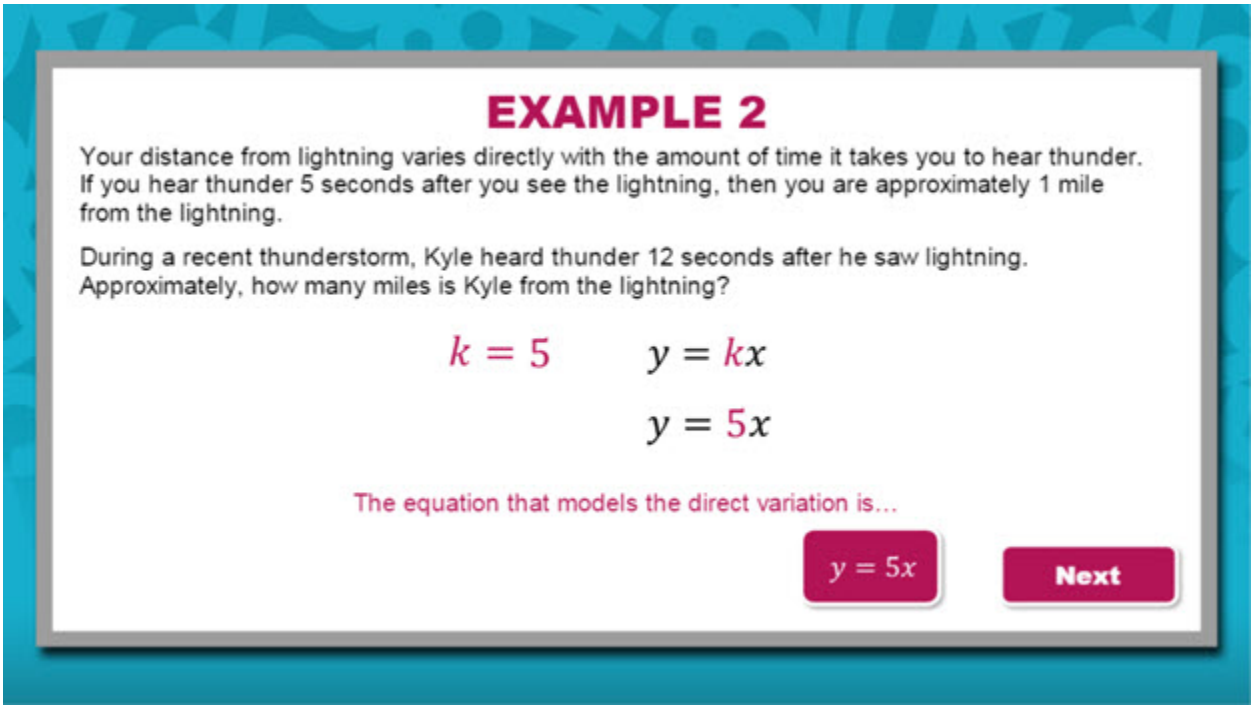

**Step 2:** Write an equation to model the direct variation.

Now that you have found $k$, you can write an equation to represent the direct variation.

Choose the equation that models the direct variation.

A) $x = 5y$
B) $x = \frac{1}{5}y$
C) $y = \frac{1}{5}x$
D) $y = 5x$

Example Two (continued)

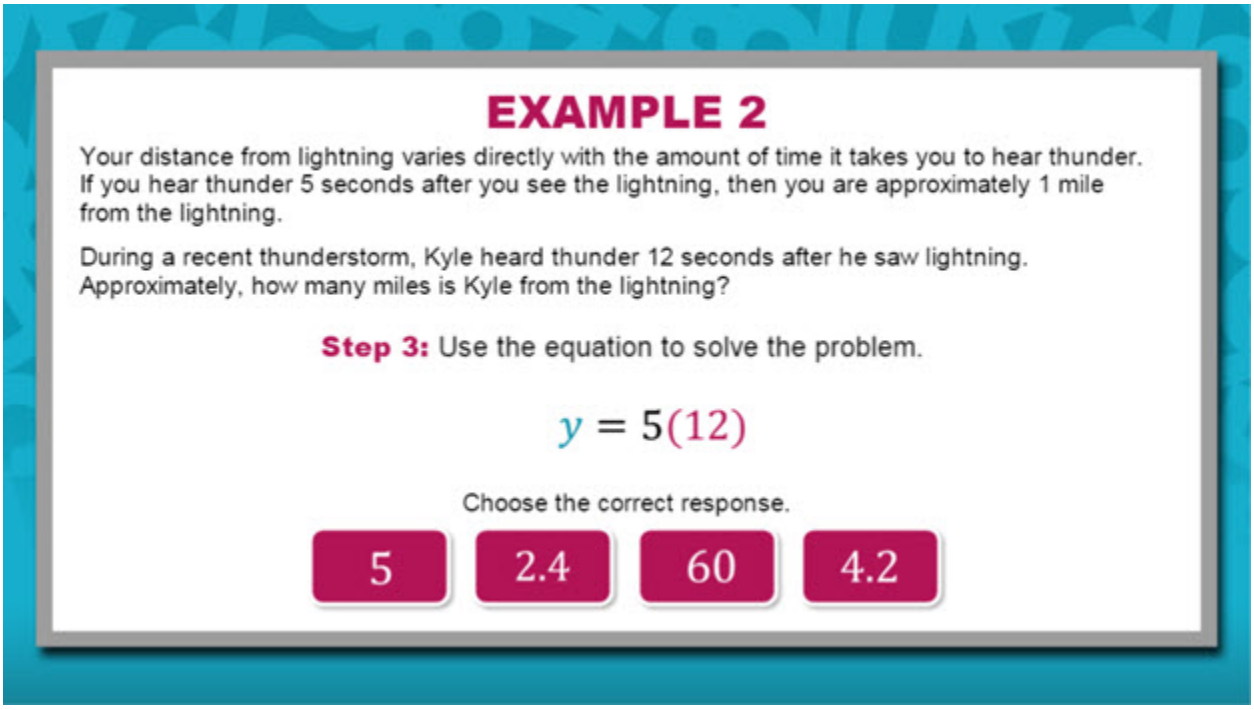



$k = 5$ $\quad y = kx$

$y = 5x$

The equation that models the direct variation is $y = 5x$.

Example Two (continued)




**Step 3:** Use the equation to solve the problem.

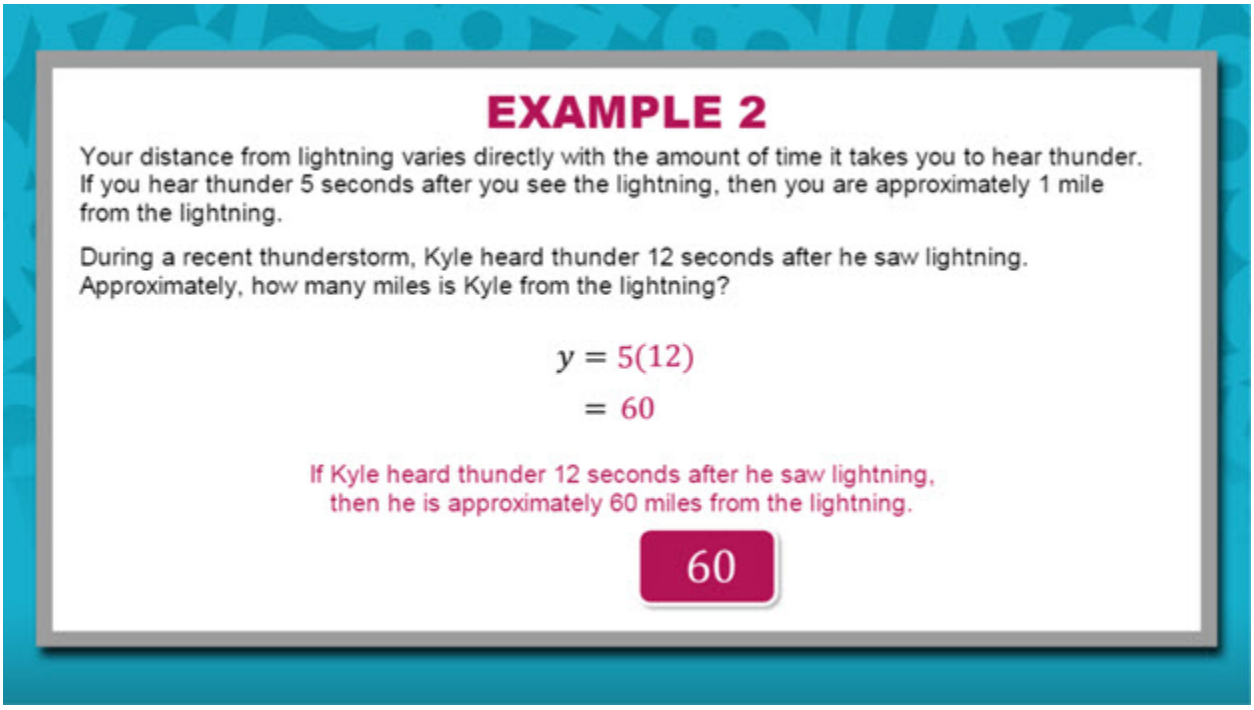
$$y = 5x$$

$$y = 5(12)$$

In the equation, $y$ represents Kyle's distance from the lightning and $x$ represents the amount of time it takes him to hear thunder. Substitute 12 for $x$. Then, evaluate the expression on the right side of the equation to determine Kyle's distance from the lightning. Choose the correct response.

A) 5
B) 2.4
C) 60
D) 4.2

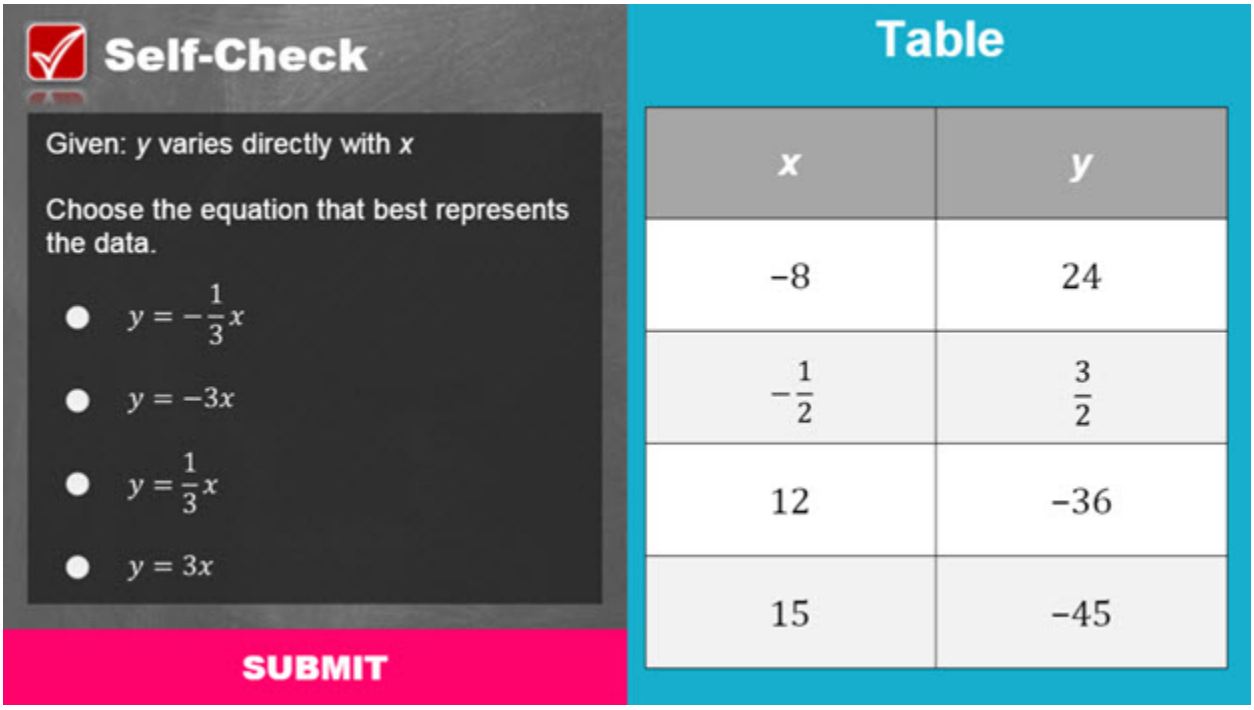
Example Two (continued)




$$y = 5(12)$$
$$= 60$$

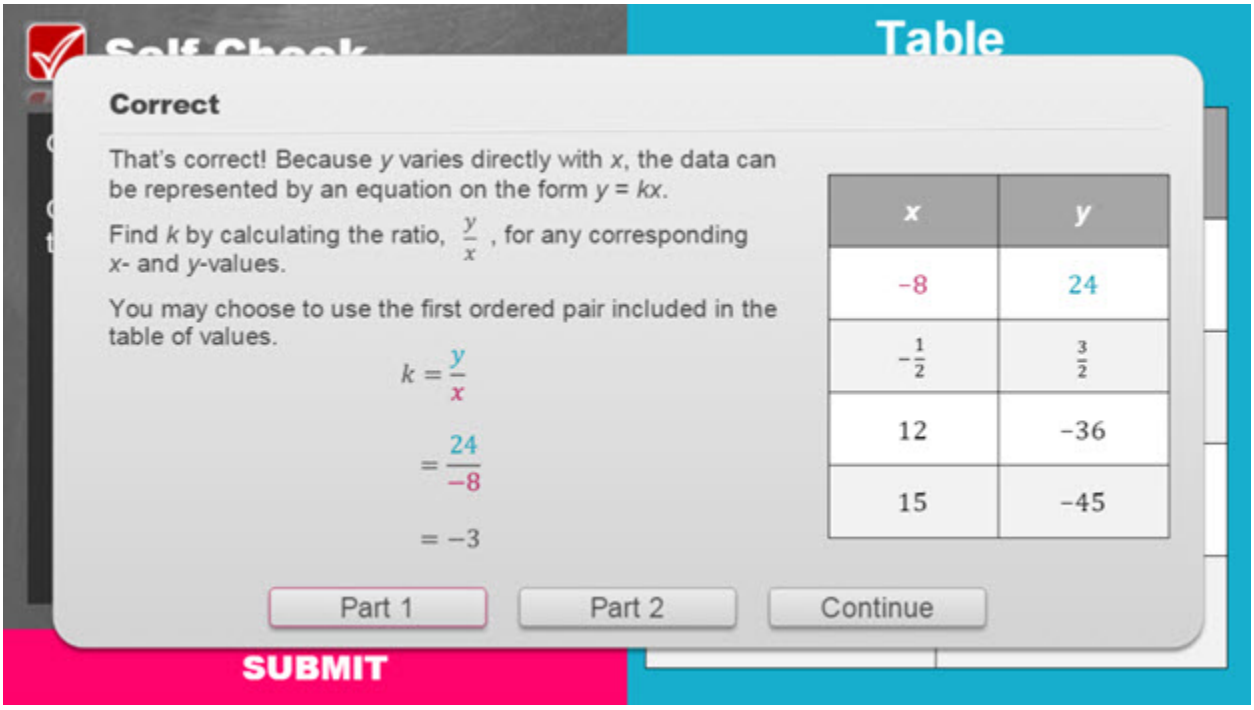
If Kyle heard thunder 12 seconds after he saw lightning, then he is approximately 60 miles from the lightning.

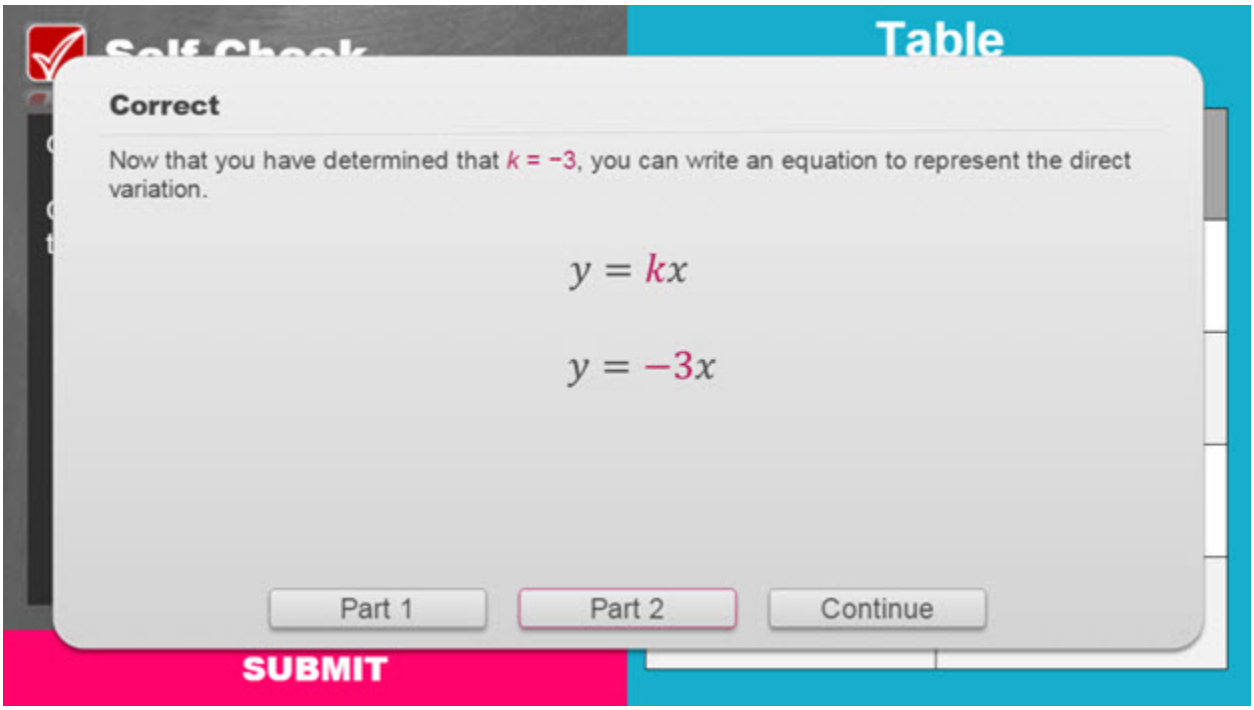
Self-Check 1




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

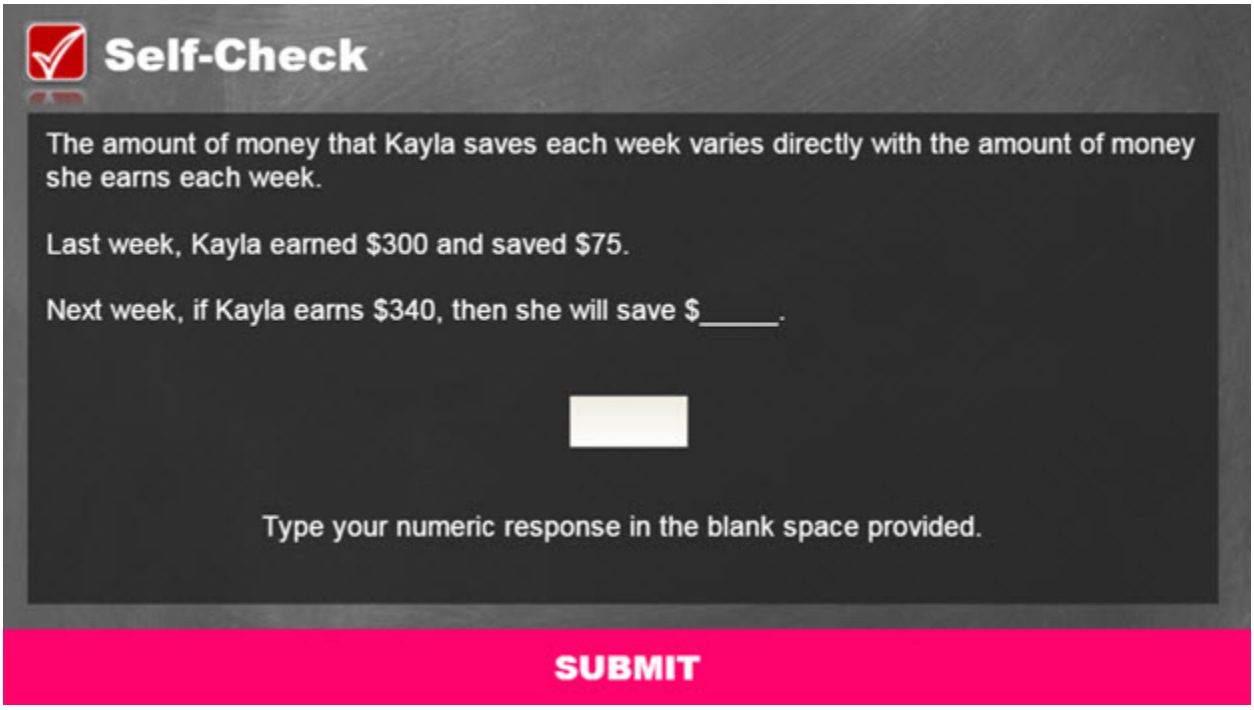
## Self-Check 1: Answer



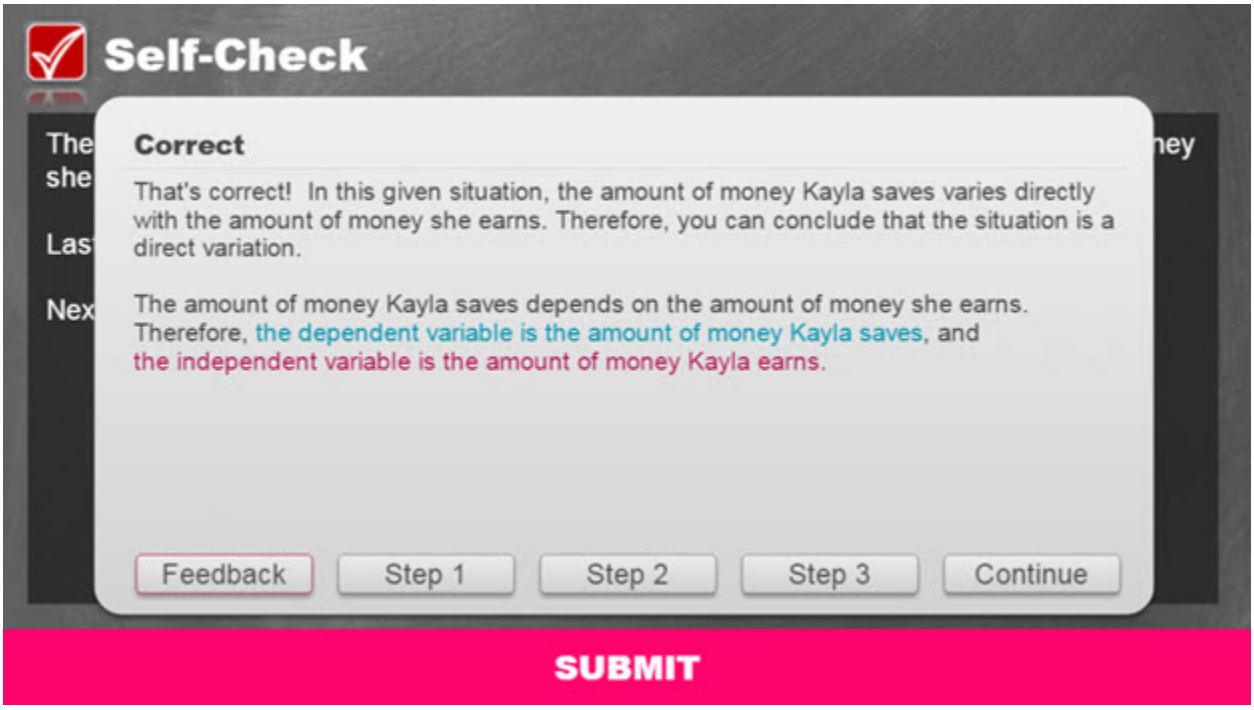

For your reference, the images above show the correct solution to the self-check problem.

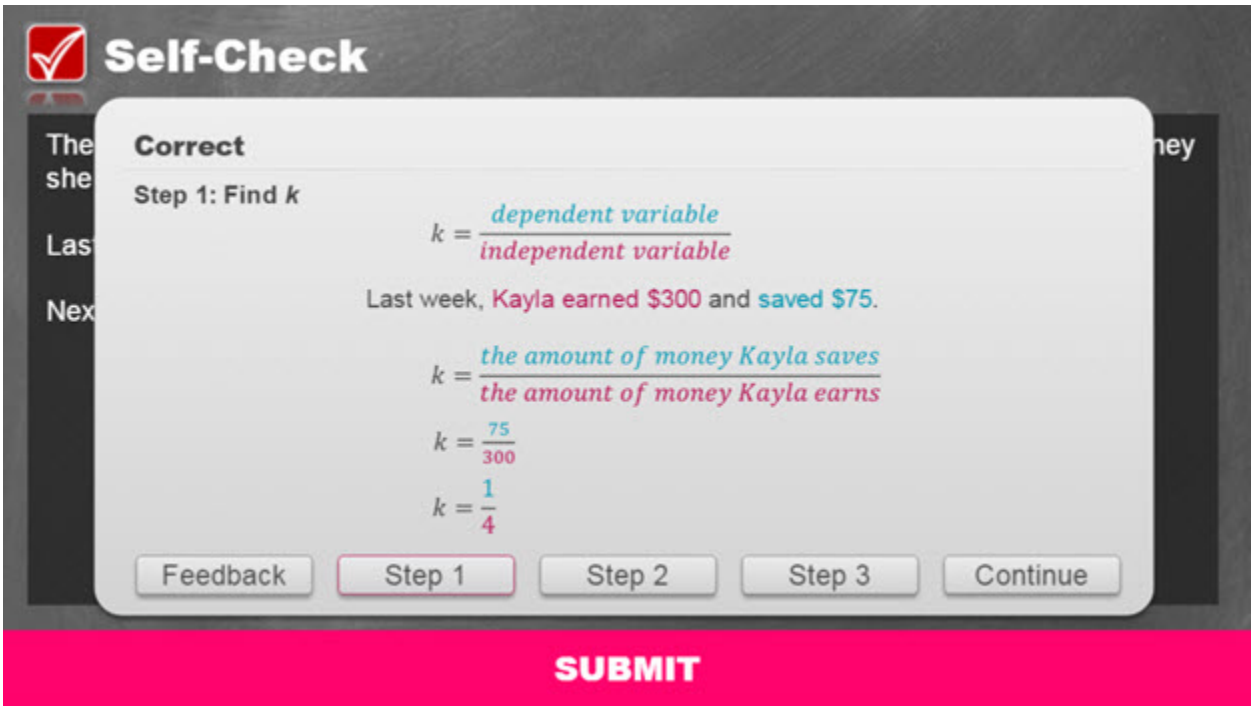
Self-Check 2




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

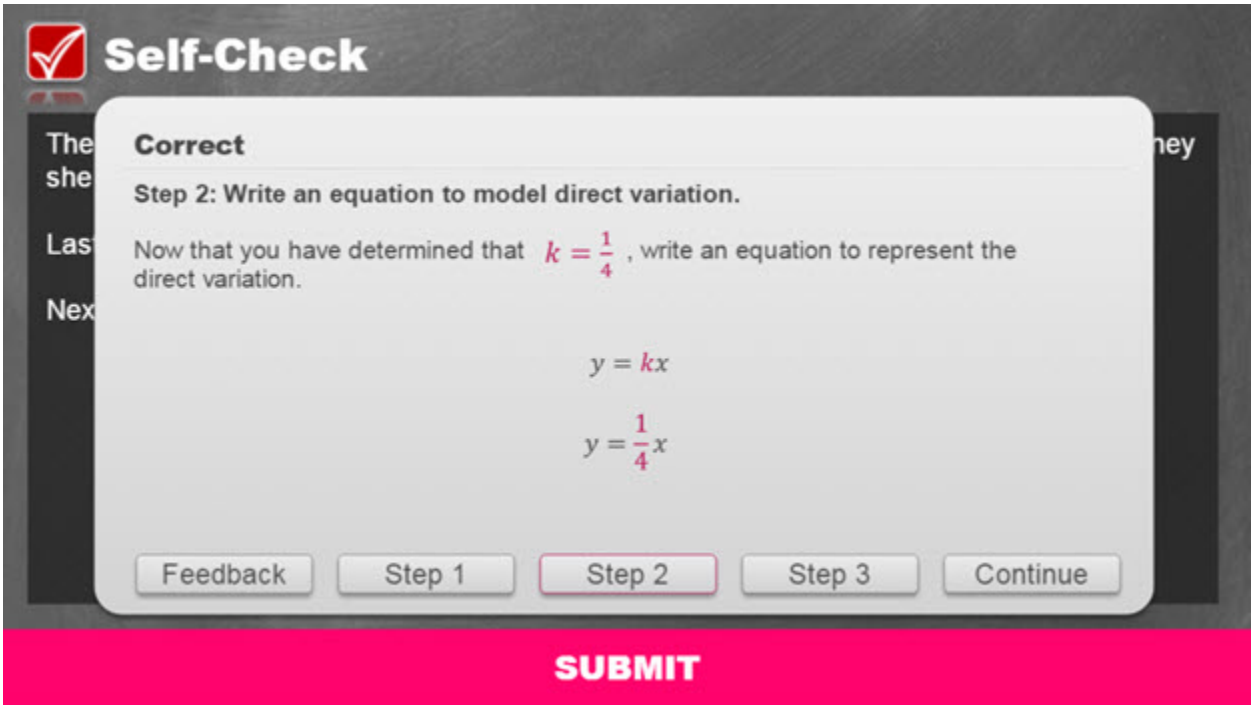
Self-Check 2: Answer

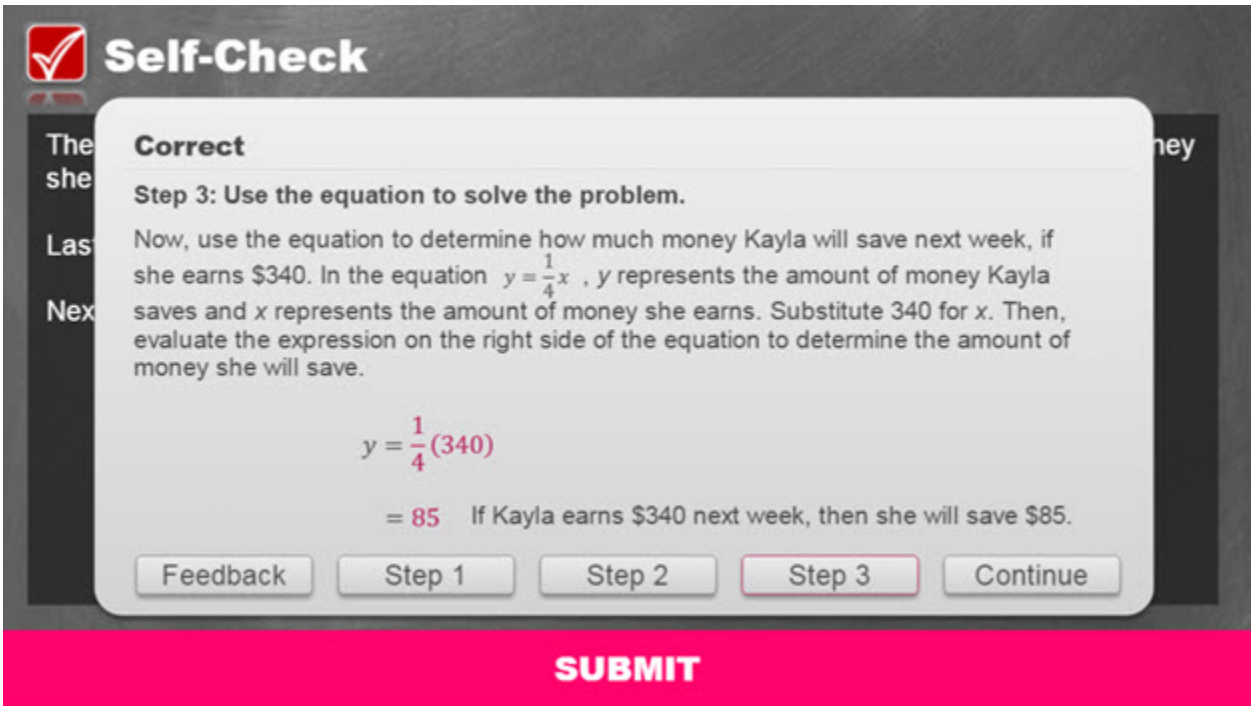



For your reference, the images above show the correct solution to the self-check problem.

Self-Check 2: Answer (continued)




For your reference, the images above show the correct solution to the self-check problem.

## Conclusion


You have reached the conclusion of this lesson where you learned how to write equations to model direct variations.