

Module 11: Direct and Inverse Variation

Topic 1 Content: Exploring Inverse Variations Notes

Introduction



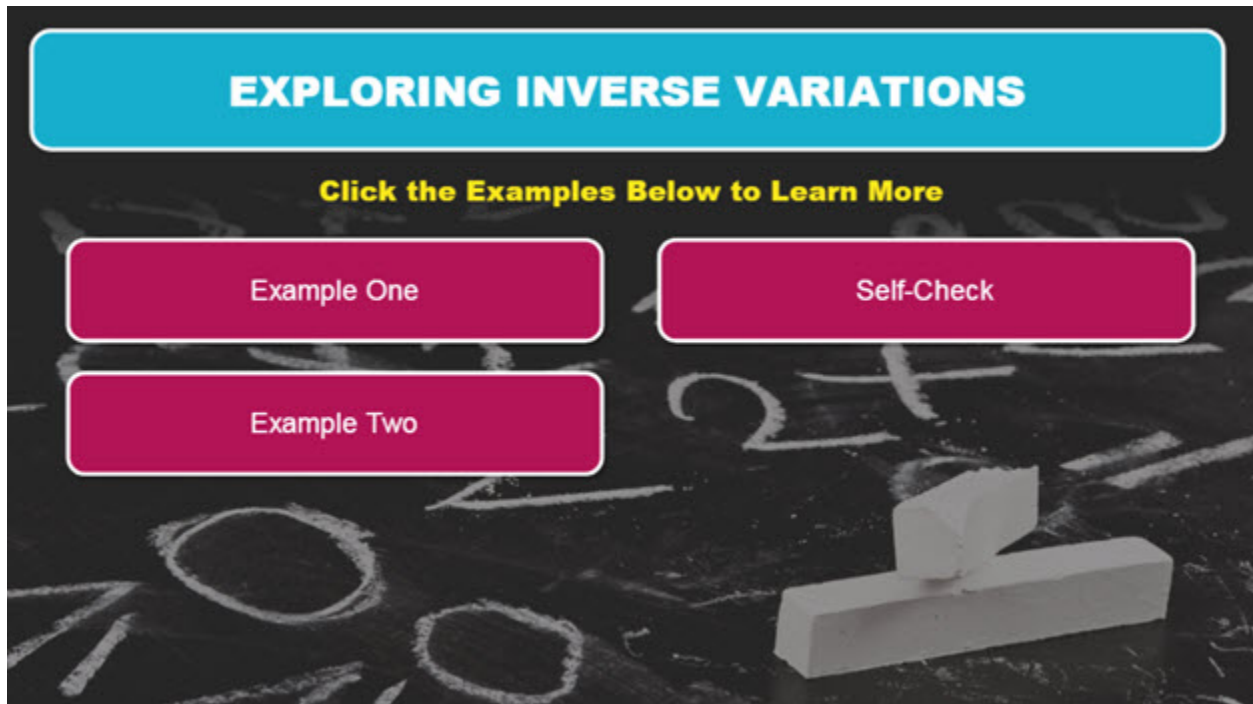
Today's Lesson

- You will explore data sets and practical situations that represent inverse variations.

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 inverse variations.

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Exploring Inverse Variations

An interactive graphic with a dark background featuring faint chalkboard numbers and a white 3D geometric shape. At the top is a blue rounded rectangle with the text "EXPLORING INVERSE VARIATIONS" in white. Below it is a yellow text prompt: "Click the Examples Below to Learn More". Underneath are three pink rounded rectangular buttons: "Example One" (top left), "Self-Check" (top right), and "Example Two" (bottom left).

Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Module 11: Direct and Inverse Variation

Topic 1 Content: Exploring Inverse Variations Notes

Example One

EXAMPLE 1

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

Inverse Variation

An inverse variation models an inversely proportional relationship between two measures.

- y varies inversely as x
- y is inversely proportional to x

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

An inverse variation models an inversely proportional relationship between two measures. When a relation represents an inverse variation, “ y varies inversely as x ” or in other words, “ y is inversely proportional to x .”

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Example One (continued)

EXAMPLE 1

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

Find the product of each corresponding x- and y-value in the table. Type your answers in the blank spaces provided.

$-1 \cdot 4 = \square$

$-\frac{1}{3} \cdot 12 = \square$

$2 \cdot -2 = \square$

Submit

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

Consider the given relation. You can determine if the relation is an inverse variation by verifying that each product of corresponding x- and y-values is equal.

Find the product of each corresponding x- and y-value in the table. Type your answers in the blank spaces provided.

$$-1 \cdot 4 = ?$$

$$-\frac{1}{3} \cdot 12 = ?$$

$$2 \cdot -2 = ?$$

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Example One (continued)

EXAMPLE 1

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

The product of each corresponding x- and y-value in the table are as follows.

$$-1 \cdot 4 = -4$$
$$-\frac{1}{3} \cdot 12 = -4$$
$$2 \cdot -2 = -4$$

Next

The product of each corresponding x- and y-value in the table are as follows.

$$-1 \cdot 4 = -4$$

$$-\frac{1}{3} \cdot 12 = -4$$

$$2 \cdot -2 = -4$$

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Example One (continued)

EXAMPLE 1

Is the relation an inverse variation?

x	y
-1	4
$-\frac{1}{3}$	12
2	-2

-4 is the constant of proportionality or the constant of variation.

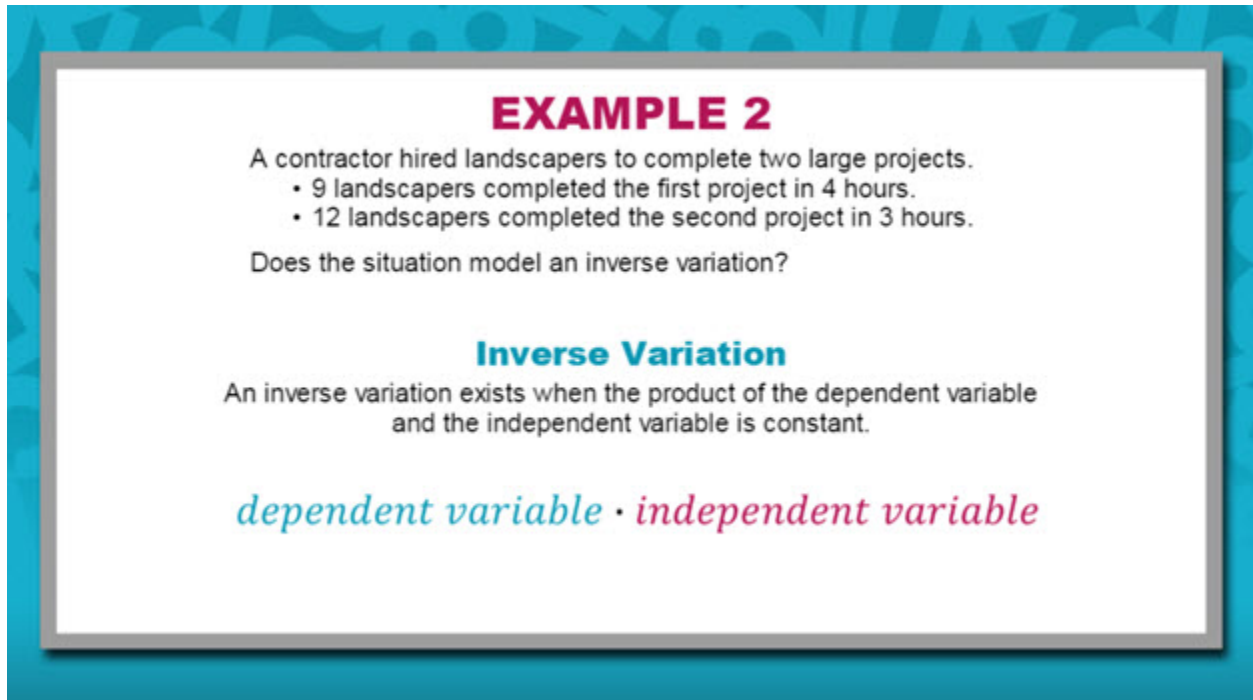
$$-1 \cdot 4 = -4$$
$$-\frac{1}{3} \cdot 12 = -4$$
$$2 \cdot -2 = -4$$

Notice that each product of corresponding x - and y -values is equal. Therefore, you can conclude that the relation does represent an inverse variation. The value, -4 , is referred to as the constant of proportionality or the constant of variation.

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Example Two



EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

Inverse Variation

An inverse variation exists when the product of the dependent variable and the independent variable is constant.

dependent variable · *independent variable*

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

An inverse variation exists when the product of the dependent variable and the independent variable is constant.

dependent variable · *independent variable*

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

independent variable =

In the given scenario, the independent variable is...

the number of landscapers the amount of time

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

In the given scenario, the independent variable is...

- A) the number of landscapers
- B) the amount of time

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

independent variable = the number of landscapers

In the given scenario, the independent variable is the number of landscapers.

**the number of
landscapers**

In the given scenario, the independent variable is **the number of landscapers**.

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

dependent variable =

In the given scenario, the dependent variable is...

the number of landscapers the amount of time

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

In the given scenario, the dependent variable is...

- A) the number of landscapers
- B) the amount of time

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

dependent variable · *independent variable*

In the given scenario,

The dependent variable is **the amount of time**.

the amount of time **Next**

In the given scenario, the dependent variable is **the amount of time**.

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

independent variable = the number of landscapers

dependent variable = the amount of time

The amount of time needed to complete the project depends on the number of landscapers working. Therefore, the independent variable is the number of landscapers, and the dependent variable is the amount of time.

The amount of time needed to complete the project depends on the number of landscapers working. Therefore,

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

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

dependent variable · *independent variable*
the amount of time · *the number of landscapers*

The product associated with the first project is...

36 108 48

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

dependent variable · *independent variable*

the amount of time · *the number of landscapers*

Now that you know that the dependent variable is the amount of time and the independent variable is the number of landscapers, you can calculate the products.

The product associated with the first project is...

- A) 36
- B) 108
- C) 48

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

dependent variable · *independent variable*
the amount of time · *the number of landscapers*

$$4 \cdot 9 = 36$$

9 landscapers completed the first project in 4 hours.

36

dependent variable · *independent variable*
the amount of time · *the number of landscapers*

$$4 \cdot 9 = 36$$

9 landscapers completed the first project in 4 hours.

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

dependent variable · *independent variable*

the amount of time · *the number of landscapers*

The product associated with the second project is...

36 108 48

A contractor hired landscapers to complete two large projects.

- *9 landscapers completed the first project in 4 hours*
- *12 landscapers completed the second project in 3 hours*

Does the situation model an inverse variation?

dependent variable · *independent variable*

the amount of time · *the number of landscapers*

The product associated with the second project is...

- A) 36
- B) 108
- C) 48

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

dependent variable · *independent variable*
the amount of time · *the number of landscapers*

$$12 \cdot 3 = 36$$

12 landscapers completed the second project in 3 hours.

36

dependent variable · *independent variable*
the amount of time · *the number of landscapers*

$$12 \cdot 3 = 36$$

12 landscapers completed the first project in 3 hours.

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Example Two (continued)

EXAMPLE 2

A contractor hired landscapers to complete two large projects.

- 9 landscapers completed the first project in 4 hours.
- 12 landscapers completed the second project in 3 hours.

Does the situation model an inverse variation?

First Project
 $4 \cdot 9 = 36$

Second Project
 $12 \cdot 3 = 36$

The situation represents an inverse variation.
36 is the constant of proportionality.


The product that corresponds to the first project is 36.

The product that corresponds to the second project is also 36.

Because the products are equal, you can conclude that the situation represents an inverse variation. The constant of proportionality is 36.

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Self-Check 1

 **Self-Check**

Choose *each* relation that is an inverse variation.

A

B

C

D

SUBMIT

Answer Choices

x	y	x	y
3	8	$-\frac{3}{2}$	24
4	7	2	-18
6	5	9	-4

A

B

$\{(-6, -15), (-3, -30), (2, 45)\}$

C

$\left\{(-2, -5), \left(-\frac{5}{2}, -4\right), (2, -5)\right\}$

D

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

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Self-Check 1: Answer

Self-Check **Answer Choices**

Correct
That's correct!

x	y	xy
3	8	$3 \cdot 8 = 24$
4	7	$4 \cdot 7 = 28$
6	7	$6 \cdot 5 = 30$

The products are *not* equal. Therefore, the relation is *not* an inverse variation.

Answer A Answer B Answer C Answer D Continue

SUBMIT D

Self-Check **Answer Choices**

Correct

x	y	xy
$-\frac{3}{2}$	24	$-\frac{3}{2} \cdot 24 = -36$
2	-18	$2 \cdot -18 = -36$
9	-4	$9 \cdot -4 = -36$

The products are equal. Therefore, the relation is an inverse variation.

Answer A Answer B Answer C Answer D Continue

SUBMIT D

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

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Self-Check 1: Answer (continued)

The screenshot shows a self-check interface with a 'Self-Check' header and an 'Answer Choices' header. A modal window displays the following content:

Correct

xy

$\{(-6, -15), (-3, -30), (2, 45)\}$

$-6 \cdot -15 = 90$

$-3 \cdot -30 = 90$

$2 \cdot 45 = 90$

The products are equal. Therefore, the relation is an inverse variation.

Buttons: Answer A, Answer B, Answer C, Answer D, Continue

SUBMIT

D

The screenshot shows a self-check interface with a 'Self-Check' header and an 'Answer Choices' header. A modal window displays the following content:

Correct

xy

$\left\{(-2, -5), \left(-\frac{5}{2}, -4\right), (2, -5)\right\}$

$-2 \cdot -5 = 10$

$-\frac{5}{2} \cdot -4 = 10$

$2 \cdot -5 = -10$

The products are *not* equal. Therefore, the relation is *not* an inverse variation.

Buttons: Answer A, Answer B, Answer C, Answer D, Continue

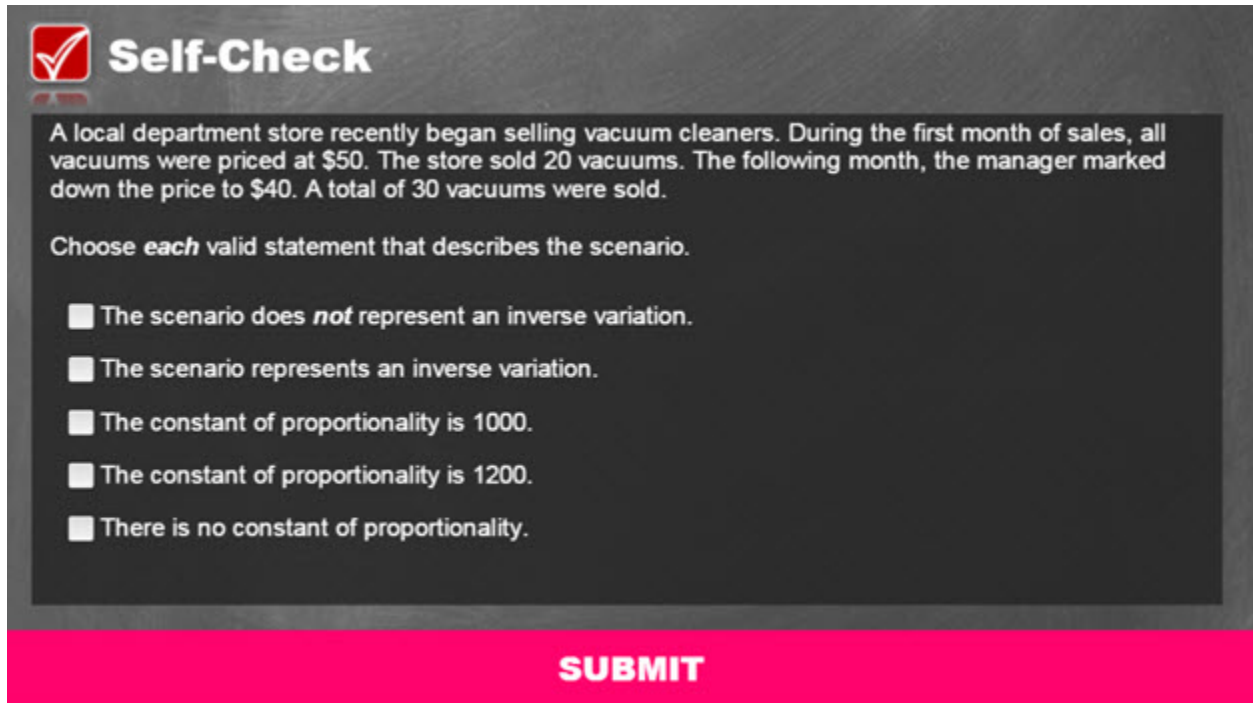
SUBMIT

D

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

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Self-Check 2

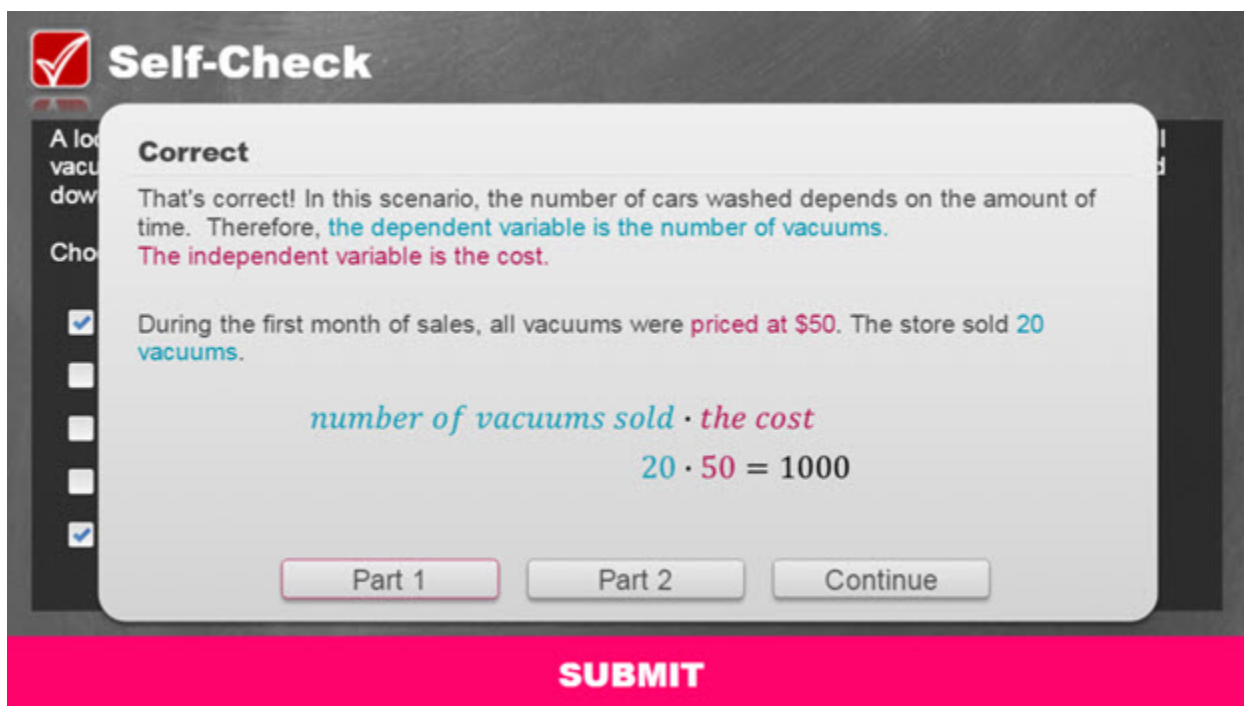
The image shows a digital interface for a self-check. At the top left, there is a red square icon with a white checkmark, followed by the text "Self-Check" in a bold, white font. Below this, a dark gray rectangular area contains the following text: "A local department store recently began selling vacuum cleaners. During the first month of sales, all vacuums were priced at \$50. The store sold 20 vacuums. The following month, the manager marked down the price to \$40. A total of 30 vacuums were sold." Below the text, it says "Choose *each* valid statement that *describes* the scenario." There are five radio button options listed: "The scenario does *not* represent an inverse variation.", "The scenario represents an inverse variation.", "The constant of proportionality is 1000.", "The constant of proportionality is 1200.", and "There is no constant of proportionality." At the bottom of the interface, there is a bright pink rectangular button with the word "SUBMIT" in white, bold, uppercase letters.

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

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Self-Check 2: Answer



Self-Check

Correct

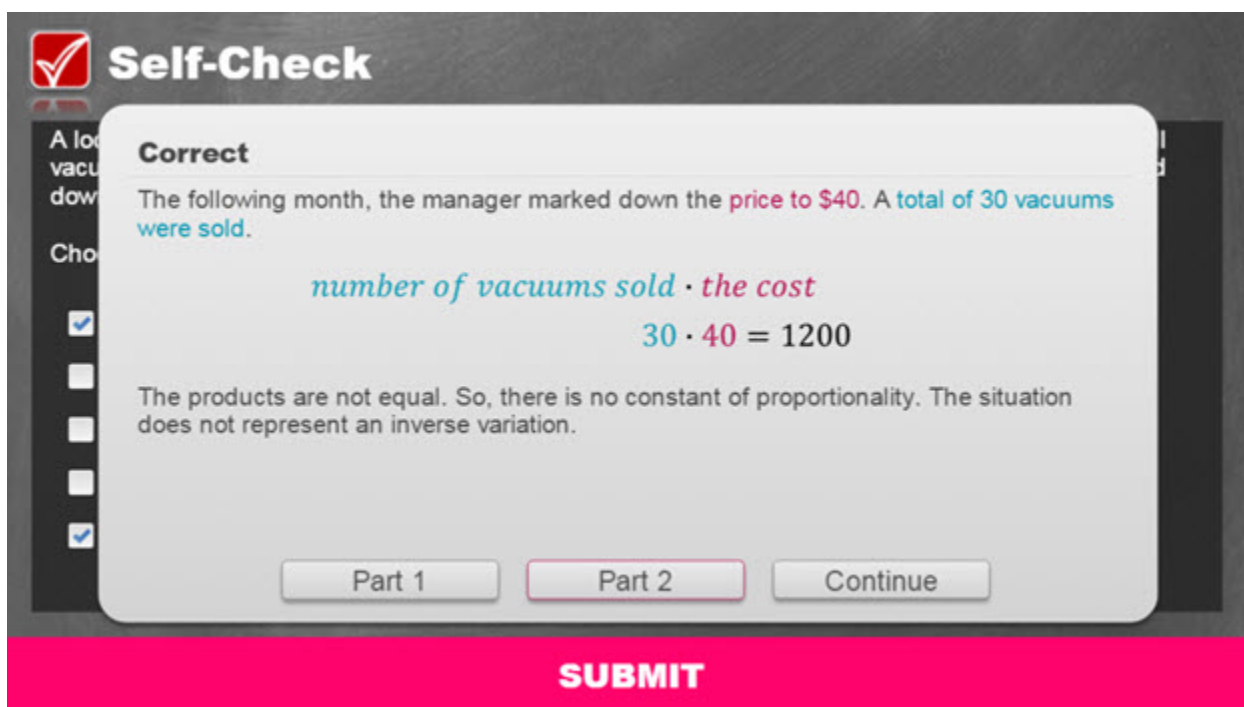
That's correct! In this scenario, the number of cars washed depends on the amount of time. Therefore, **the dependent variable is the number of vacuums.**
The independent variable is the cost.

During the first month of sales, all vacuums were **priced at \$50.** The store sold **20 vacuums.**

$$\text{number of vacuums sold} \cdot \text{the cost}$$
$$20 \cdot 50 = 1000$$

Part 1 Part 2 Continue

SUBMIT



Self-Check

Correct

The following month, the manager marked down the **price to \$40.** A **total of 30 vacuums were sold.**

$$\text{number of vacuums sold} \cdot \text{the cost}$$
$$30 \cdot 40 = 1200$$

The products are not equal. So, there is no constant of proportionality. The situation does not represent an inverse variation.

Part 1 Part 2 Continue

SUBMIT

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

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Conclusion



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