Module 10: Linear and Quadratic Function Families
Topic 1 Content: Determining if a Relation is a Function Notes

Introduction

Hi there! I'm so glad to have you here for this lesson in Algebra I, where you will investigate relations and functions.

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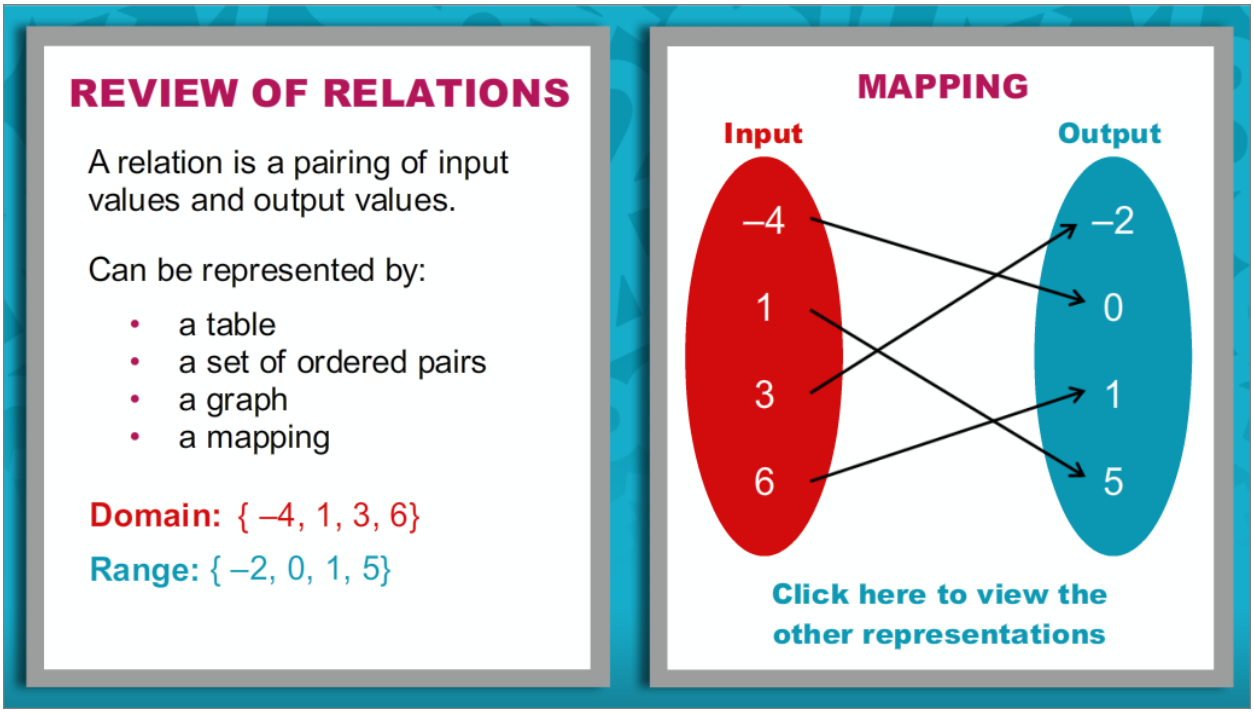
Topic 1 Content: Determining if a Relation is a Function Notes

Anticipatory Set



A relation is a pairing of input values and output values. It can be represented by a table, a set of ordered pairs, a graph, or a mapping.

Consider the given relation. Here, it is represented by a table. It can also represented by a set of ordered pairs, a graph, or a mapping.

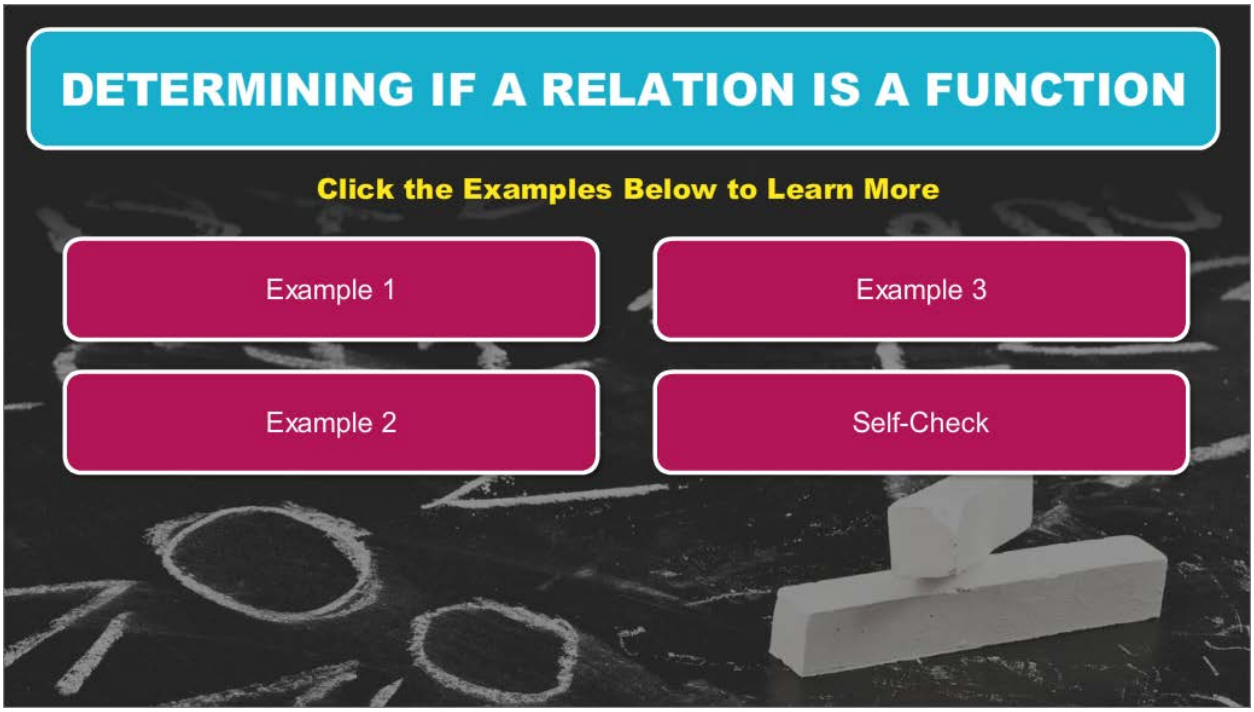
Notice in the mapping that an arrow is drawn from each input value to its corresponding output value.

The domain consists of all input values.

The range consists of all output values.

For this relation, the domain is $\{-4, 1, 3, 6\}$. The range is $\{-2, 0, 1, 5\}$.

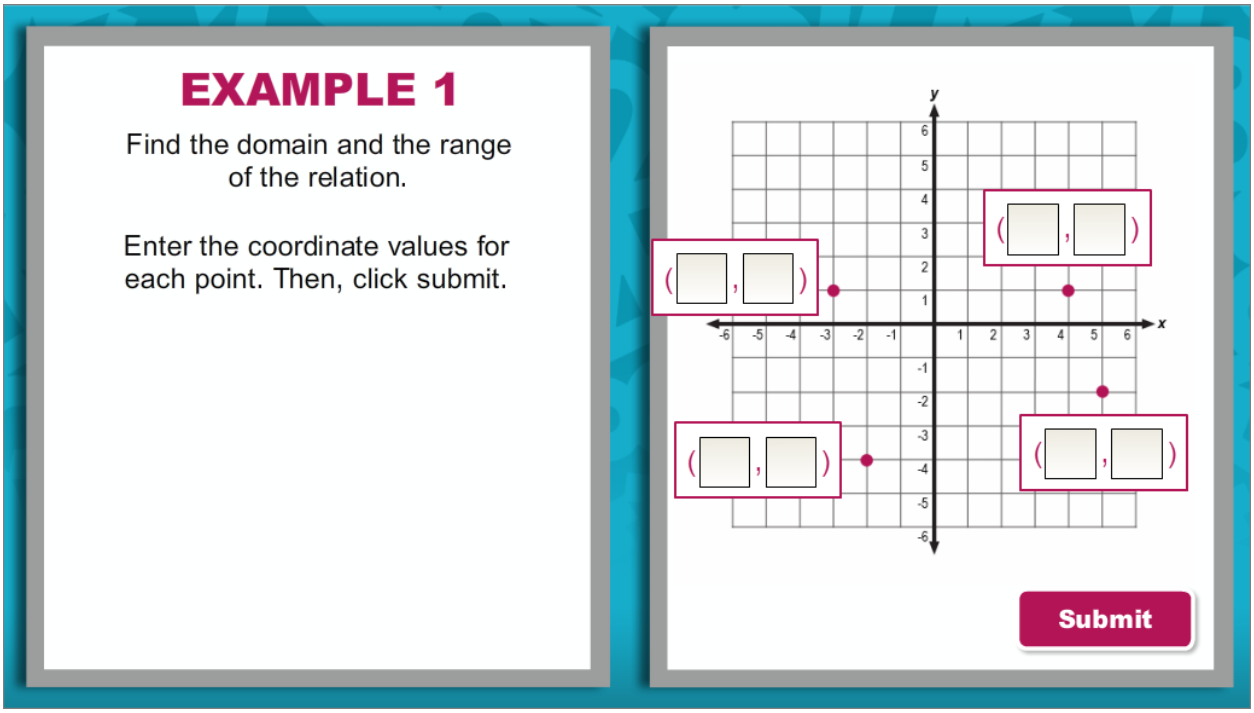
Determining If A Relation Is A Function



Click the examples below to learn more.

- Example 1
- Example 2
- Example 3
- Self-Check

Example 1

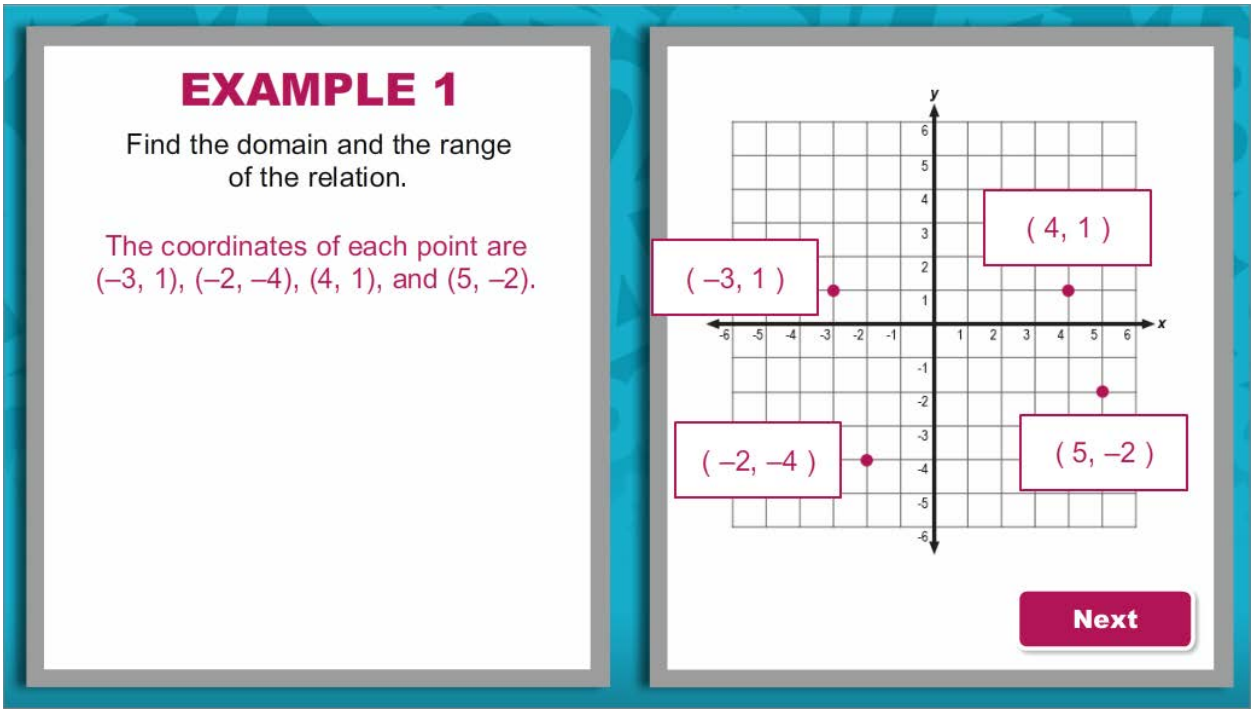


Find the domain and range of the relation.

To determine the domain and range of a relation represented by a discrete graph, you may find it helpful to begin by representing the relation as a set of ordered pairs.

Enter the coordinate values for each point. Then, click submit.

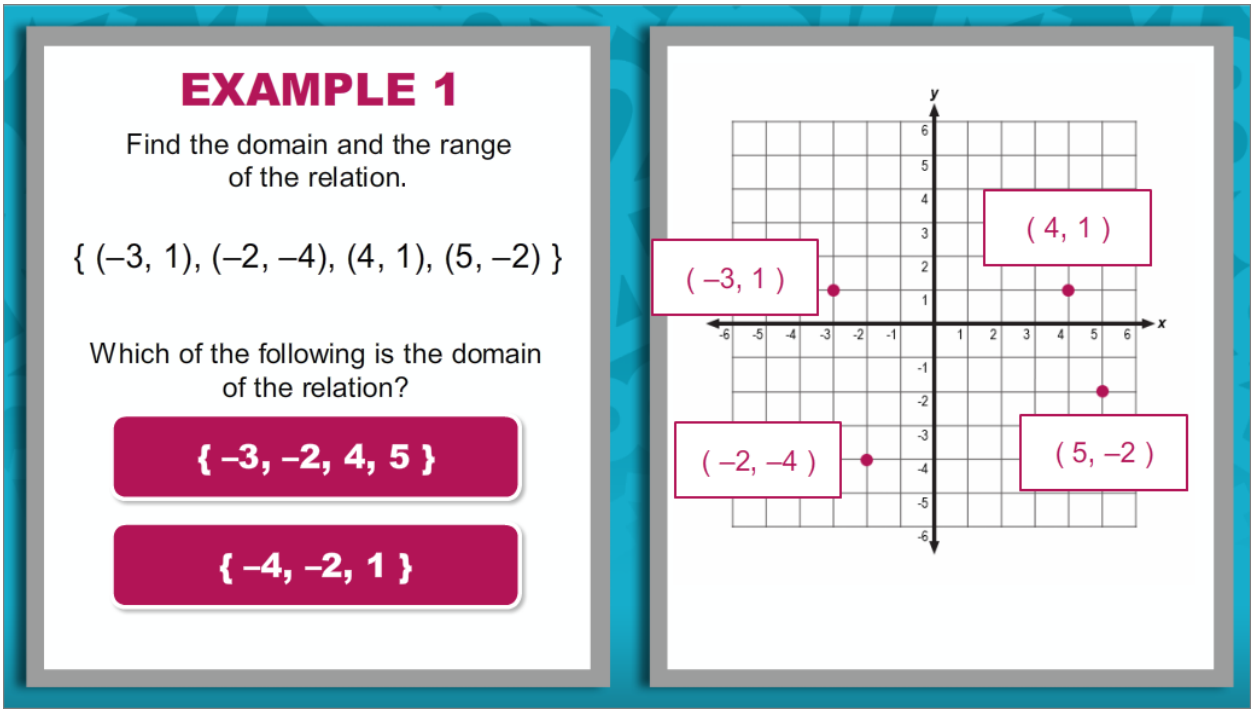
Example 1 (continued)



Find the domain and range of the relation.

The coordinates for each point are $(-3, 1)$, $(-2, -4)$, $(4, 1)$, and $(5, -2)$.

Example 1 (continued)



Find the domain and range of the relation.

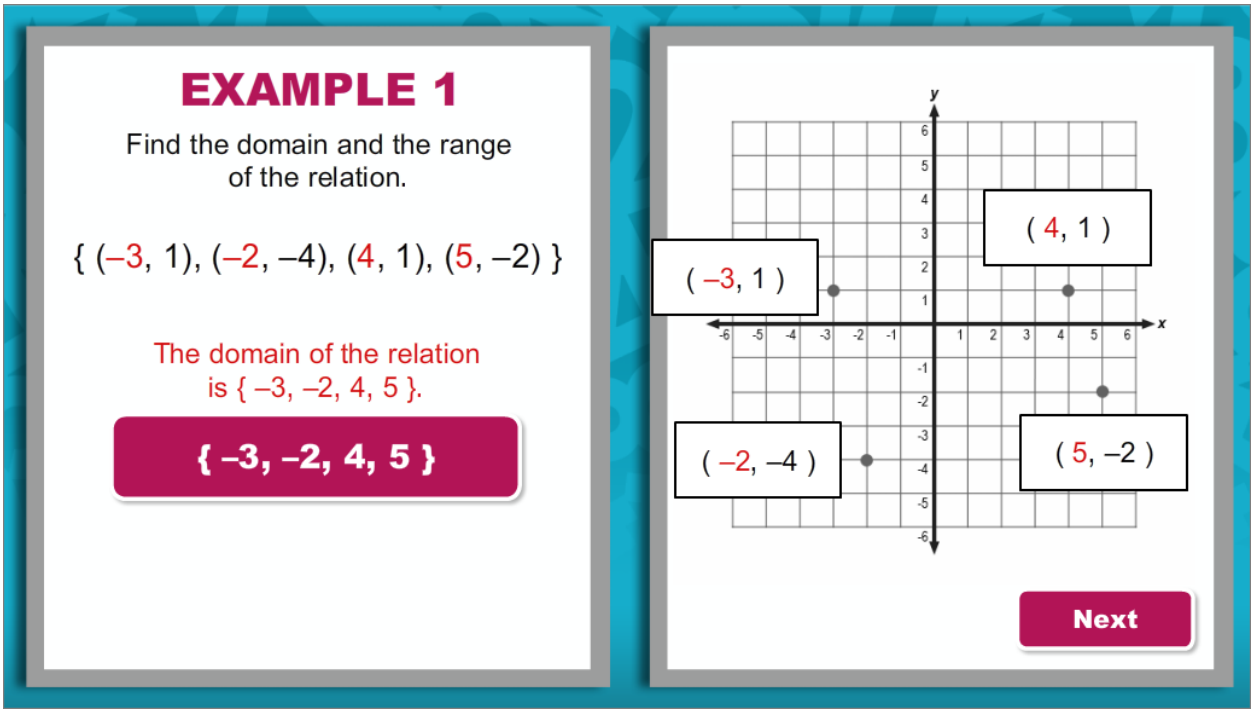
Now that you have determined the coordinates of each point, you can represent the relation as a set of ordered pairs.

$$\{(-3, 1), (-2, -4), (4, 1), (5, -2)\}$$

Which of the following is the domain of the relation?

A) $\{-3, -2, 4, 5\}$
B) $\{-4, -2, 1\}$

Example 1 (continued)

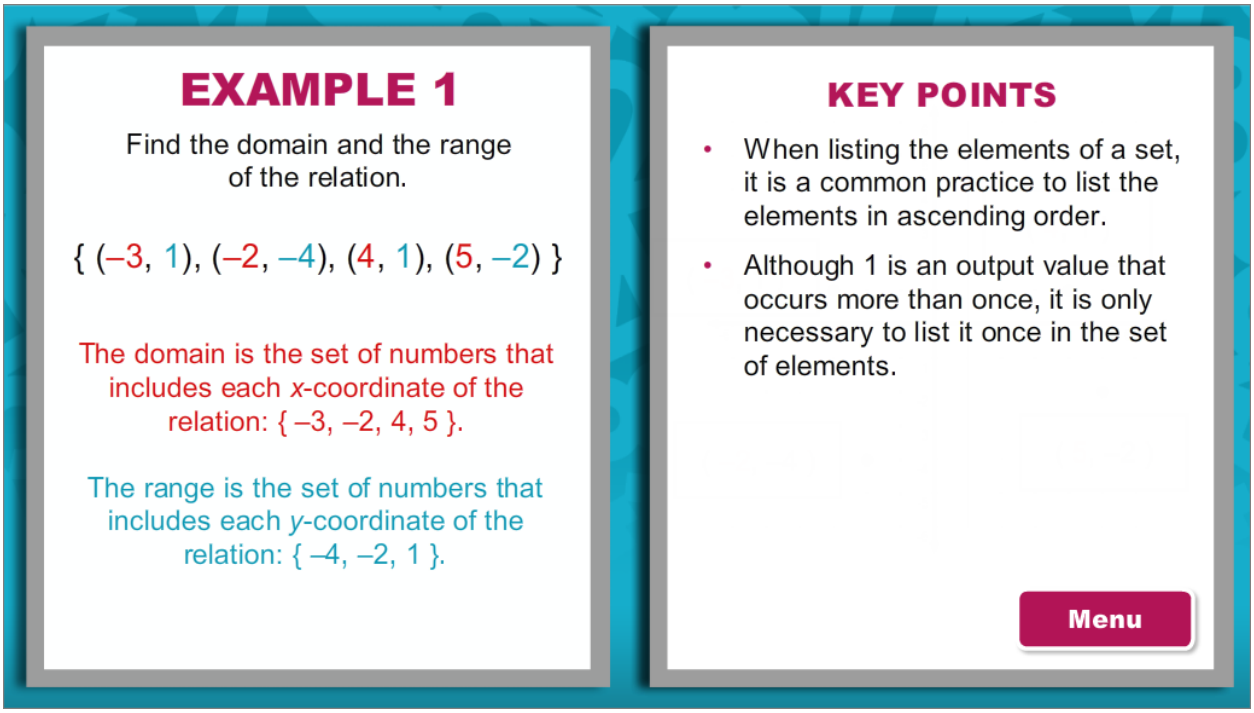


Find the domain and range of the relation.

$$\{(-3, 1), (-2, -4), (4, 1), (5, -2)\}$$

The domain of the relation is $\{-3, -2, 4, 5\}$.

Example 1 (continued)



Find the domain and range of the relation.

$$\{(-3, 1), (-2, -4), (4, 1), (5, -2)\}$$

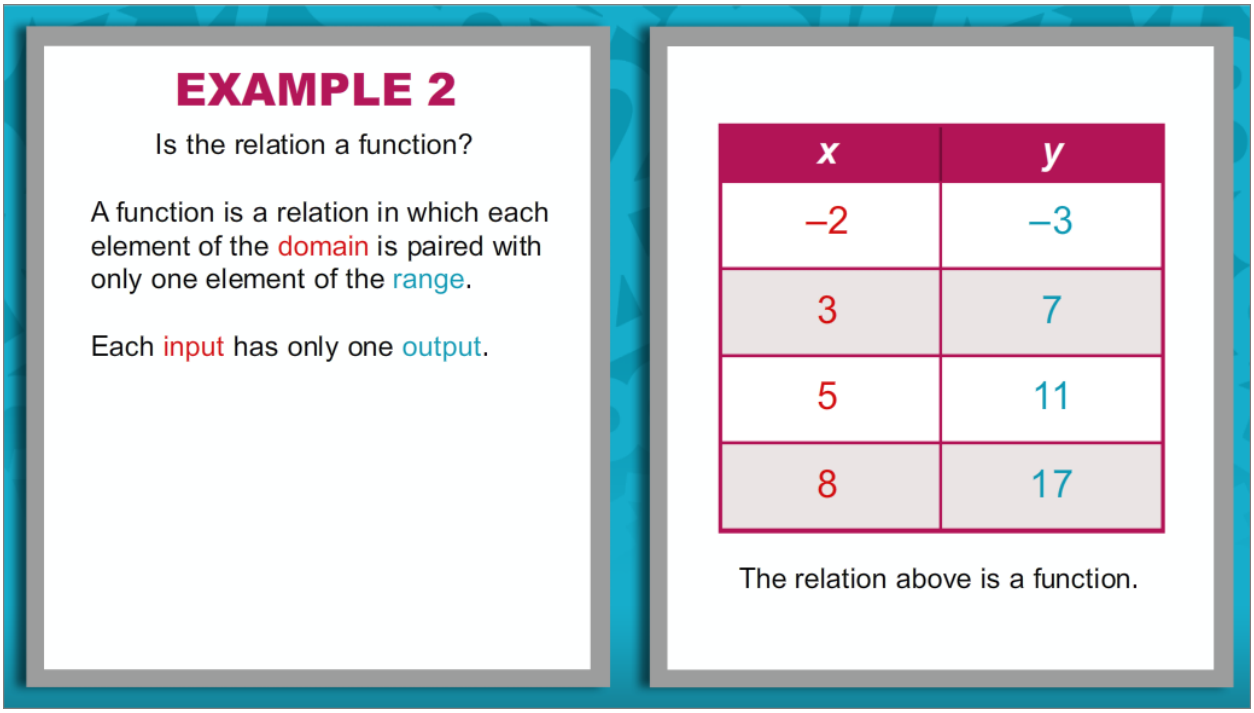
The domain is the set of numbers that includes each x-coordinate of the relation: $\{-3, -2, 4, 5\}$.

The range is the set of numbers that includes each y-coordinate of the relation: $\{-4, -2, 1\}$.

A couple of things to notice:

- When listing the elements of a set, it is a common practice to list the elements in ascending order.
- Although 1 is an output value that occurs more than once, it is only necessary to list it once in the set of elements.

Example 2

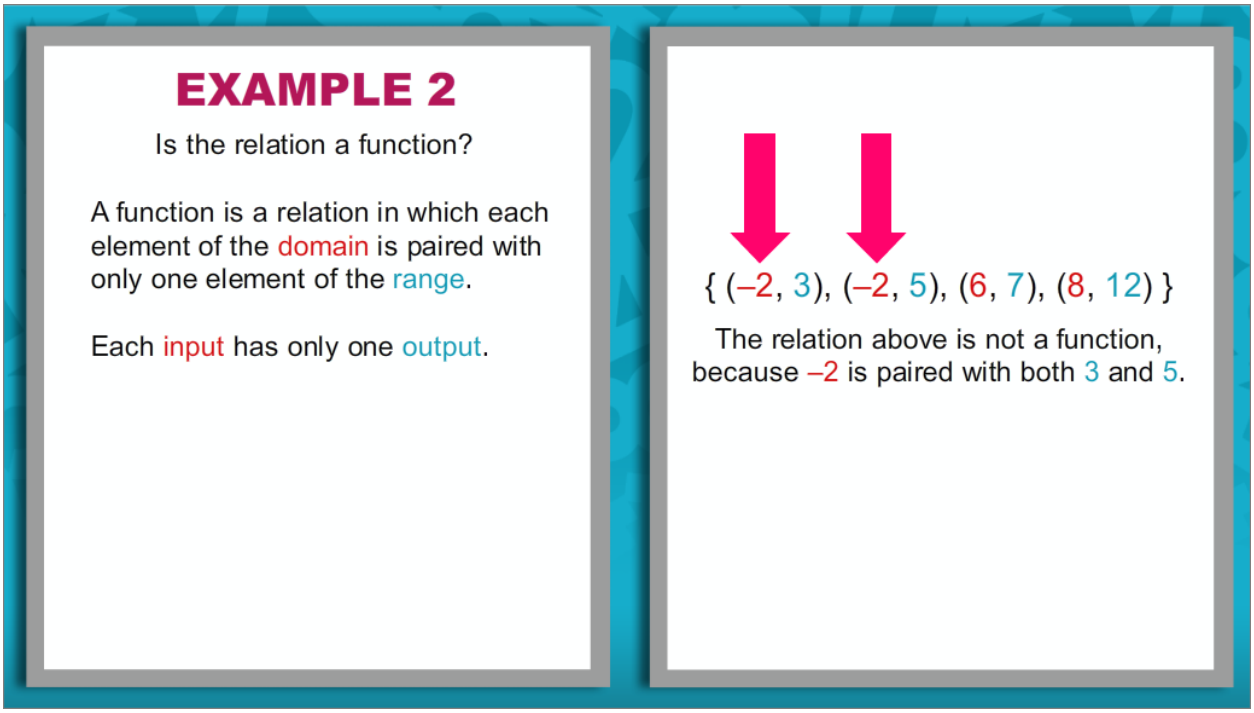


Is the relation a function?

A function is a relation in which each element of the domain is paired with only one element of the range.

Consider the relation represented by the table of values. This relation is a function because each element of the domain is paired with only one element of the range. Or in other words, each input has only one output.

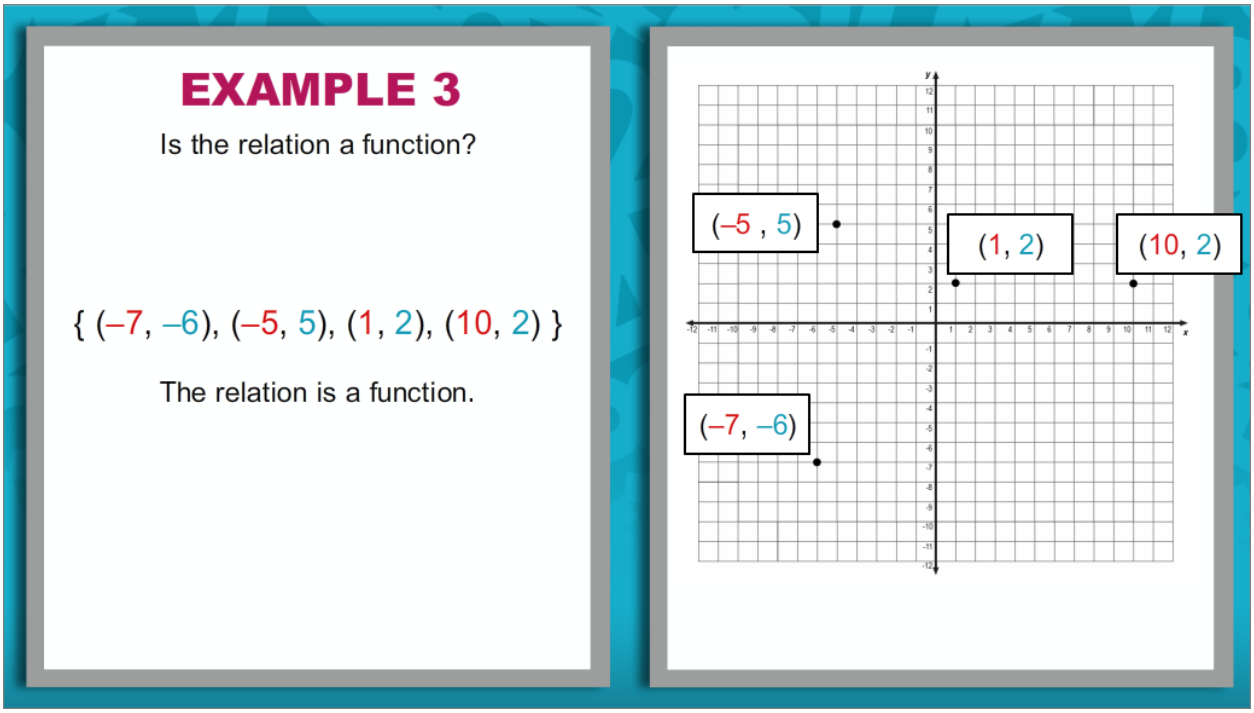
Example 2 (continued)



Is the relation a function?

The relation represented by the set of ordered pairs, however, is not a function. Notice that one of the elements of the domain is paired with two different elements of the range. Or, in other words, one of the input values has two different outputs.

Example 3



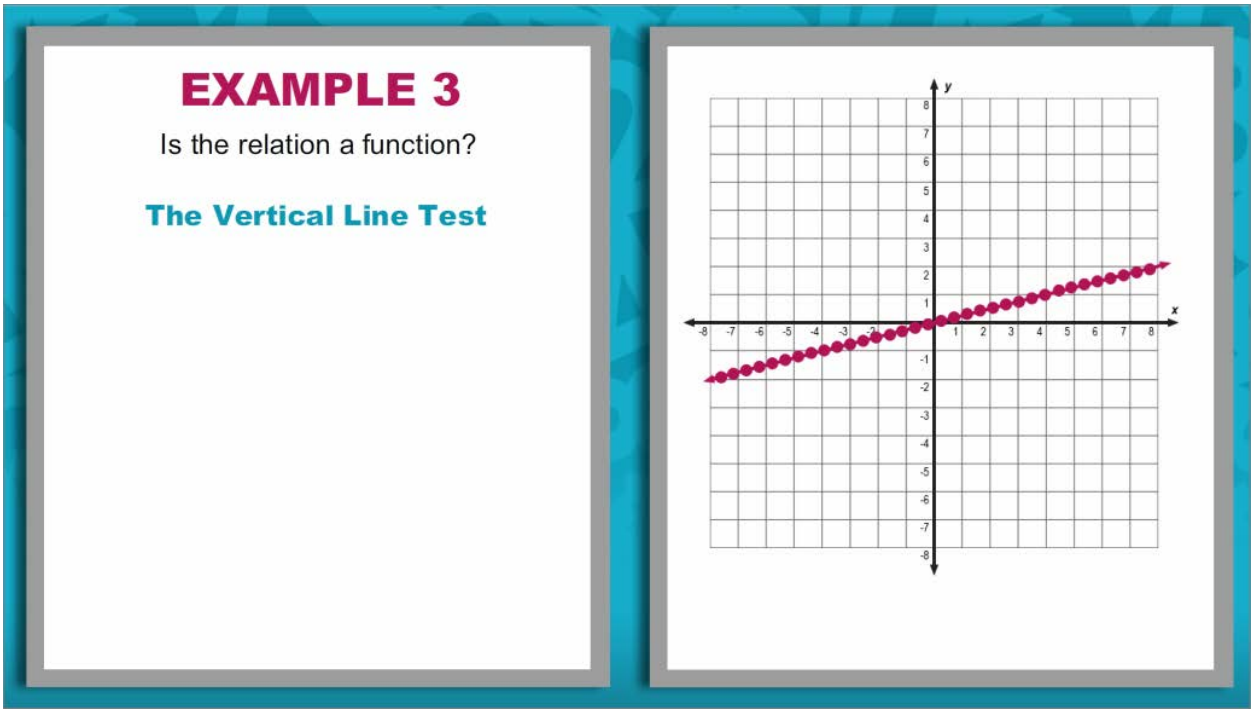
Is the relation a function?

$\{(-7,-6),(-5,5),(1,2),(10,2)\}$

The relation is a function.

You can determine if a relation represented by a discrete graph is a function by finding the location of each point. You can then verify that each input value is paired with only one output value.

Example 3 (continued)

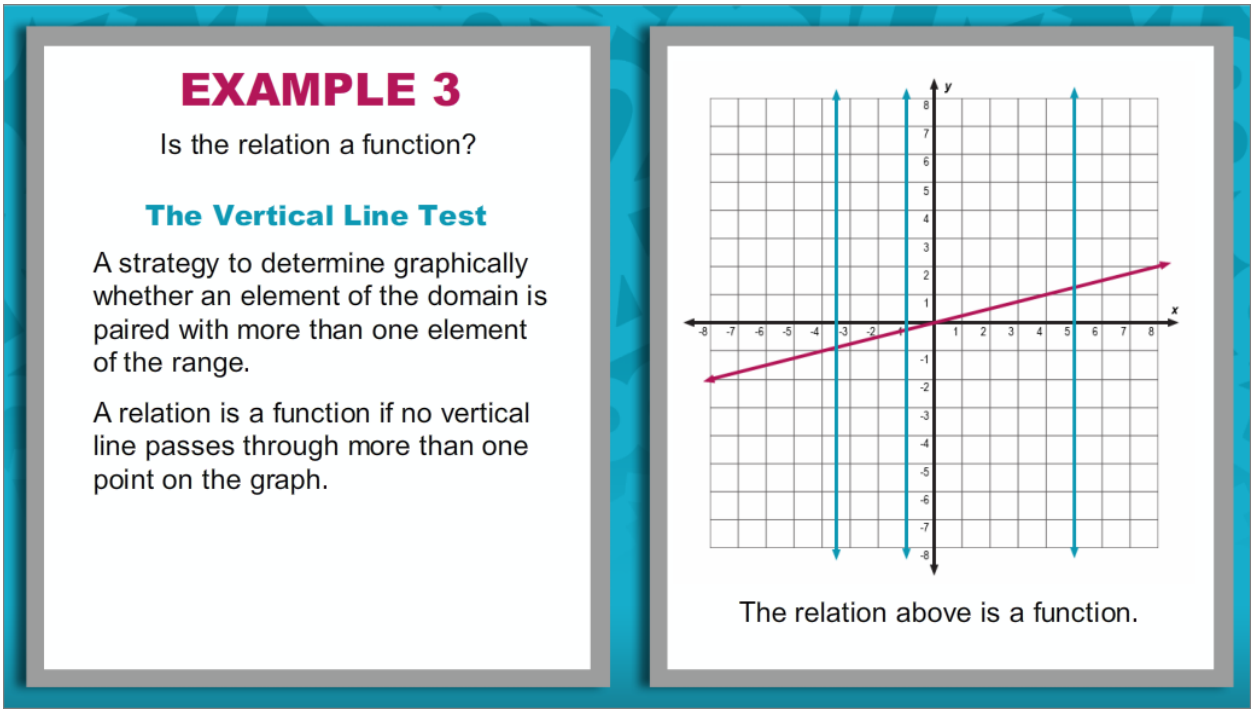


Is the relation a function?

When given a continuous graph, however, it is impossible to identify each point on the graph – as there are an infinite number of points.

So how can you determine if a continuous graph represents a function? You can use the vertical line test.

Example 3 (continued)



Is the relation a function?

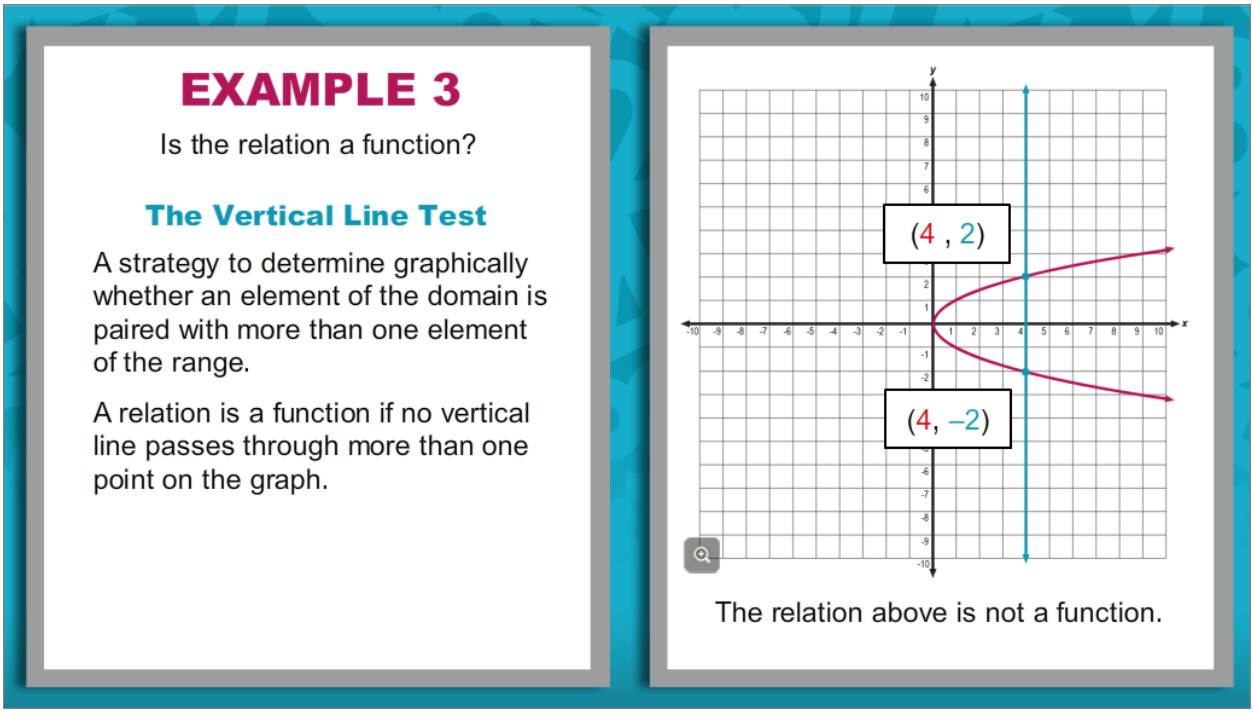
The Vertical Line Test

The vertical line test is a strategy to determine graphically that there exists an element of the domain that is paired with more than one element of the range.

When given a relation represented by a graph, the relation is a function if no vertical line passes through more than one point on the graph.

The relation represented by this graph is a function because there is no vertical line that passes through more than one point on the graph.

Example 3 (continued)

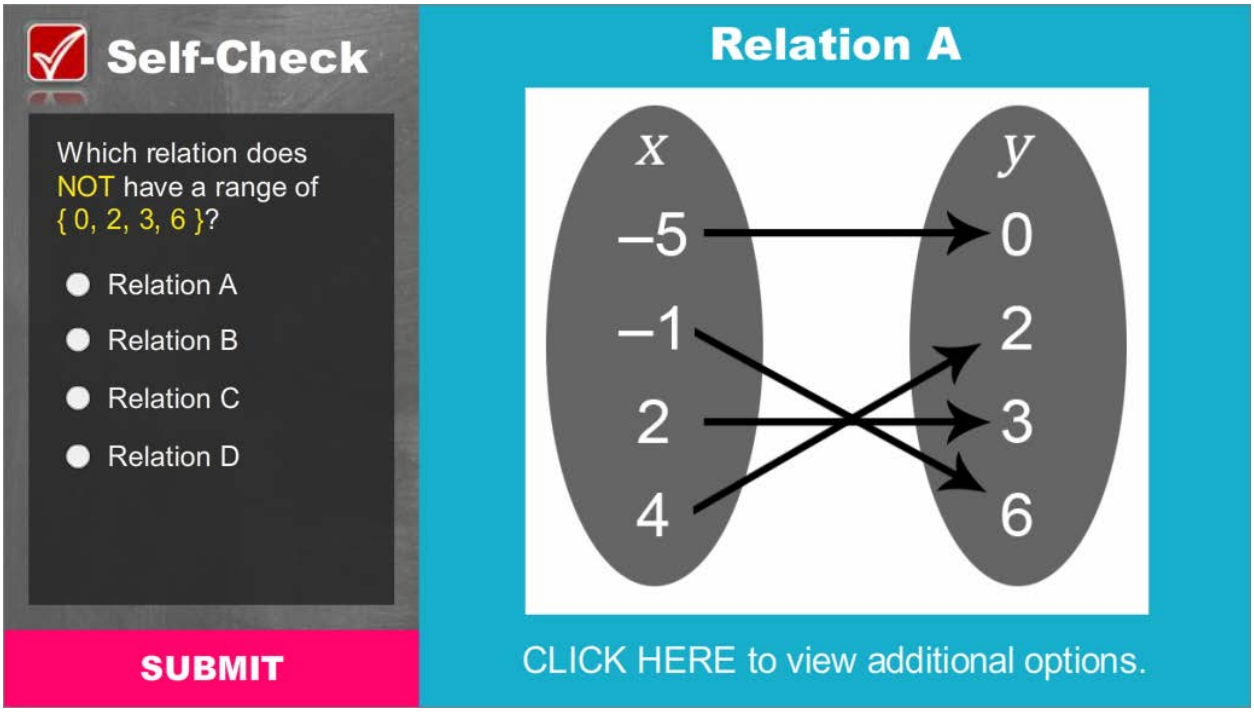


Is the relation a function?

Now, consider this relation. This relation is not a function because there is a vertical line that passes through more than one point on the graph.

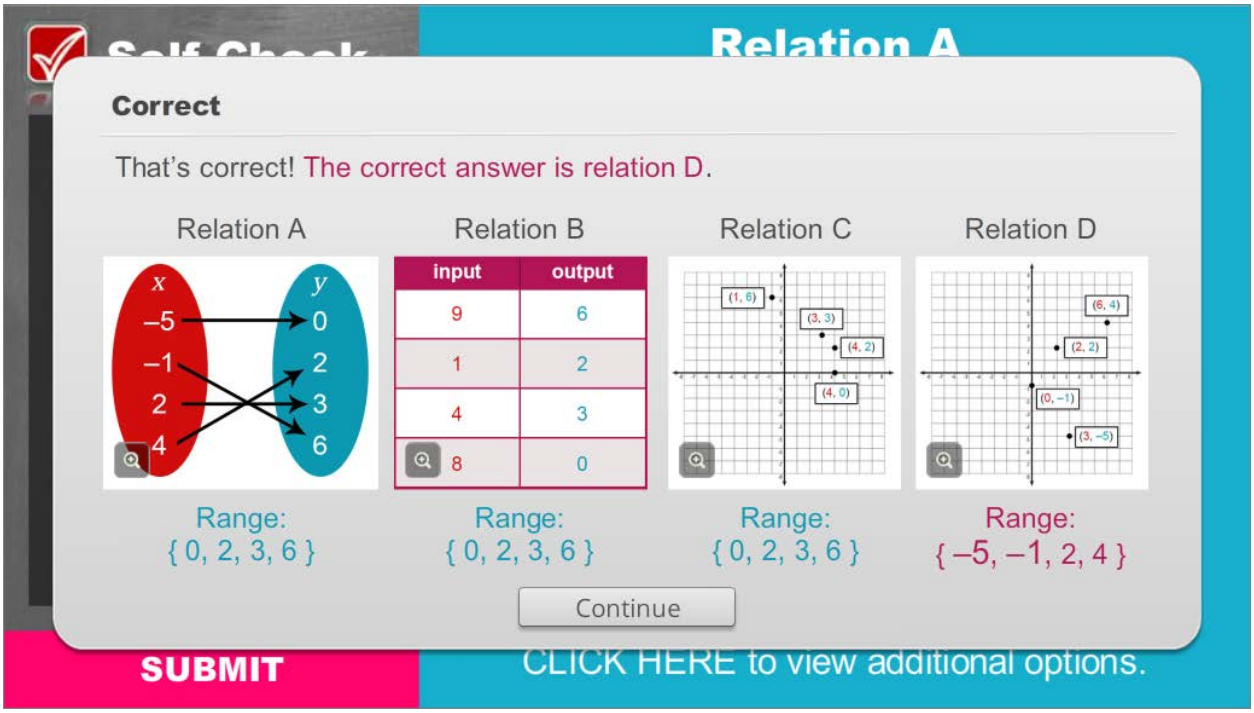
This relation failed the vertical line test. Therefore, it is not a function.

Self-Check 1



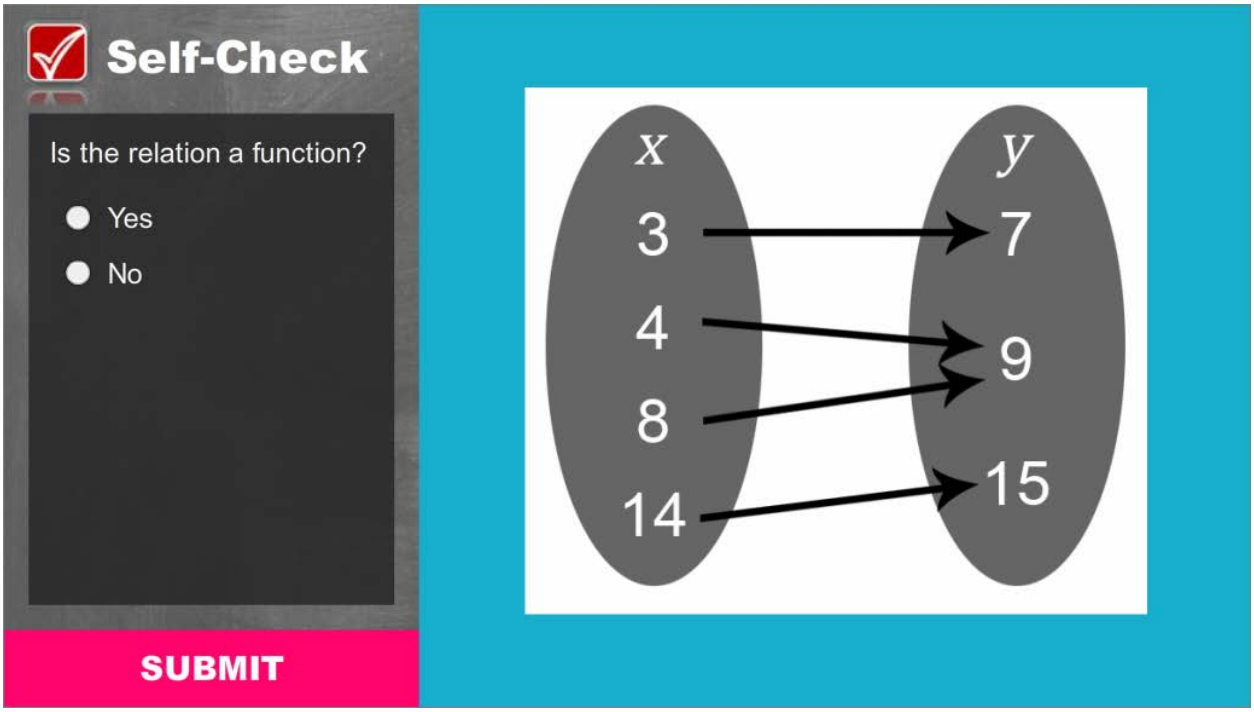
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



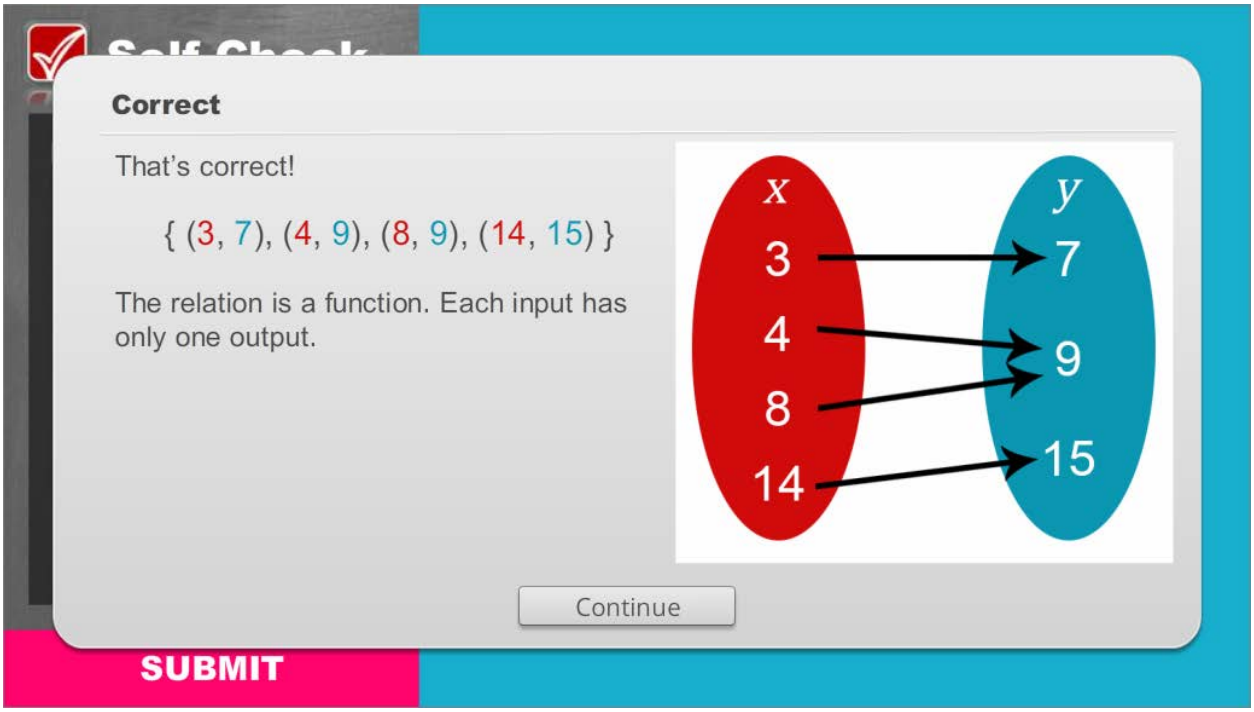
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



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

Self-Check 2: Answer



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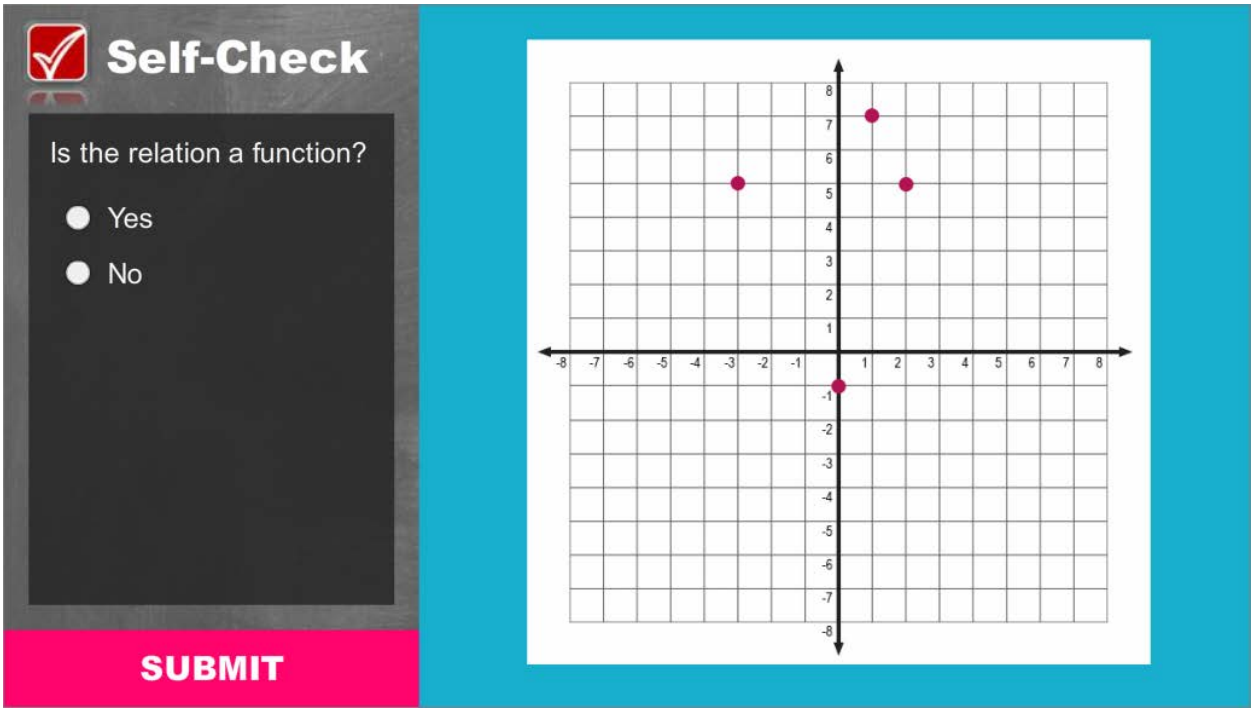
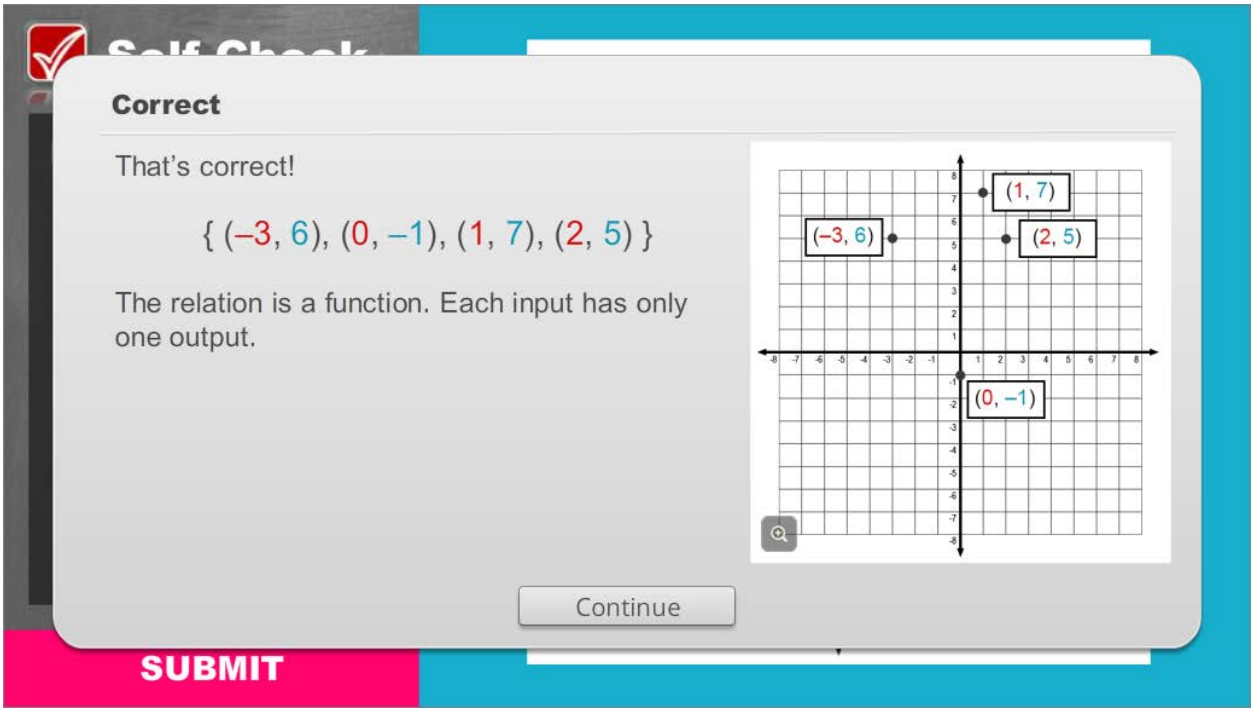
Self-Check 3



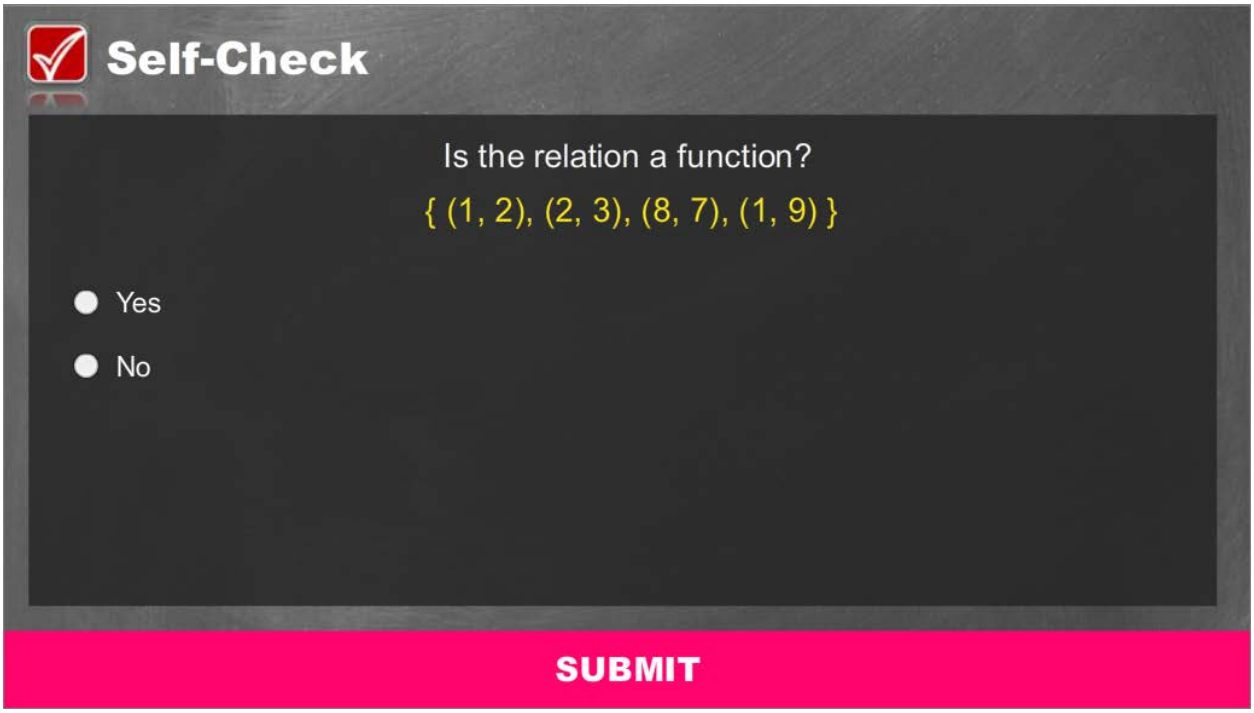
Solve the problem in the image above to check your understanding of the content.

Self-Check 3: Answer



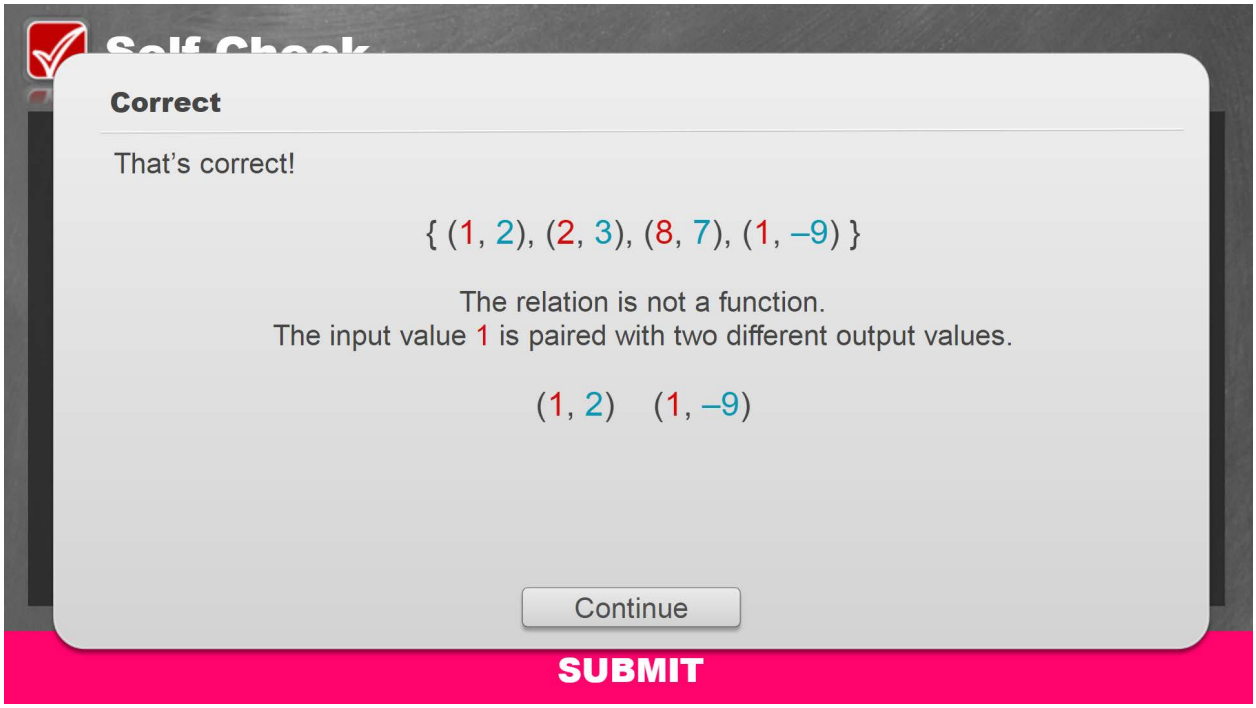
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 4



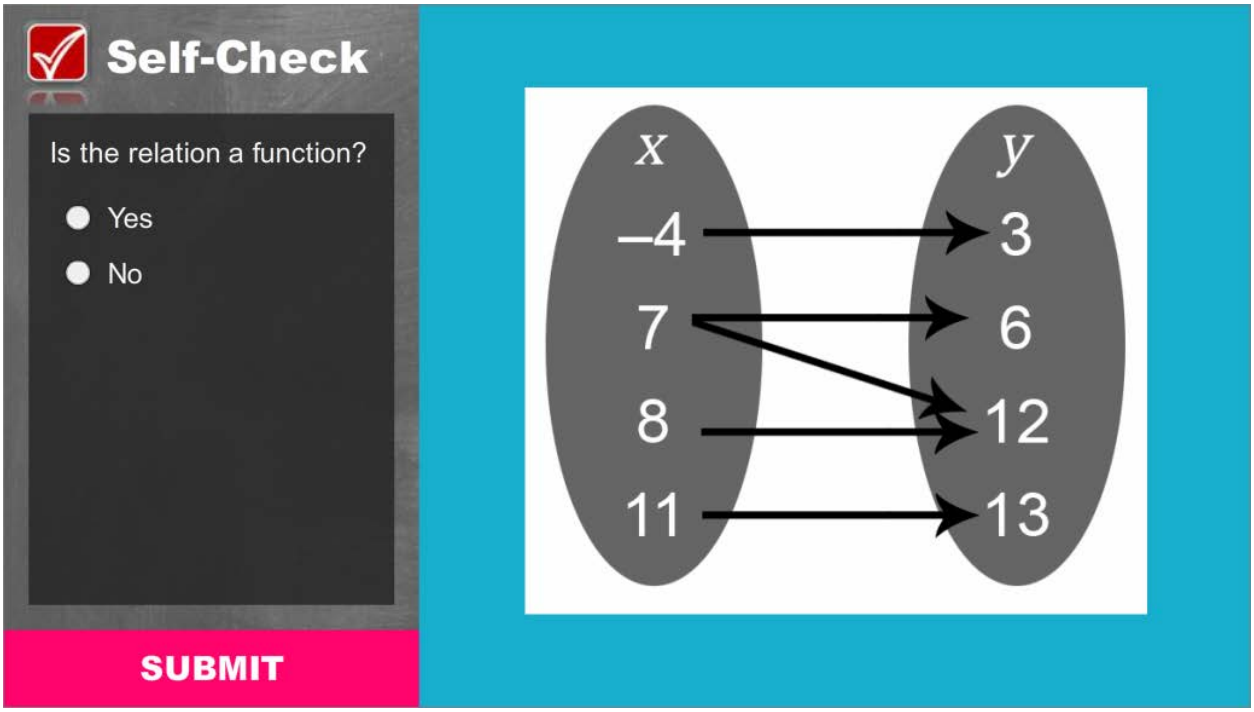
Solve the problem in the image above to check your understanding of the content.

Self-Check 4: Answer



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

Self-Check 5



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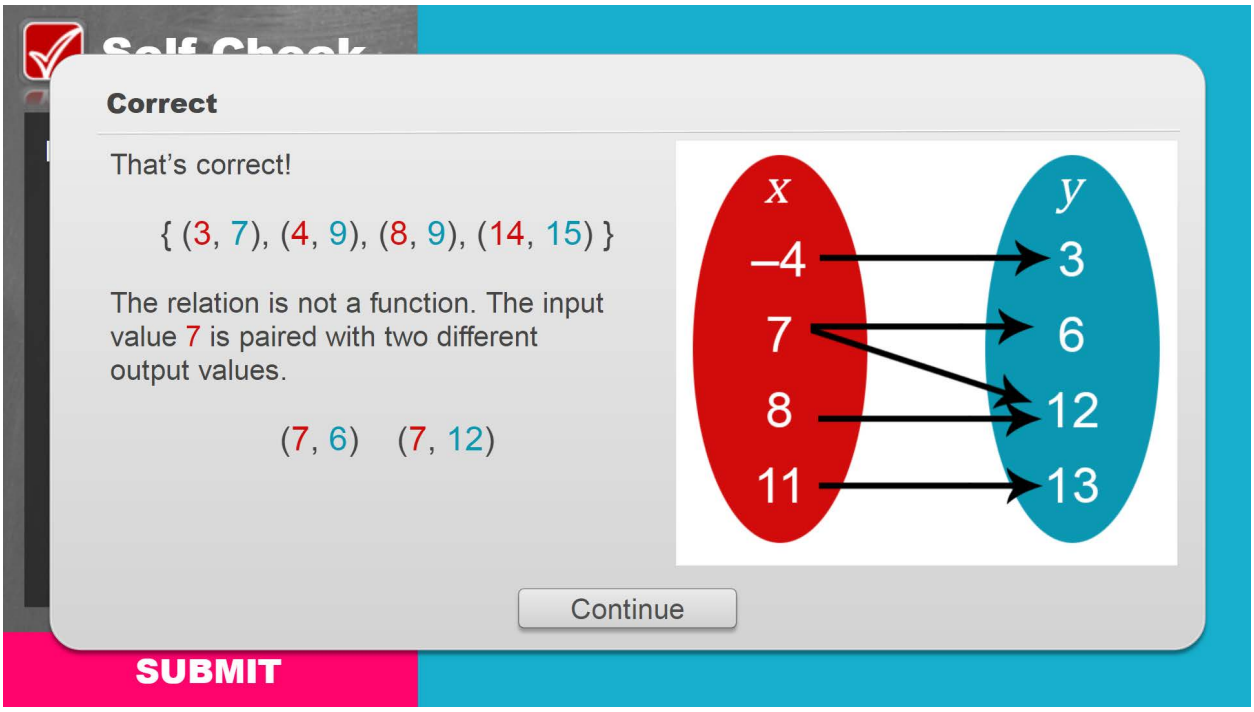
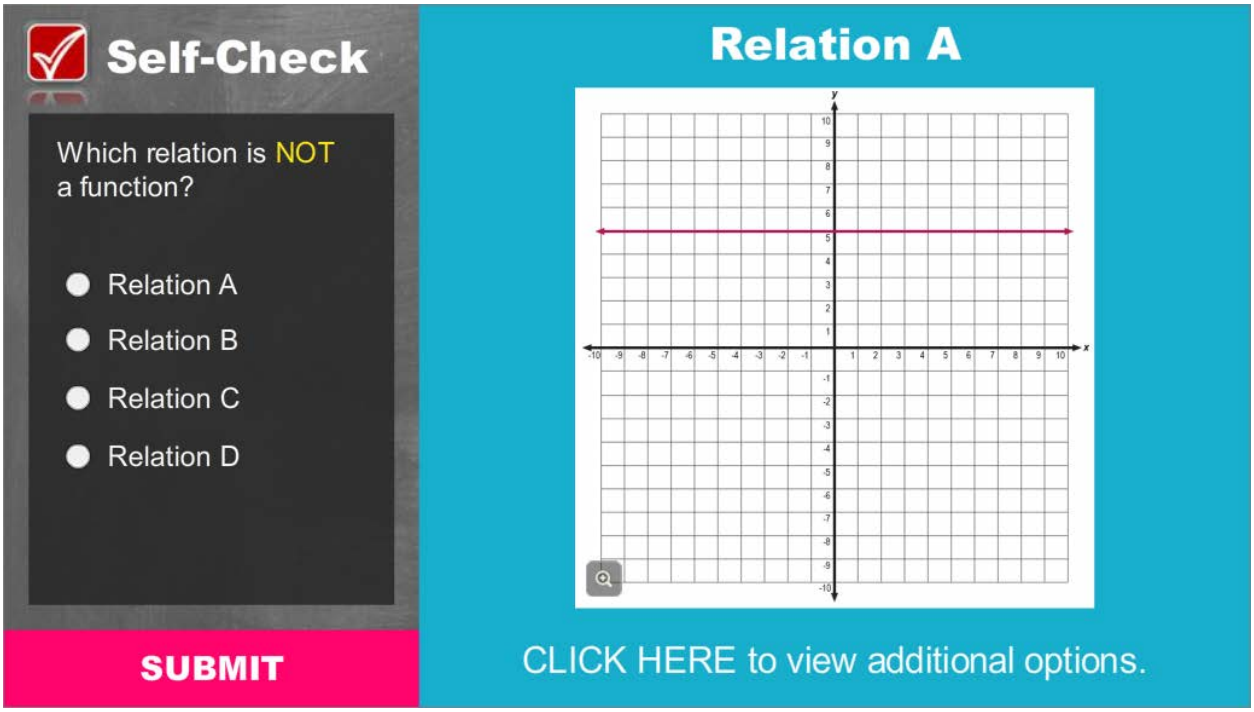
Self-Check 5: Answer



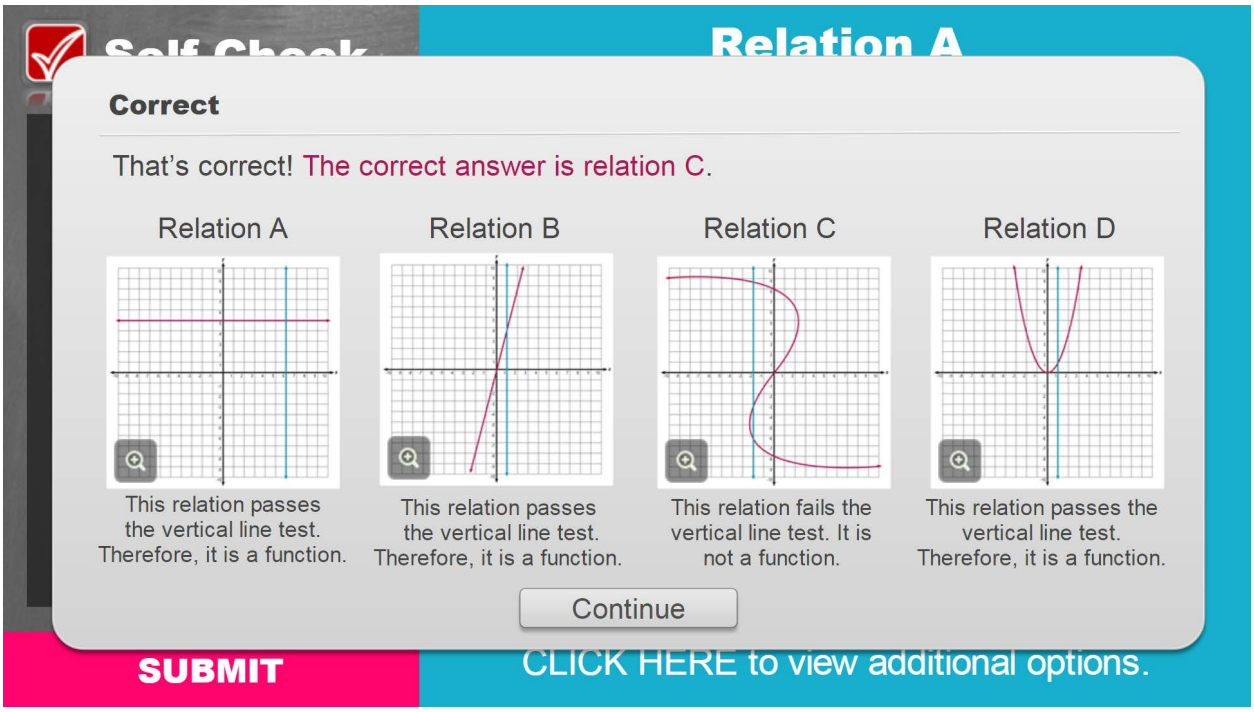
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 6



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

Self-Check 6: Answer



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Conclusion

You have reached the conclusion of this lesson where you explored relations and function.