Module 11: Direct and Inverse Variation
Topic 1 Content: Exploring Direct Variations Notes

Introduction

Hello there! I'm so glad you could join me for this lesson in Algebra I, where you will explore data sets and practical situations that represent direct variations.

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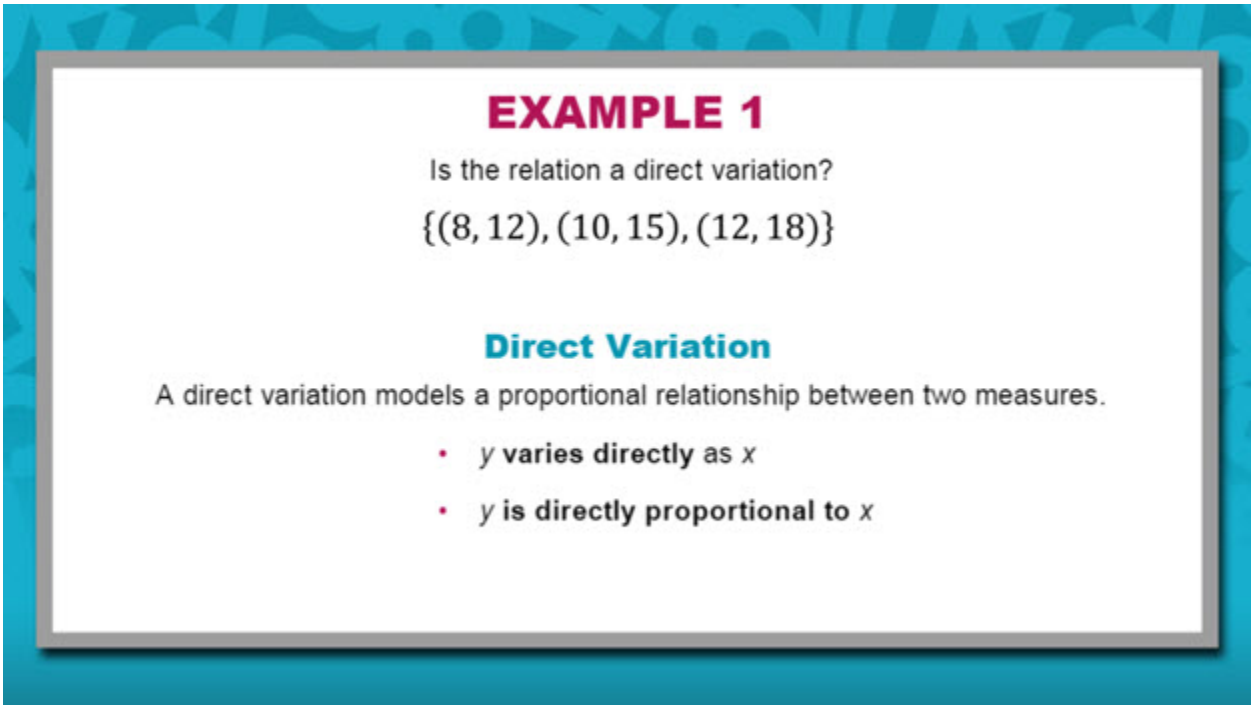
Exploring Direct Variations

Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Example One

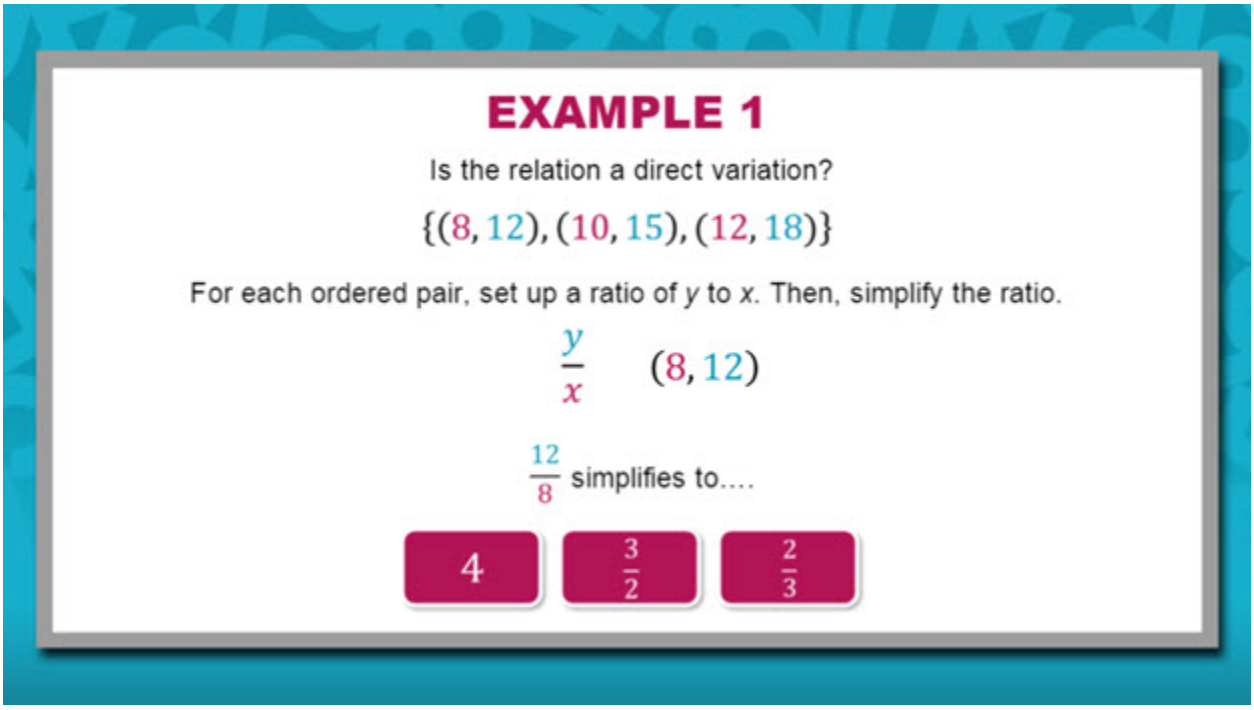


Is the relation a direct variation?

$\{(8, 12), (10, 15), (12, 18)\}$

A direct variation models a proportional relationship between two measures. When a direct variation exists, "y varies directly as x" or in other words, "y is directly proportional to x."

Example One (continued)



Is the relation a direct variation?

$\{(8, 12), (10, 15), (12, 18)\}$

For each ordered pair, set up a ratio of y to x. Then, simplify the ratio.

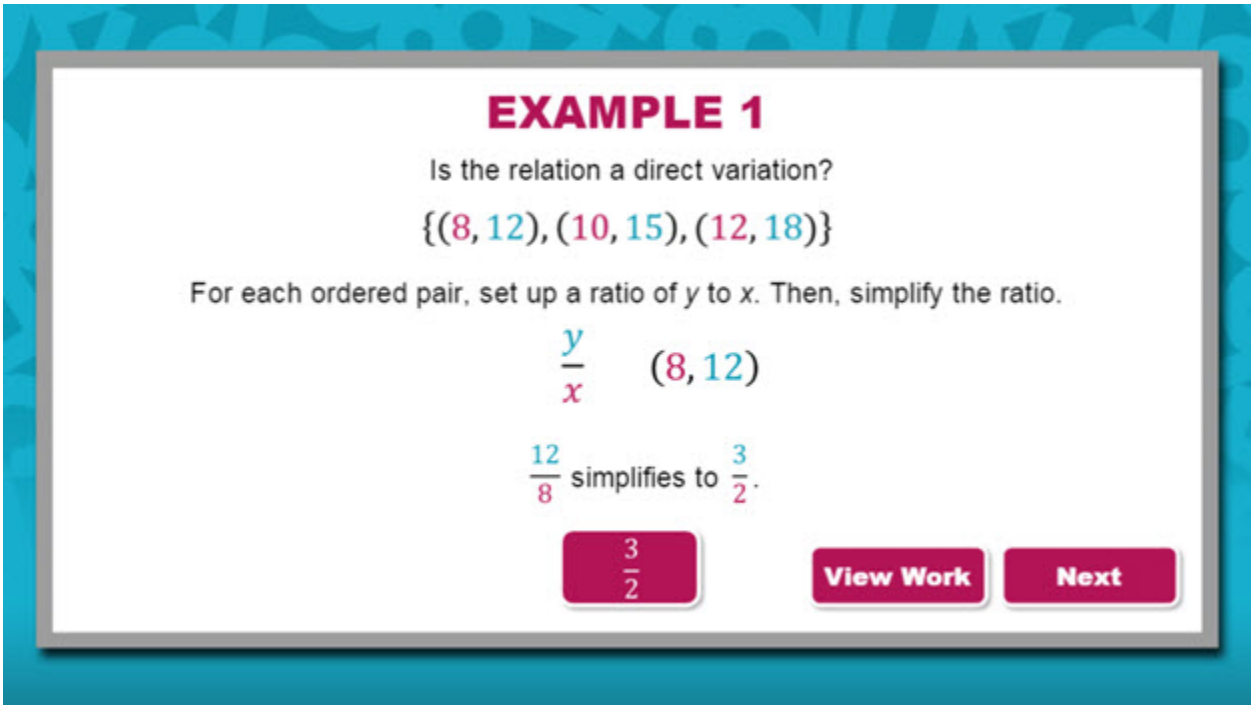
$$\frac{y}{x}$$

$(8, 12)$

$\frac{12}{8}$ simplifies to…

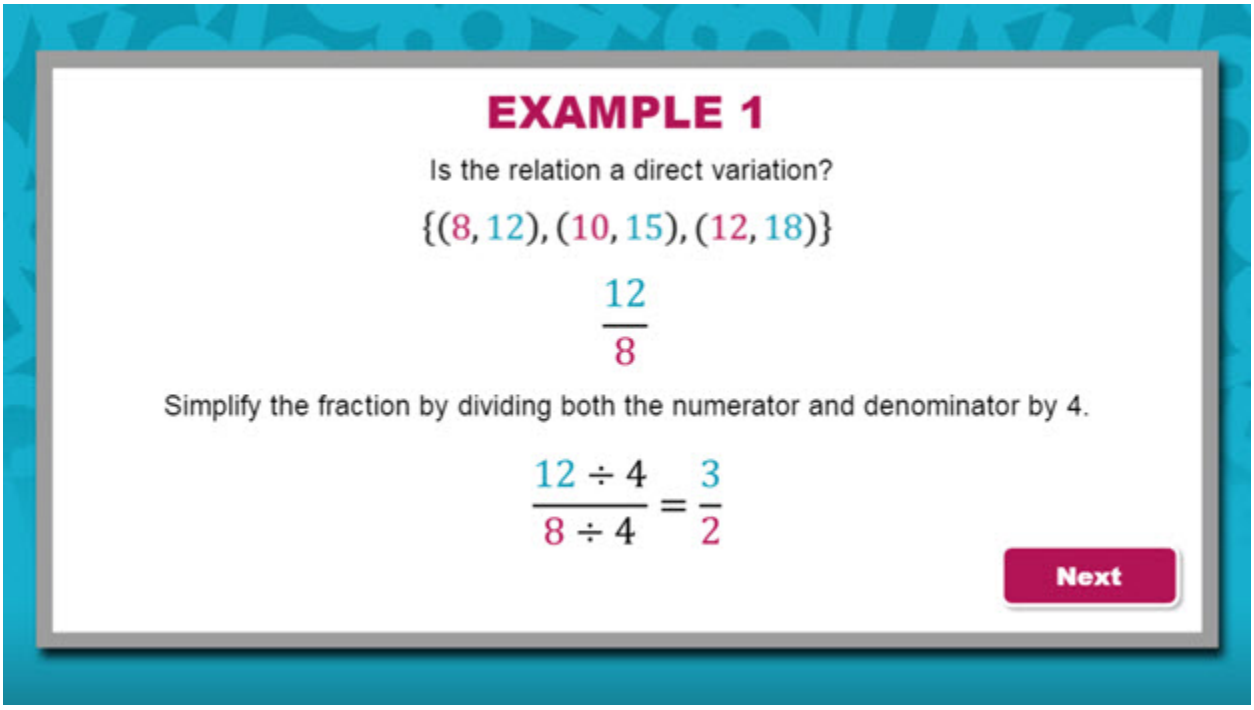
A) 4
B) $\frac{3}{2}$
C) $\frac{2}{3}$

Example One (continued)



$\frac{12}{8}$ simplifies to $\frac{3}{2}$.

Example One (continued)

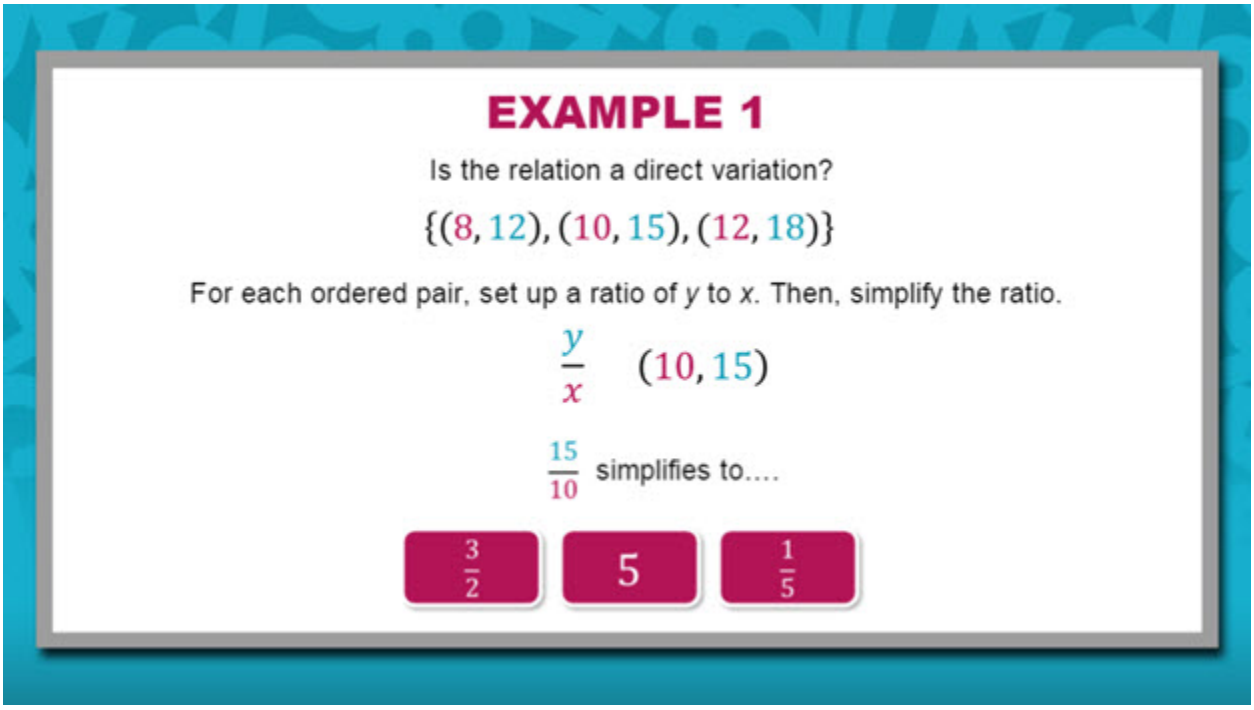


$$\frac{12}{8}$$

Simplify the fraction by dividing both the numerator and denominator by 4.

$$\frac{12 \div 4}{8 \div 4} = \frac{3}{2}$$

Example One (continued)



For each ordered pair, set up a ratio of y to x. Then, simplify the ratio.

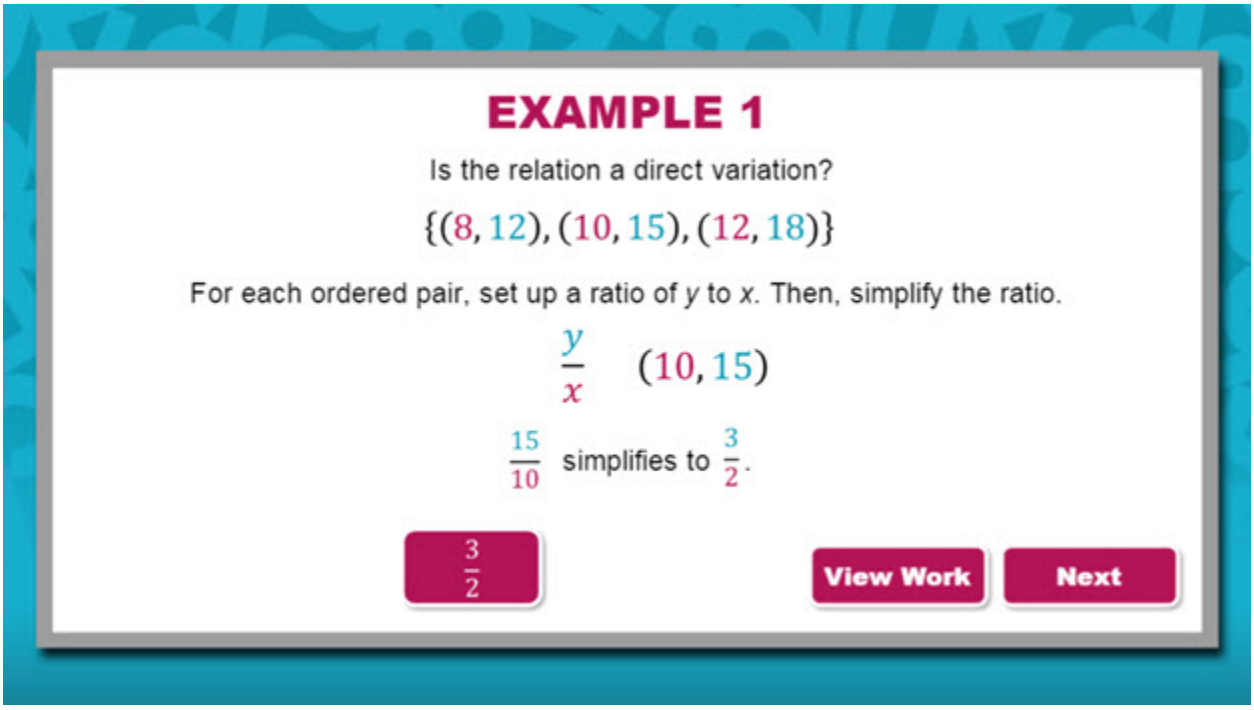
$$\frac{y}{x}$$

$$(10, 15)$$

$\frac{15}{10}$ simplifies to...

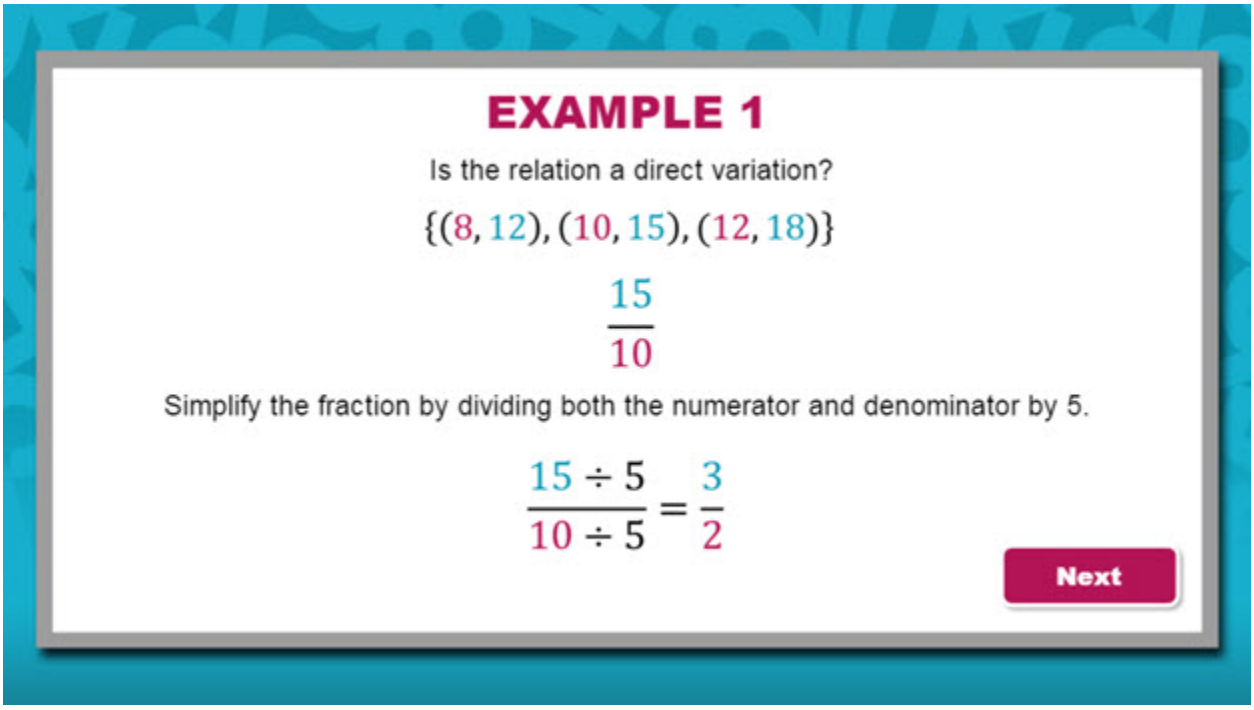
A) $\frac{3}{2}$
B) 5
C) $\frac{1}{5}$

Example One (continued)



$\frac{15}{10}$ simplifies to $\frac{3}{2}$.

Example One (continued)

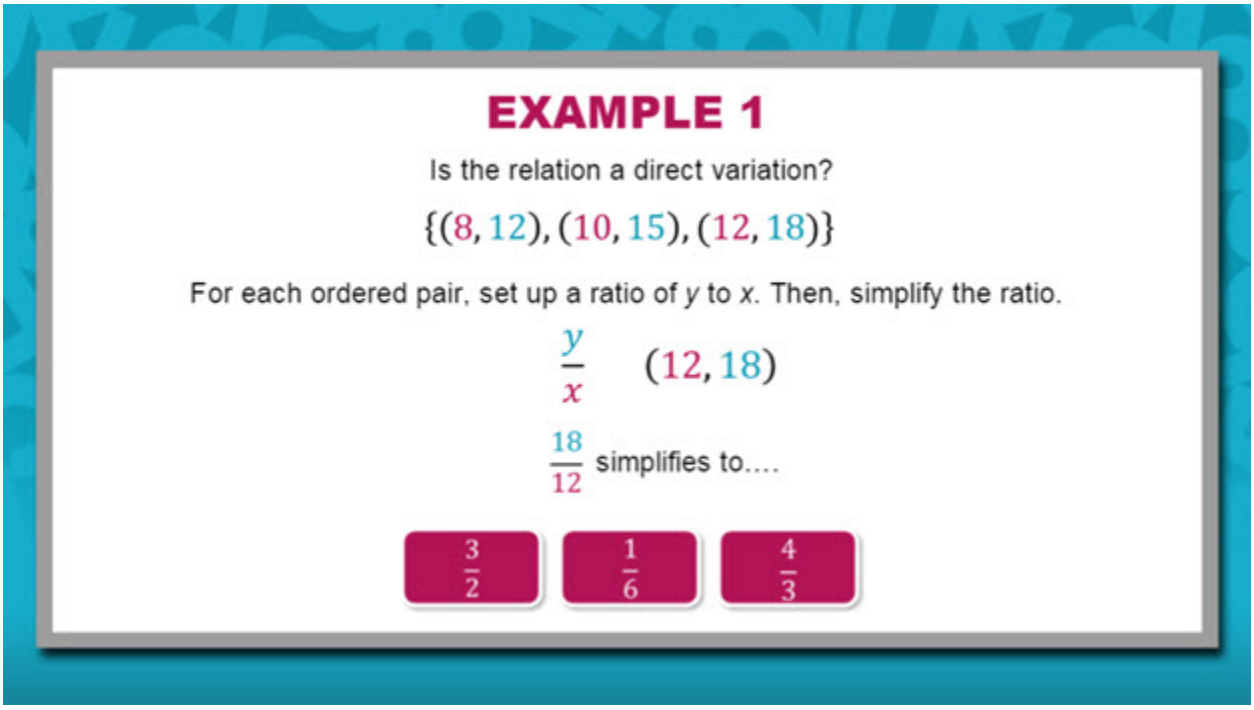


$$\frac{15}{10}$$

Simplify the fraction by dividing both the numerator and denominator by 5.

$$\frac{15 \div 5}{10 \div 5} = \frac{3}{2}$$

Example One (continued)



For each ordered pair, set up a ratio of y to x. Then, simplify the ratio.

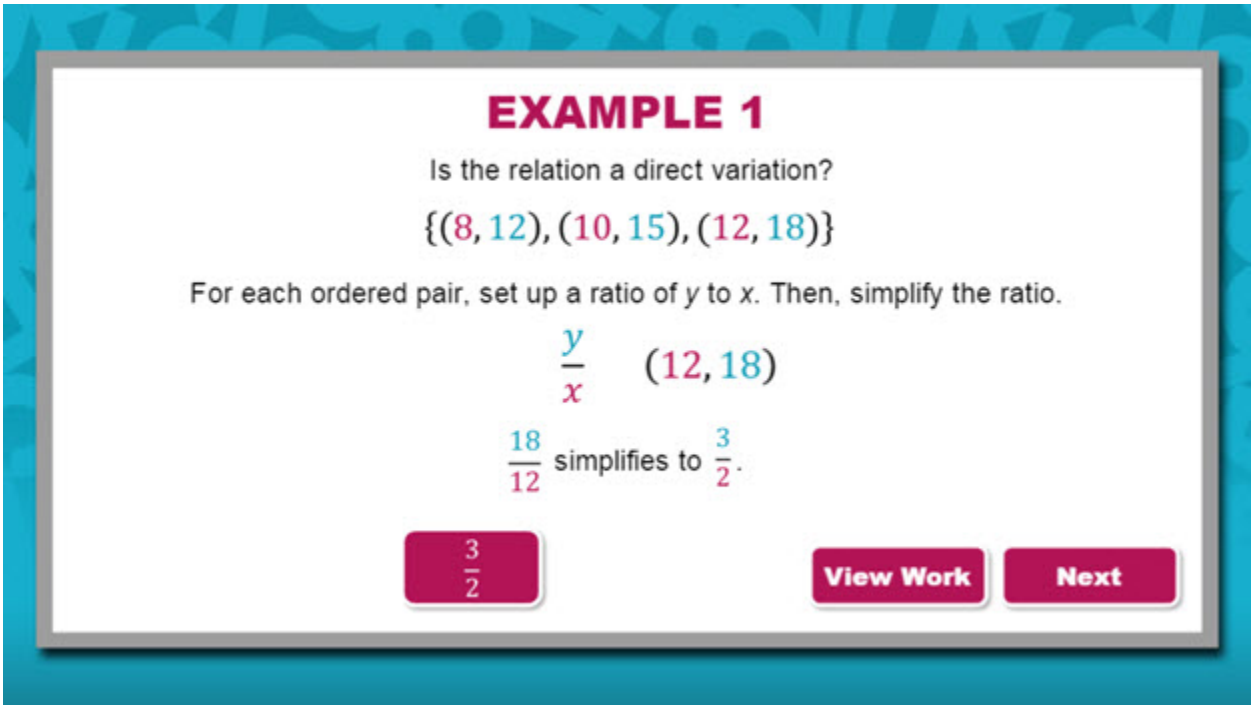
$$\frac{y}{x}$$

$$(12, 18)$$

$\frac{18}{12}$ simplifies to...

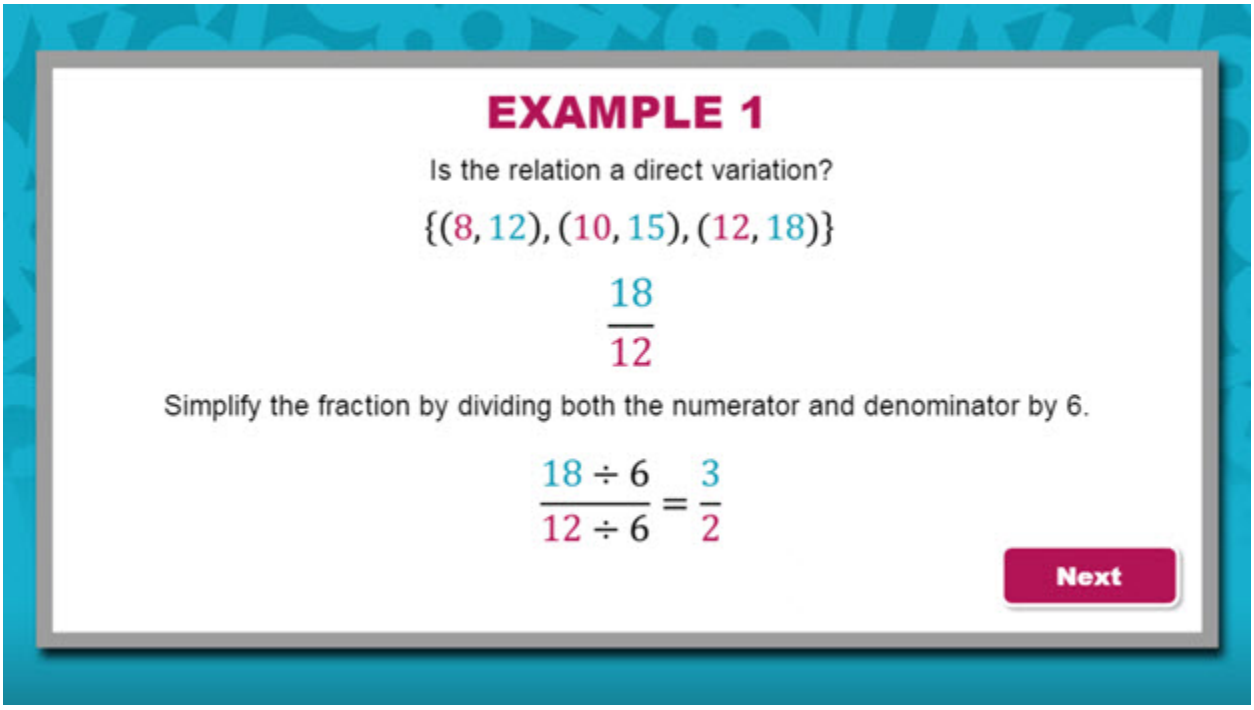
A) $\frac{3}{2}$
B) $\frac{1}{6}$
C) $\frac{4}{3}$

Example One (continued)



$\frac{18}{12}$ simplifies to $\frac{3}{2}$.

Example One (continued)

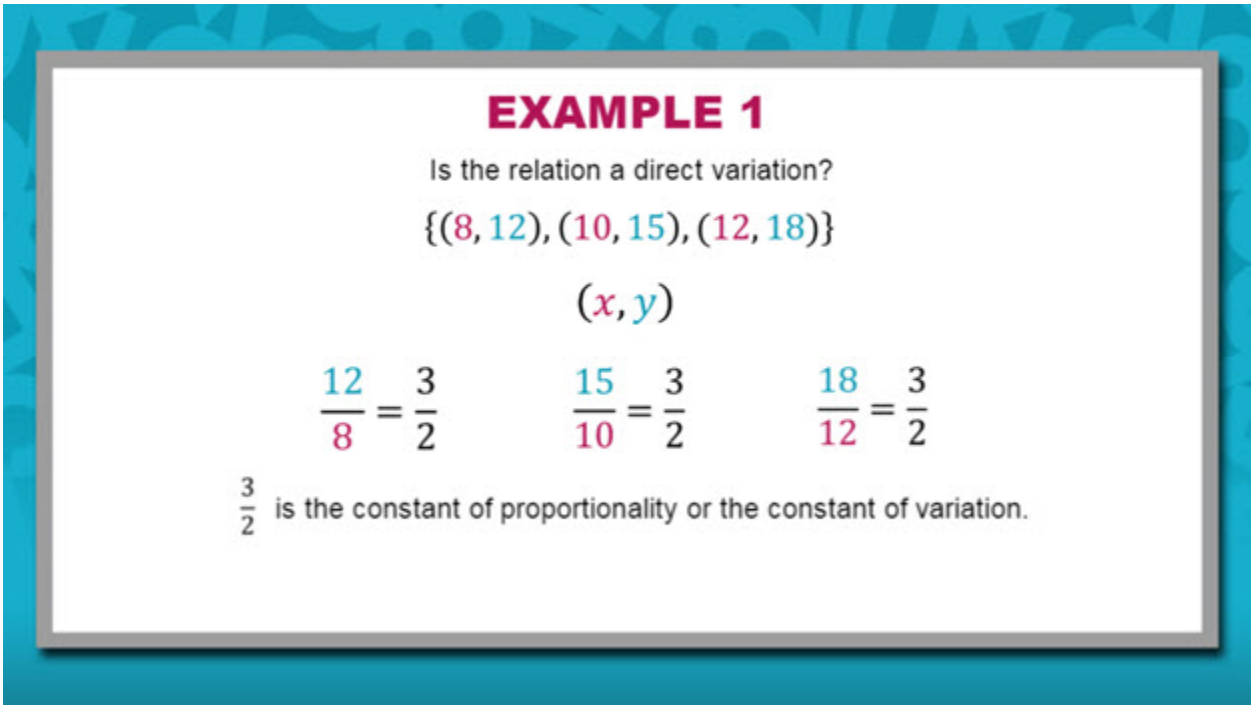


$$\frac{18}{12}$$

Simplify the fraction by dividing both the numerator and denominator by 6.

$$\frac{18 \div 6}{12 \div 6} = \frac{3}{2}$$

Example One (continued)



Is the relation a direct variation?

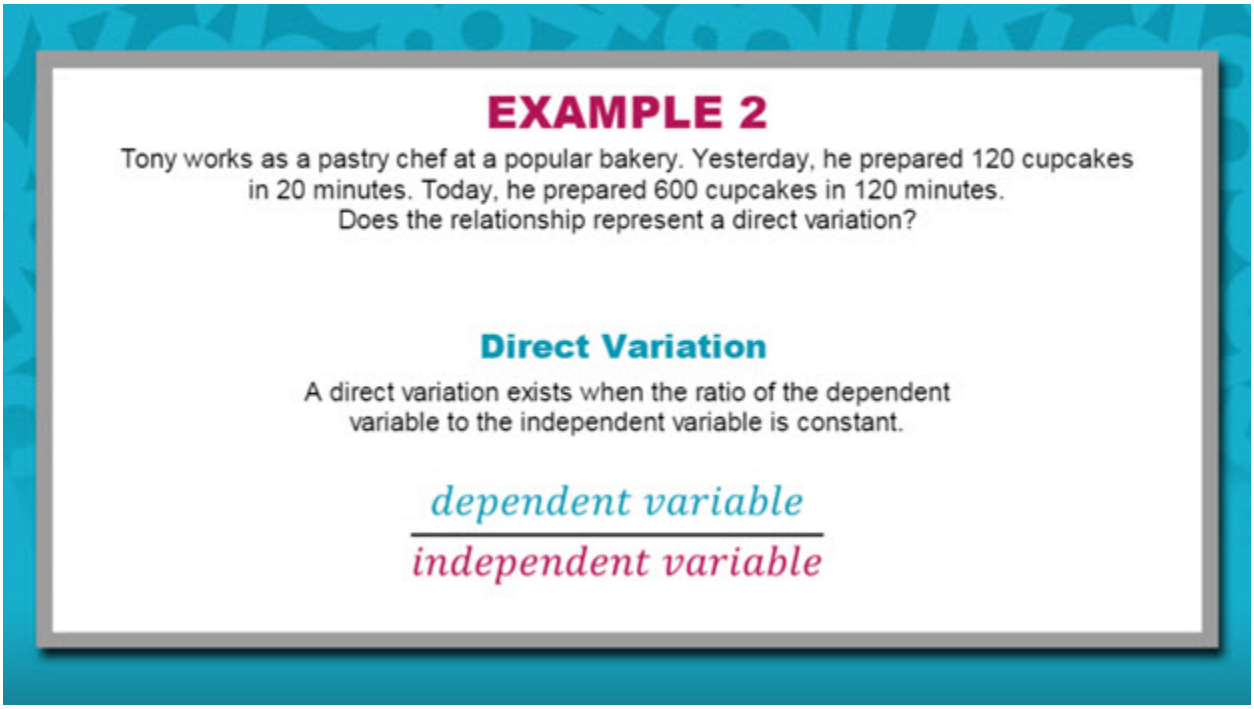
$\{(8, 12), (10, 15), (12, 18)\}$

(x, y)

$\frac{12}{8} = \frac{3}{2}$ $\frac{15}{10} = \frac{3}{2}$ $\frac{18}{12} = \frac{3}{2}$

Notice that each ratio of the dependent variable, y, to the independent variable, x, has the same value, $\frac{3}{2}$. Therefore, you can conclude that the relation does represent a direct variation. The value, $\frac{3}{2}$, is referred to as the constant of proportionality or the constant of variation.

Example Two

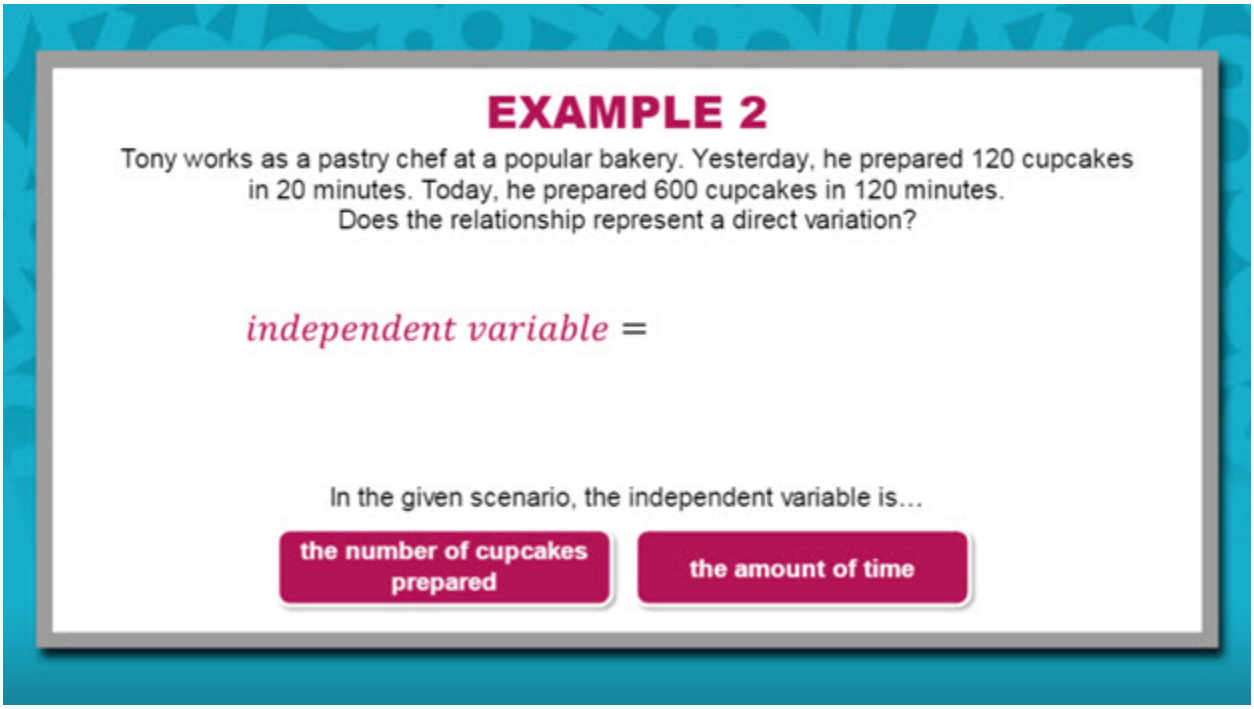


Tony works as a pastry chef at a popular bakery. Yesterday, he prepared 120 *cupcakes in* 20 *minutes. Today, he prepared* 600 *cupcakes in* 120 *minutes. Does the relationship represent a direct variation?*

A direct variation exists when the ratio of the dependent variable to the independent variable is constant.

$$\frac{\textit{dependent variable}}{\textit{independent variable}}$$

Example Two (continued)

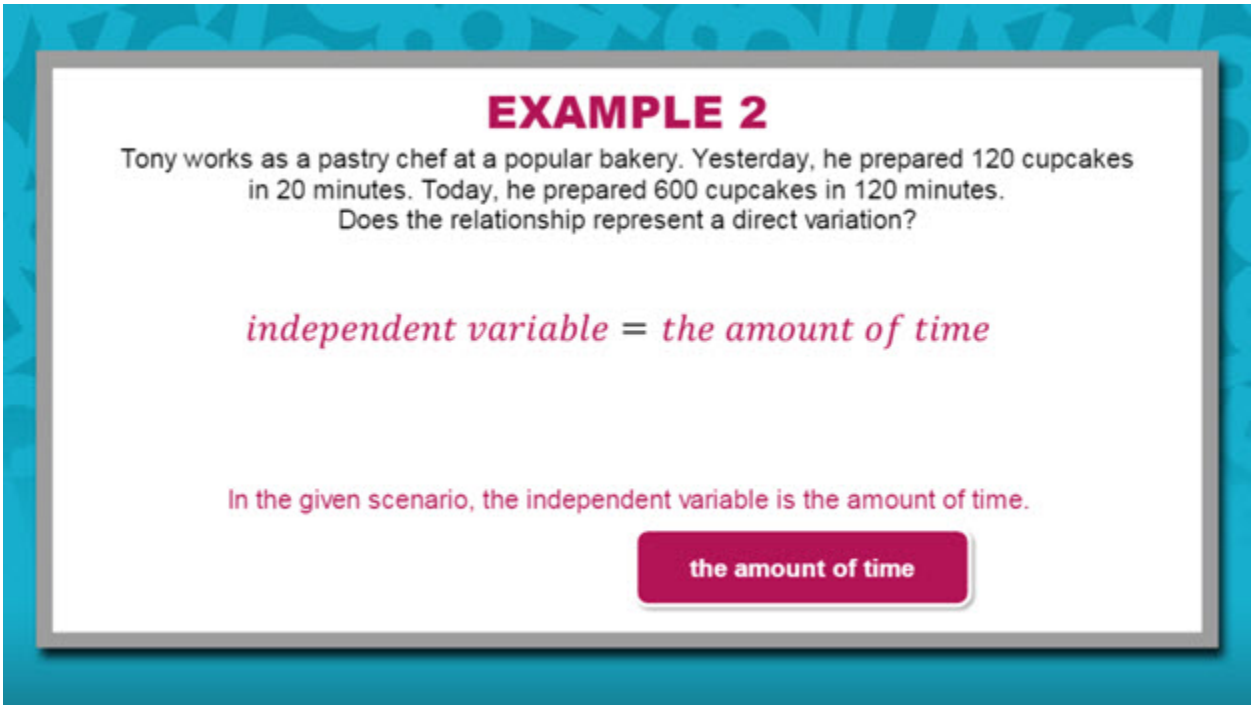


Tony works as a pastry chef at a popular bakery. Yesterday, he prepared 120 *cupcakes in* 20 *minutes. Today, he prepared* 600 *cupcakes in* 120 *minutes. Does the relationship represent a direct variation?*

In the given scenario, the independent variable is…

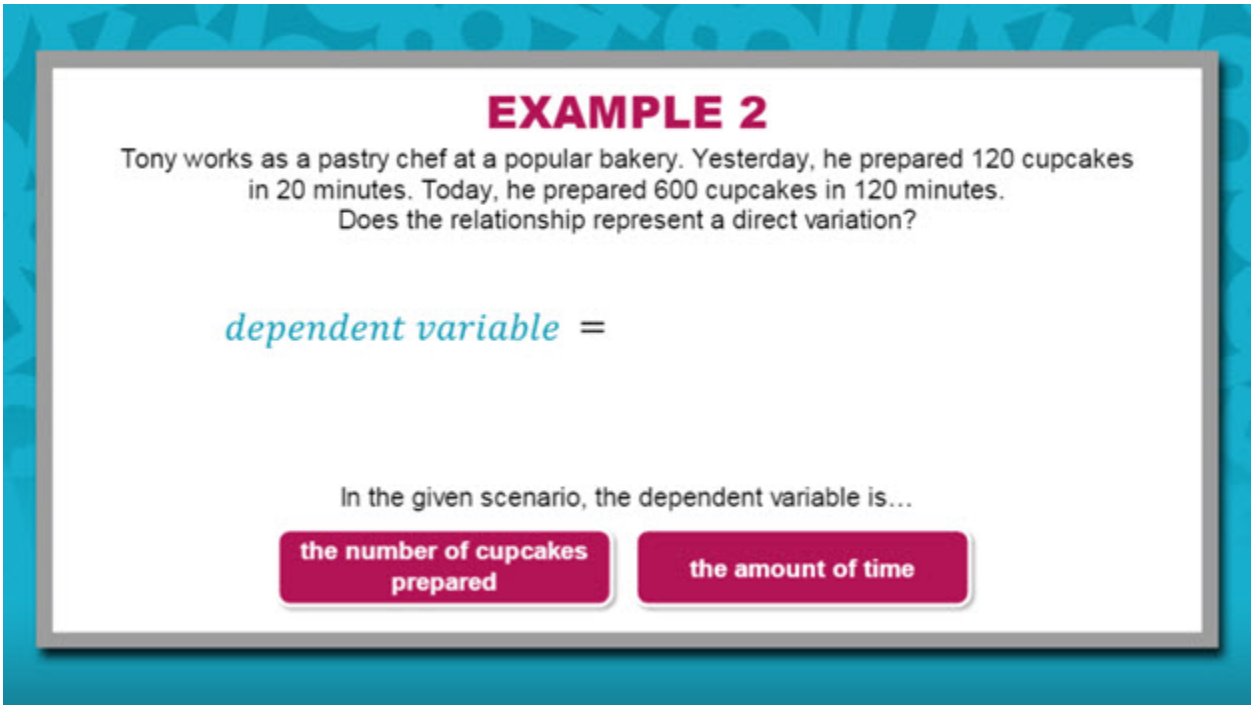
A) the amount of time
B) the number of cupcakes prepared

Example Two (continued)



In the given scenario, the independent variable is the amount of time.

Example Two (continued)



Tony works as a pastry chef at a popular bakery. Yesterday, he prepared 120 *cupcakes in* 20 *minutes. Today, he prepared* 600 *cupcakes in* 120 *minutes. Does the relationship represent a direct variation?*

In the given scenario, the dependent variable is…

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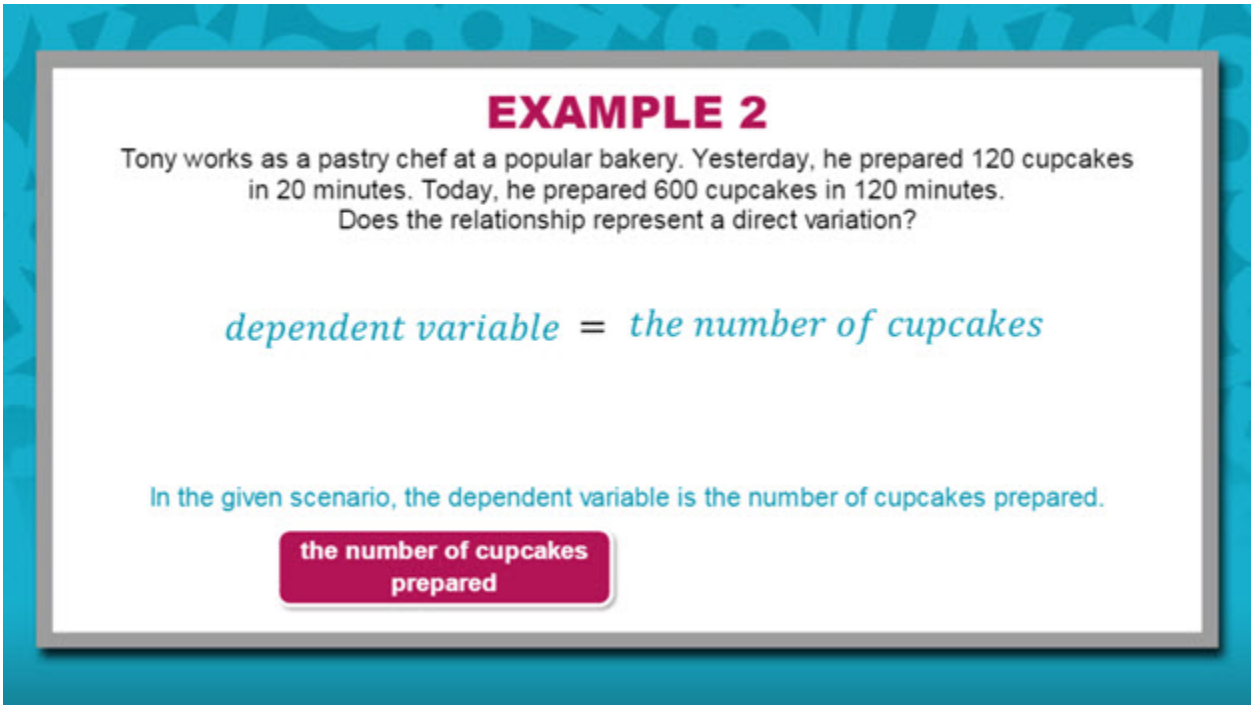
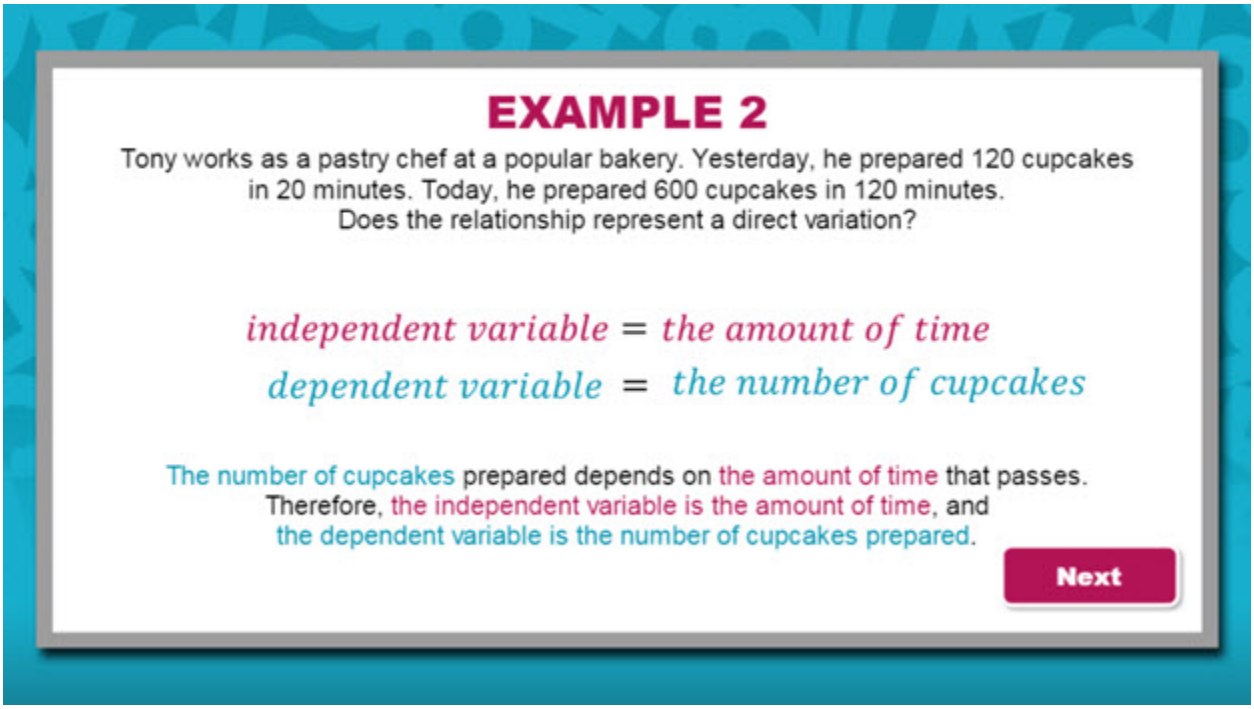
Example Two (continued)



In the given scenario, the dependent variable is the number of cupcakes prepared.

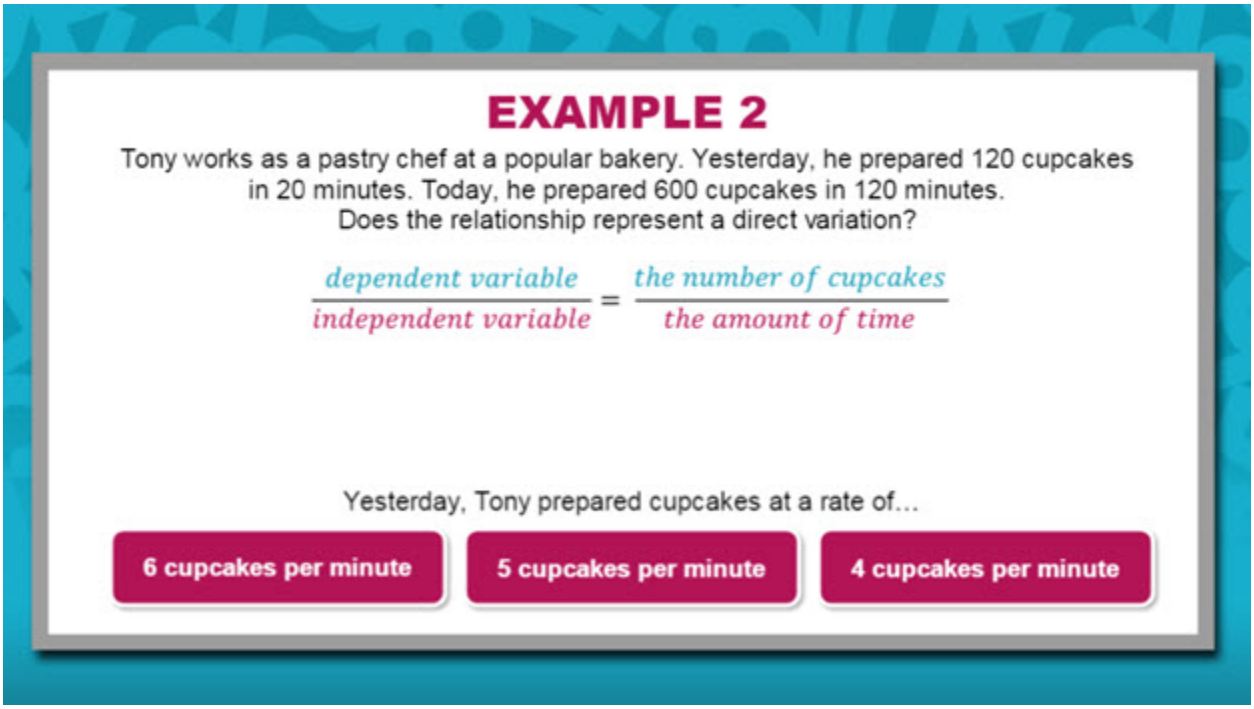
Example Two (continued)



The number of cupcakes prepared depends on the amount of time that passes. Therefore,

- the independent variable is the amount of time; and
- the dependent variable is the number of cupcakes prepared.

Example Two (continued)



Tony works as a pastry chef at a popular bakery. Yesterday, he prepared 120 *cupcakes in* 20 *minutes. Today, he prepared* 600 *cupcakes in* 120 *minutes. Does the relationship represent a direct variation?*

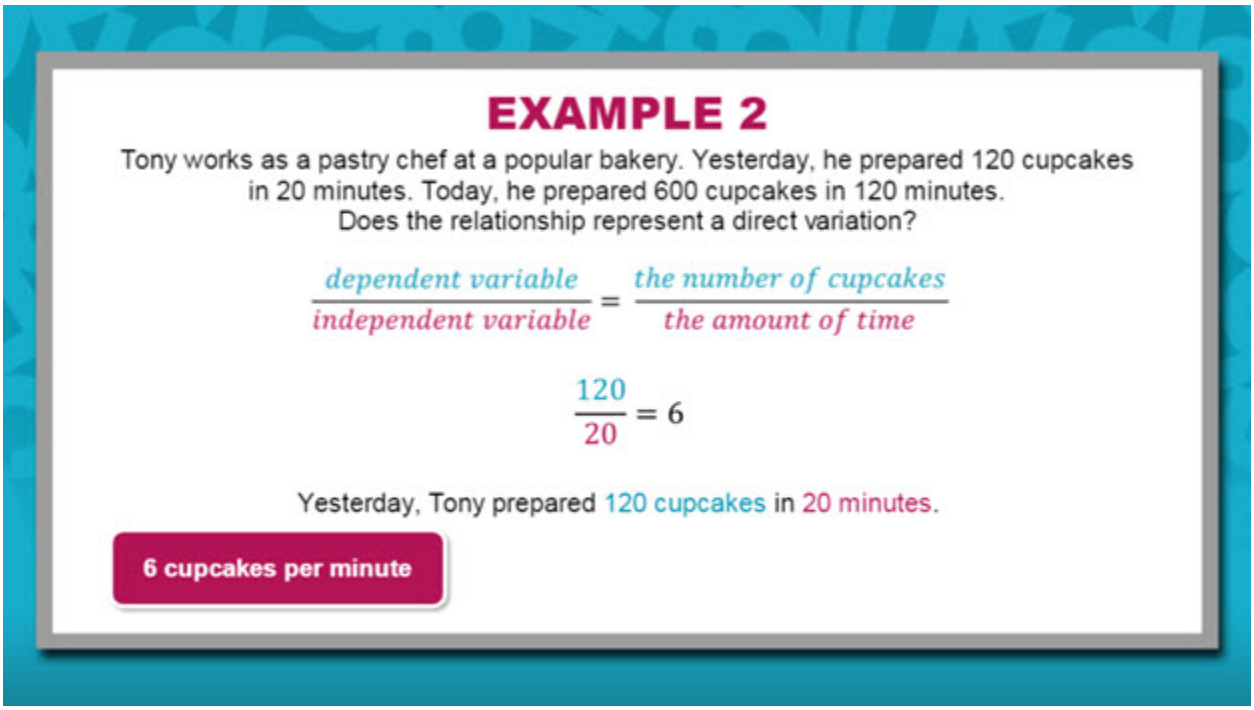
$$\frac{dependent\ variable}{independent\ variable} = \frac{the\ number\ of\ cupcakes}{the\ amount\ of\ time}$$

Now that you know that the dependent variable is the number of cupcakes and the independent variable is time, you can calculate the ratios.

Yesterday, Tony prepared cupcakes at a rate of…

A) 6 cupcakes per minute
B) 5 cupcakes per minute
C) 4 cupcakes per minute

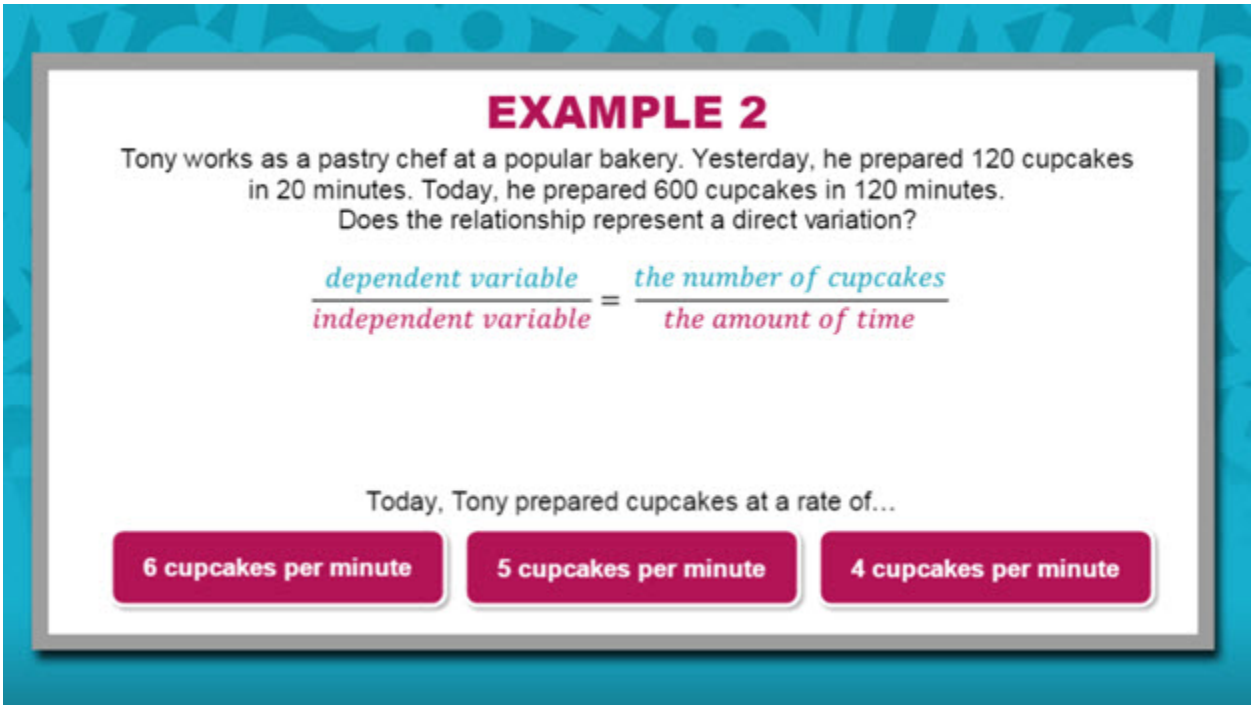
Example Two (continued)



Yesterday, Tony prepared 120 cupcakes in 20 minutes.

$$\frac{120}{20} = 6$$

Example Two (continued)



Tony works as a pastry chef at a popular bakery. Yesterday, he prepared 120 *cupcakes in* 20 *minutes. Today, he prepared* 600 *cupcakes in* 120 *minutes. Does the relationship represent a direct variation?*

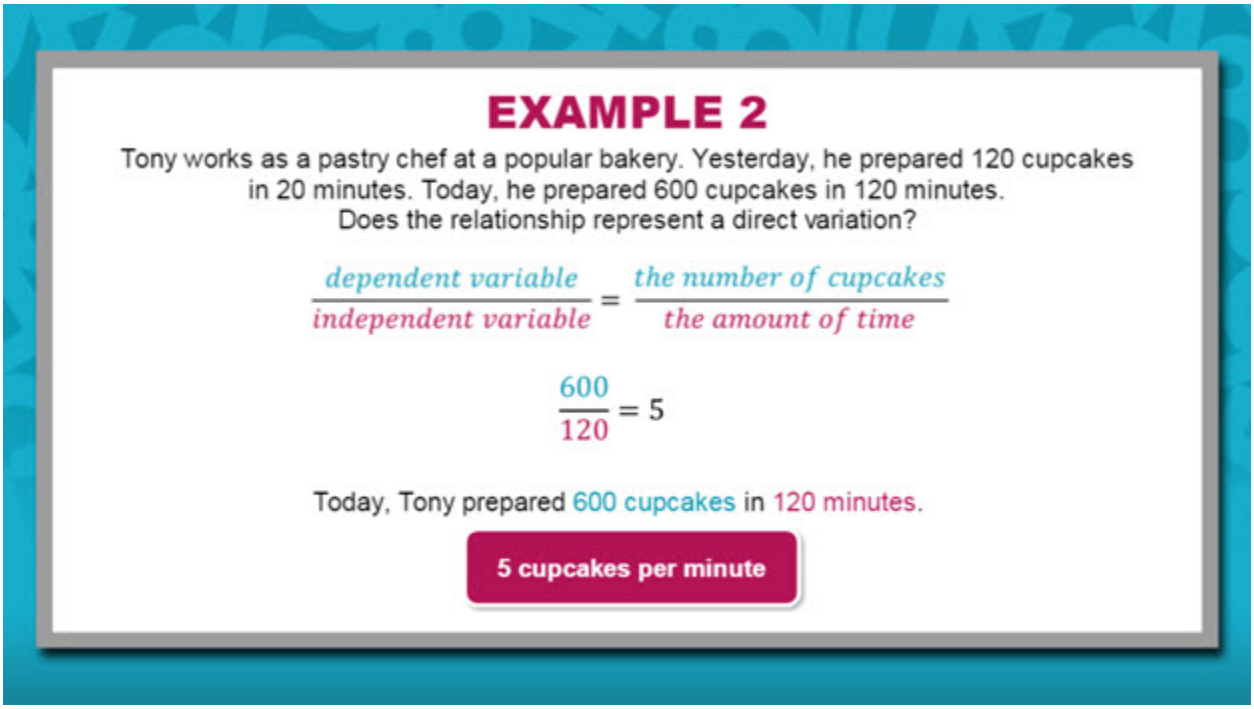
$$\frac{dependent\ variable}{independent\ variable} = \frac{the\ number\ of\ cupcakes}{the\ amount\ of\ time}$$

Now that you know that the dependent variable is the number of cupcakes and the independent variable is time, you can calculate the ratios.

Today, Tony prepared cupcakes at a rate of…

A) 6 cupcakes per minute
B) 5 cupcakes per minute
C) 4 cupcakes per minute

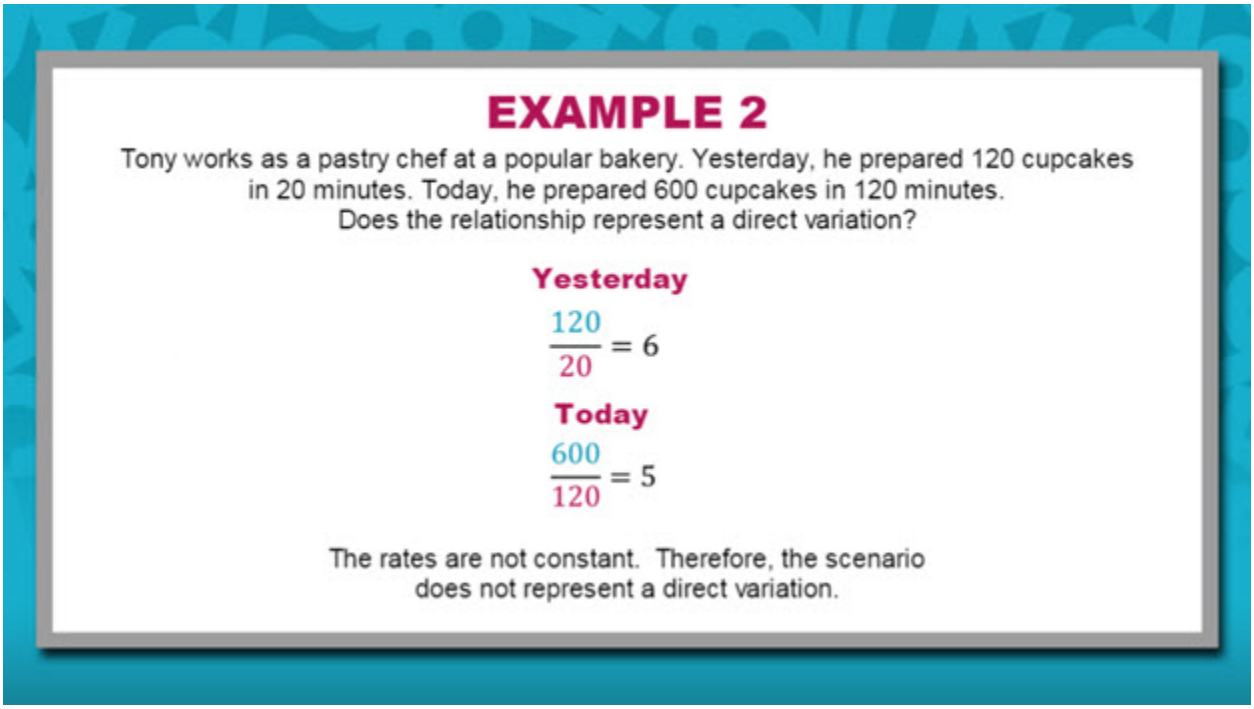
Example Two (continued)



Today, Tony prepared 600 cupcakes in 120 minutes.

$$\frac{600}{120} = 5$$

Example Two (continued)



$$\frac{120}{20} = 6$$

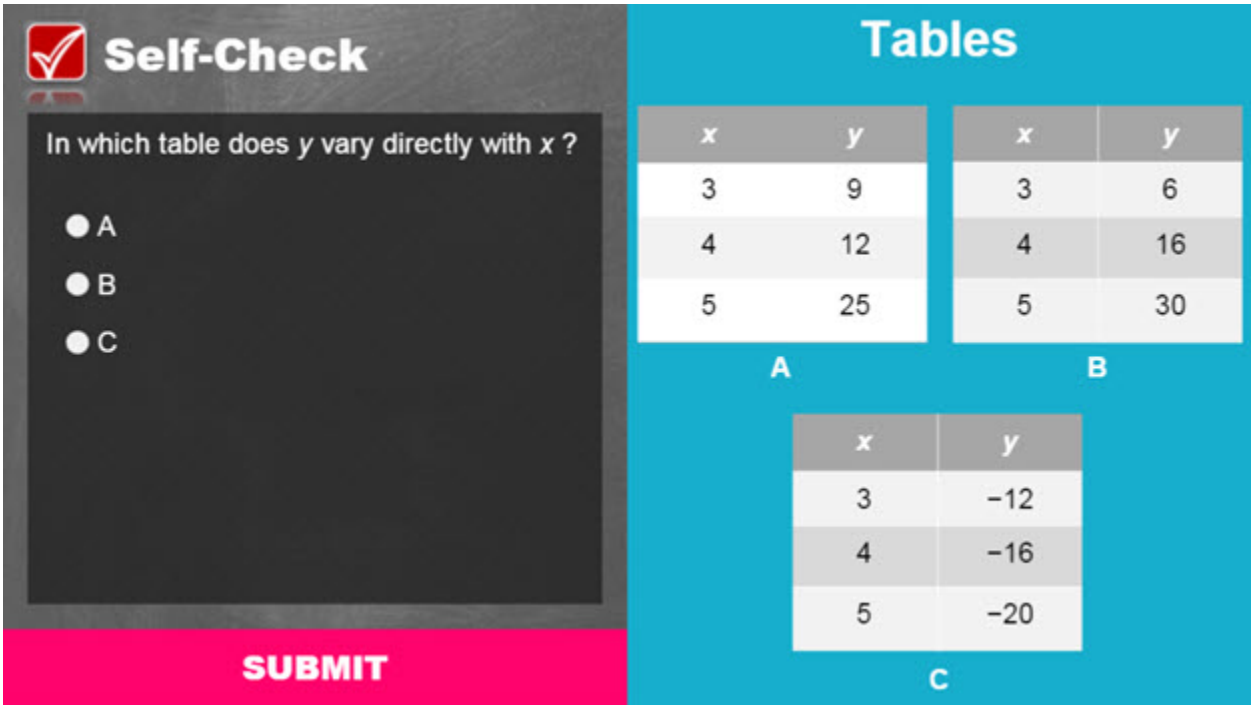
Yesterday, Tony prepared 6 cupcakes per minute.

$$\frac{600}{120} = 5$$

Today, Tony prepared 5 cupcakes per minute.

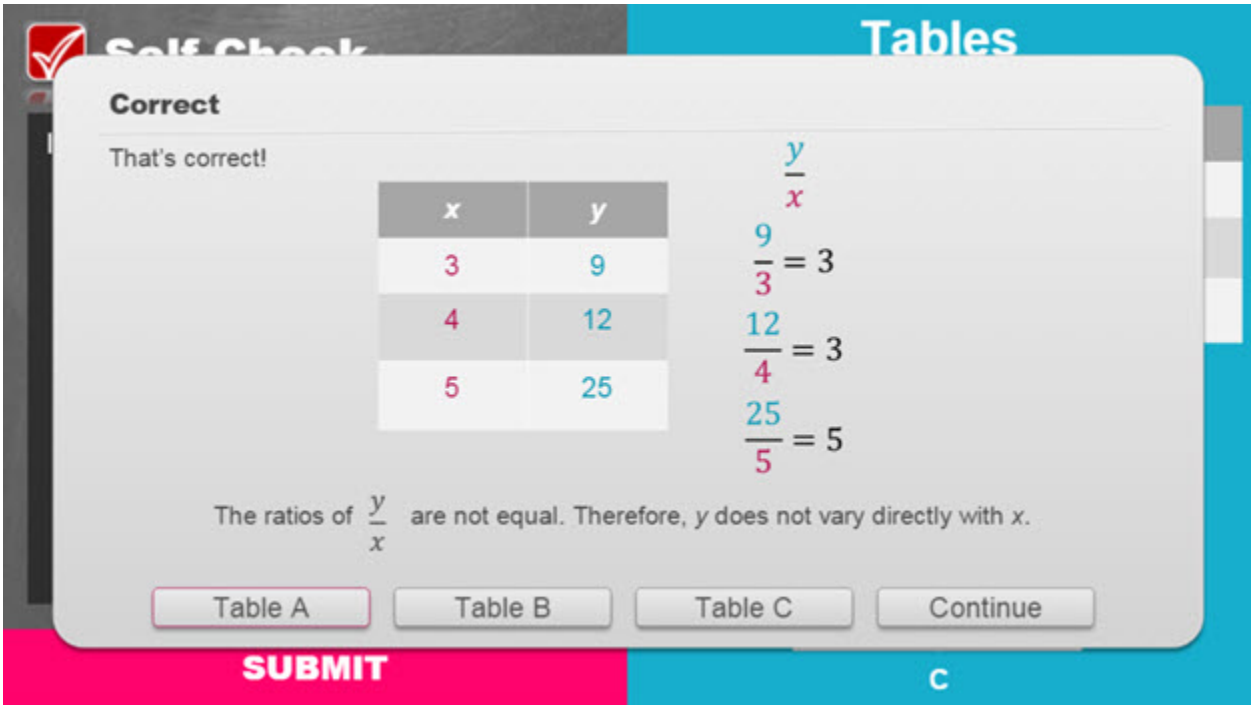
The rates are not constant. Therefore, the scenario does not represent a direct variation.

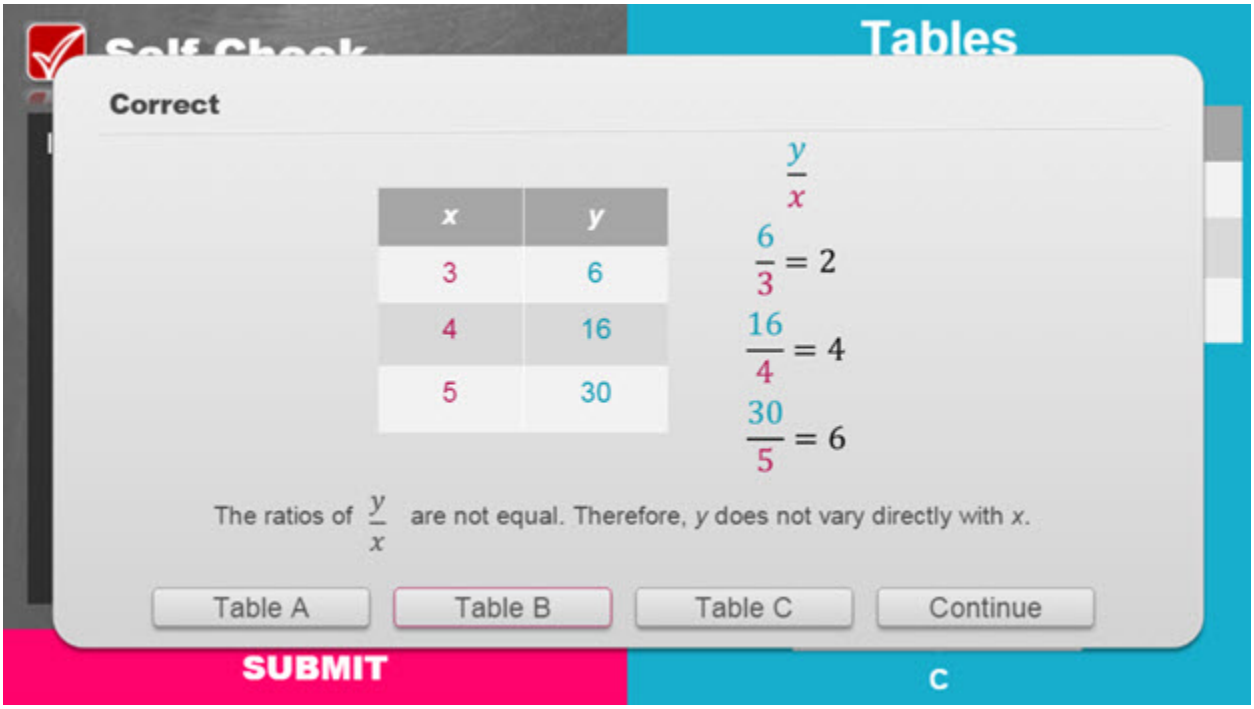
Self-Check 1



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

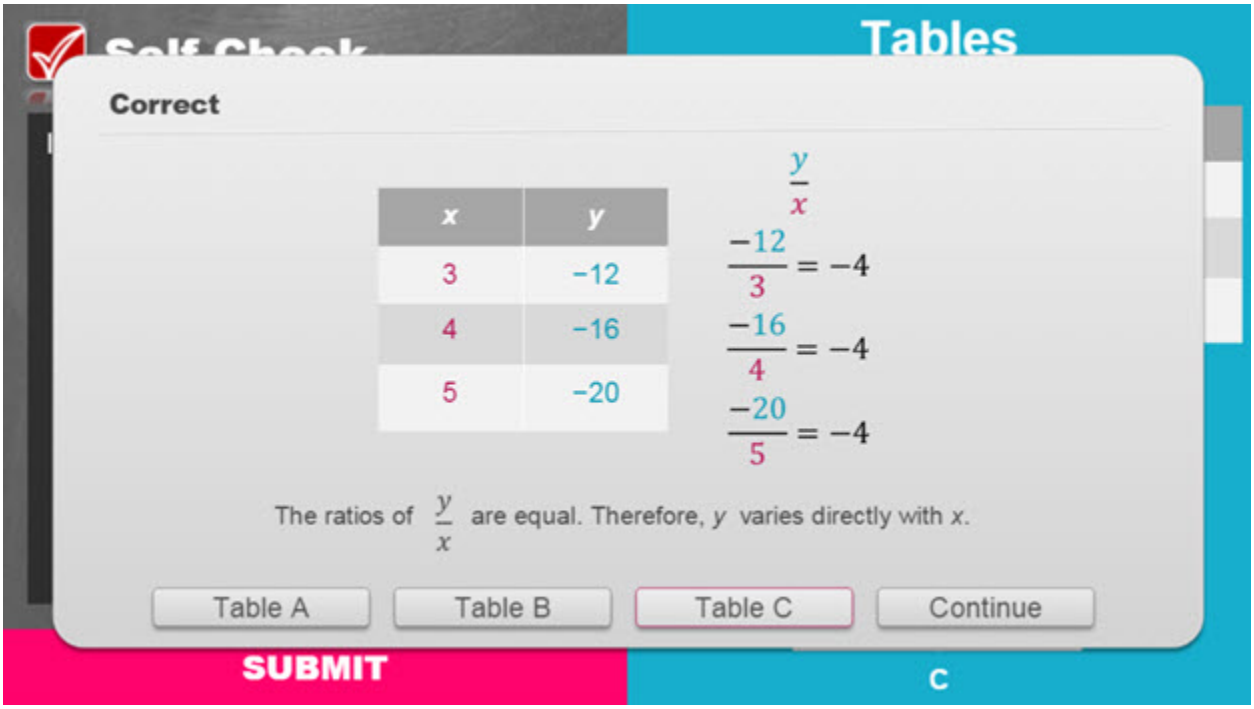
Self-Check 1: Answer





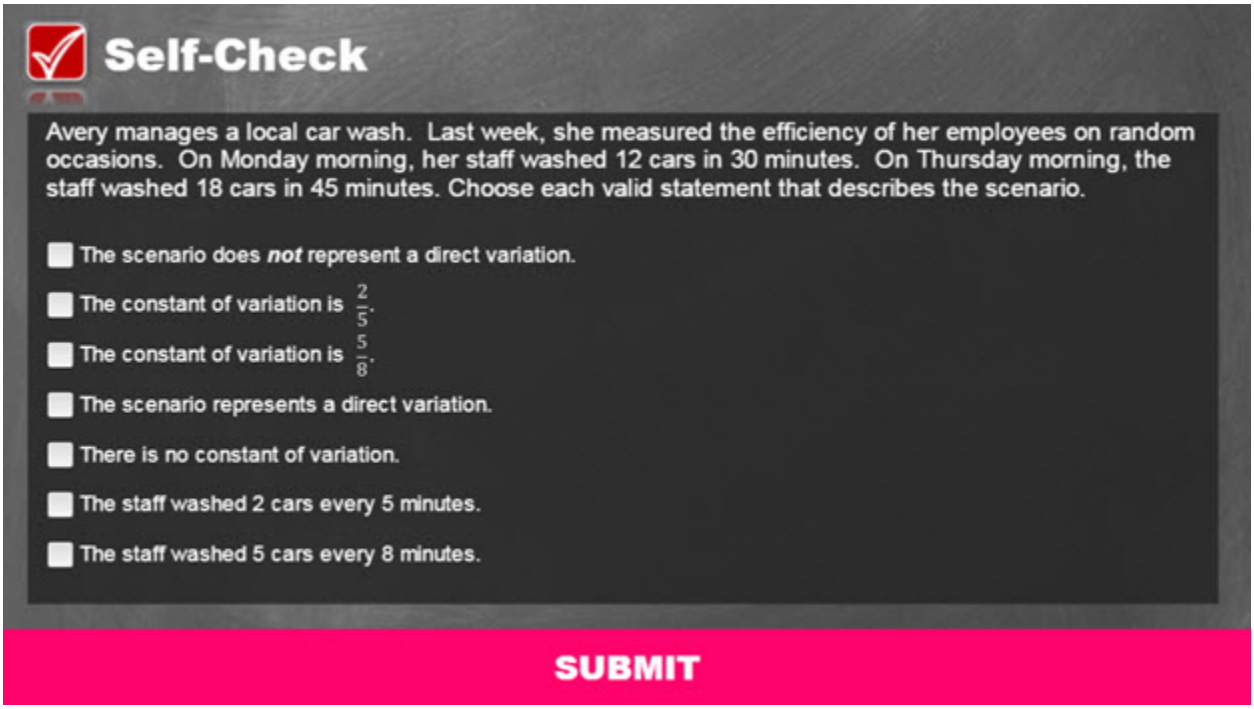
For your reference, the images above show the correct solution to the self-check problem.

Self-Check 1: Answer (continued)



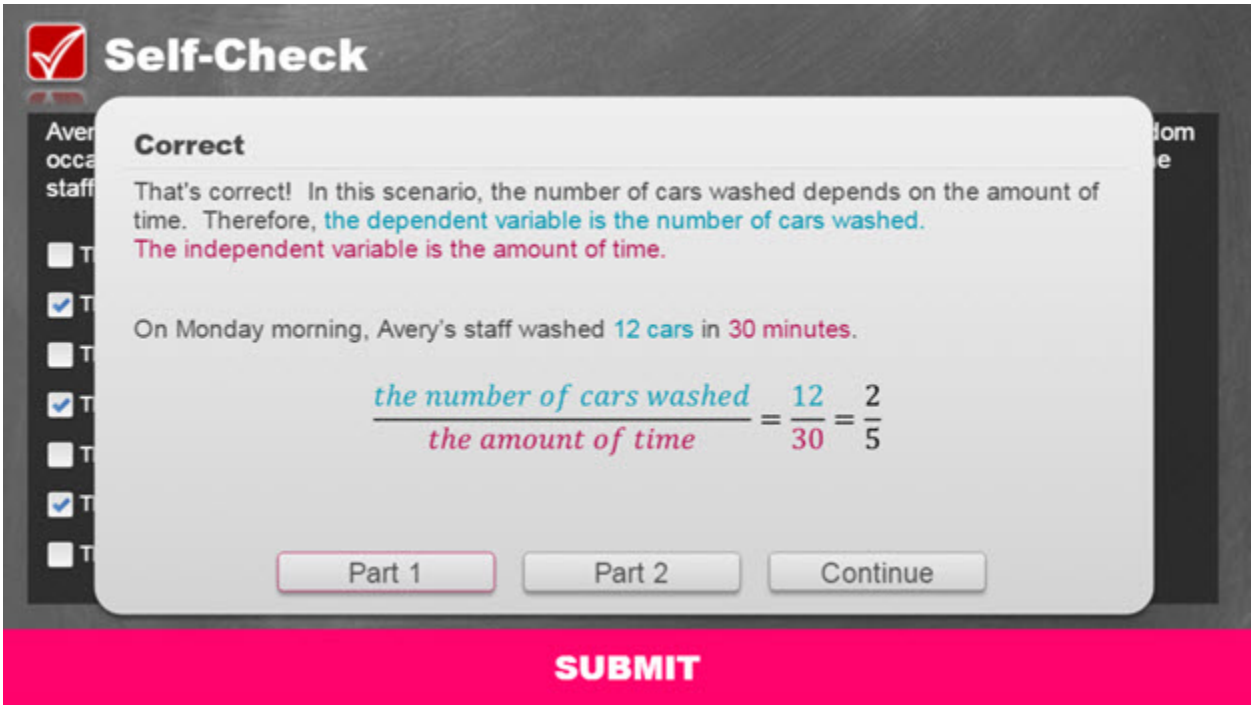
For your reference, the image above shows the correct solution to the self-check problem.

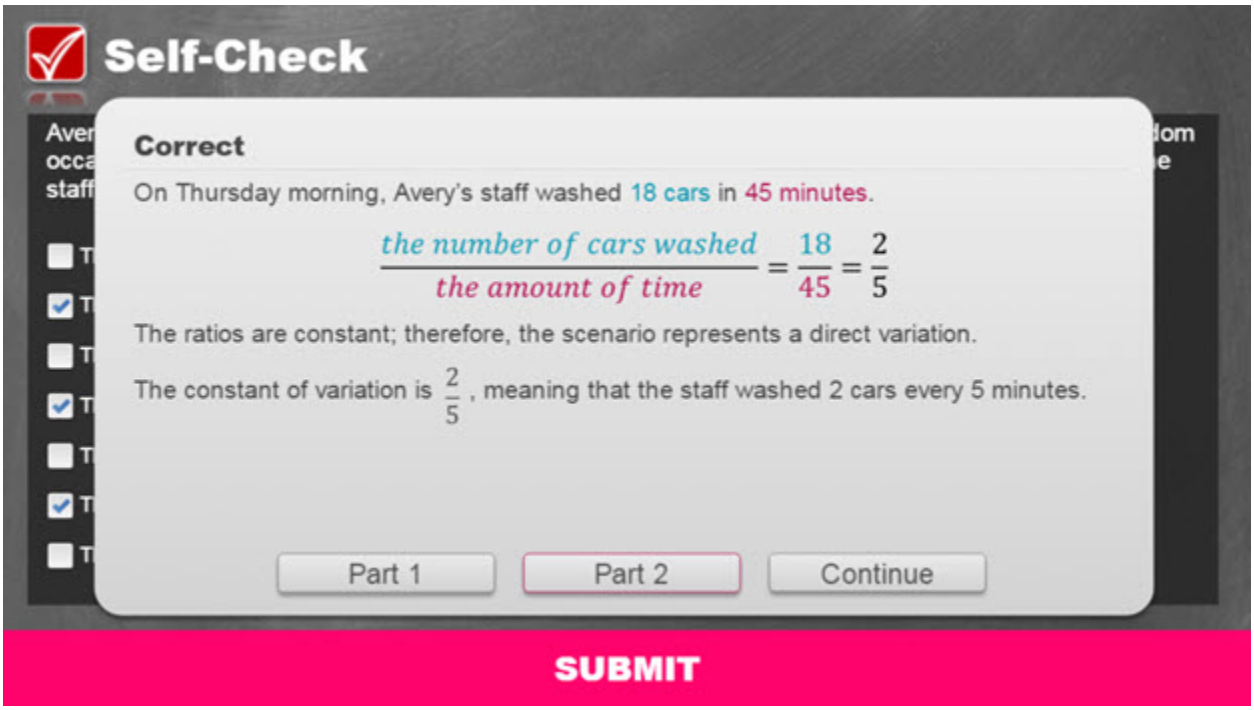
Self-Check 2



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

Self-Check 2: Answer





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

Conclusion

You have reached the conclusion of this lesson where you explored data sets and practical situations that represent direct variations.