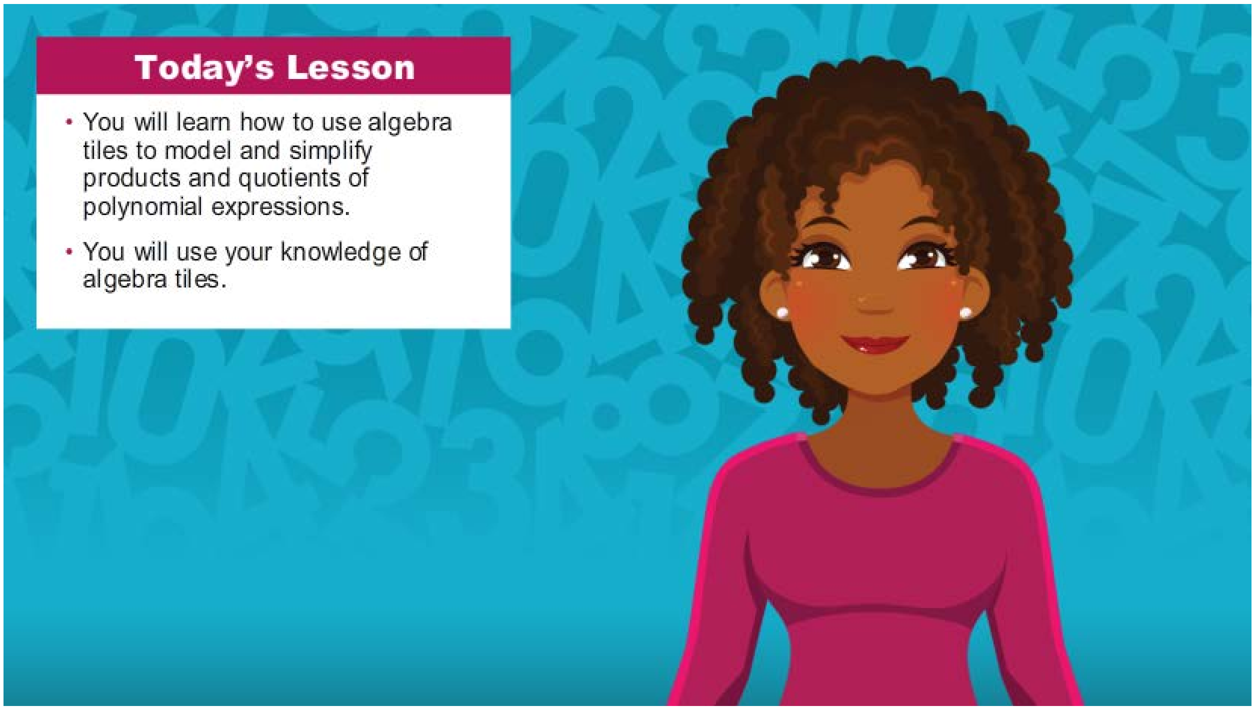
Module 3: Adding and Subtracting Polynomials

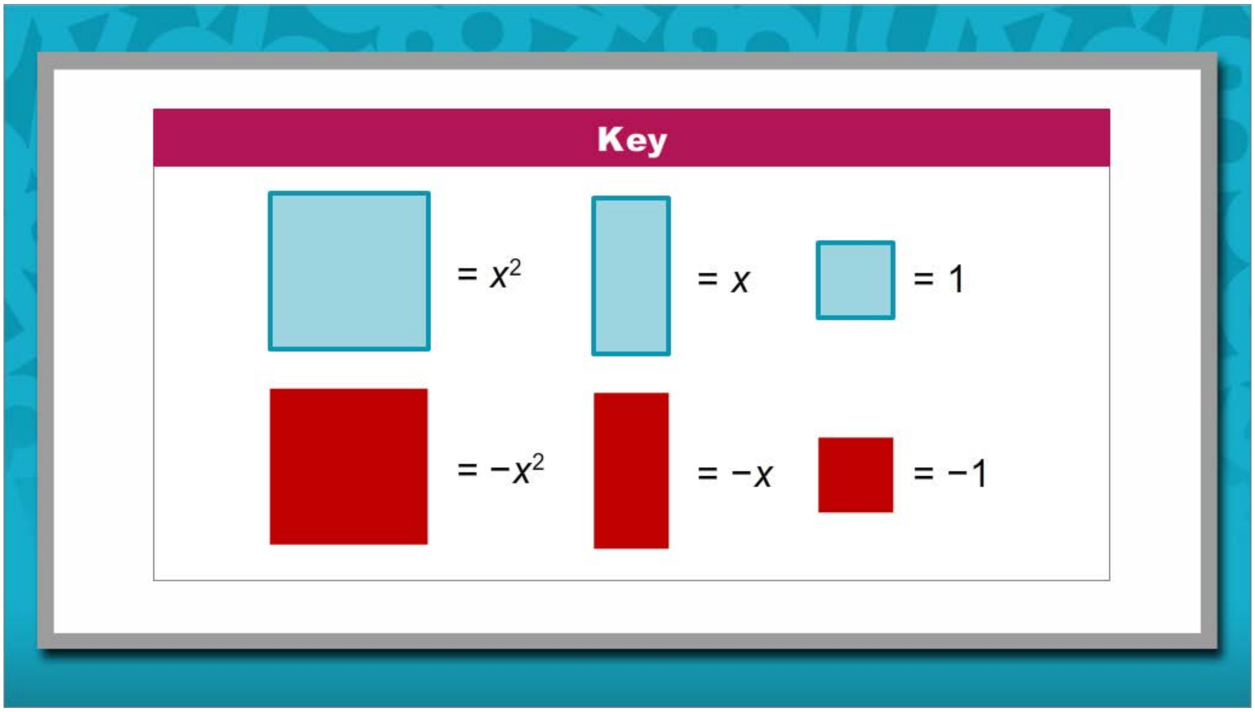
Topic 2 Content: Multiplying and Dividing Polynomials – Algebra Tiles

Introduction



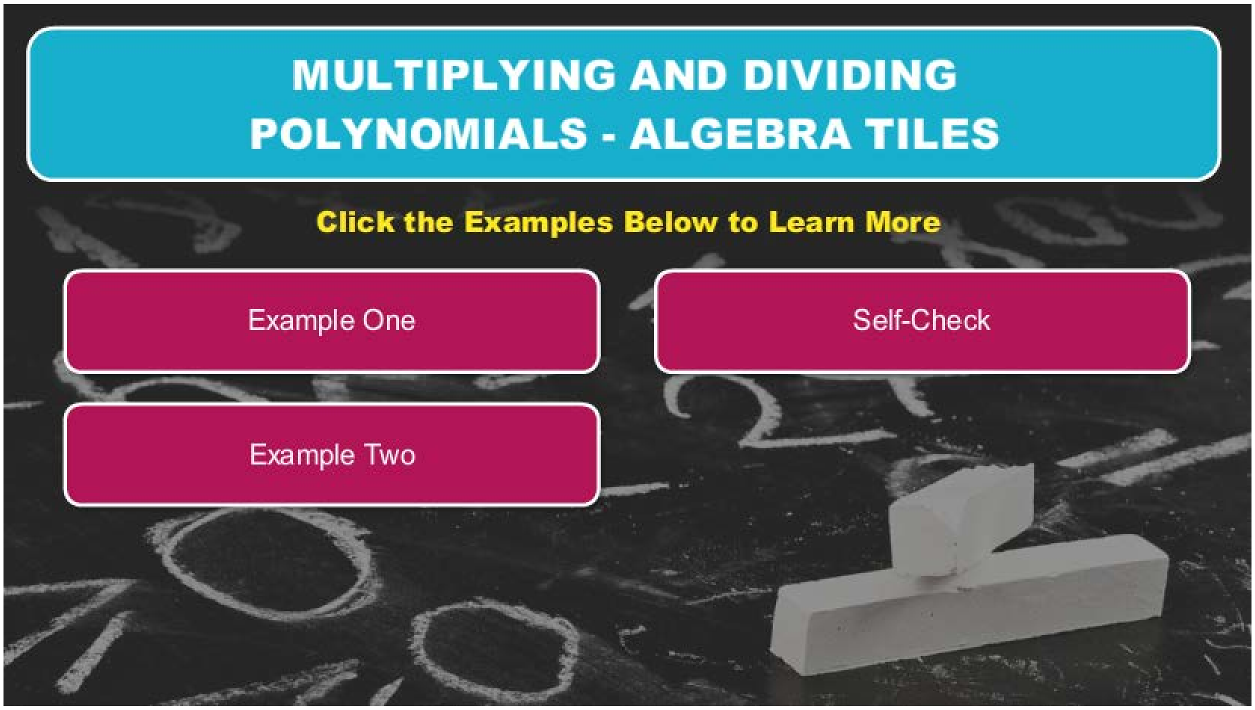
Hello and welcome! I'm so glad to have you here for this lesson in Algebra I, where you will learn how to use algebra tiles to model and simplify products and quotients of polynomial expressions. Your knowledge of how to use algebra tiles to model integer operations will be a useful skill during this lesson.

Anticipatory Set



Take a moment to review what each algebra tile represents.

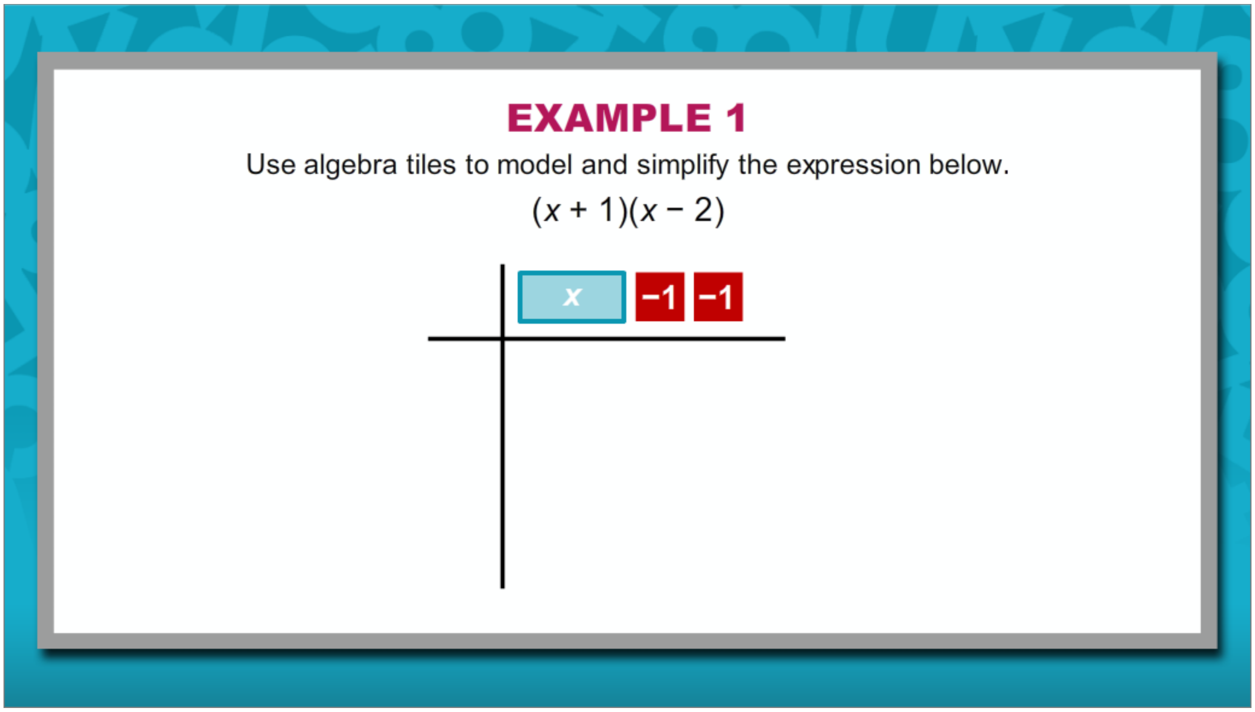
Multiplying and Dividing Polynomials – Algebra Tiles



Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Example 1



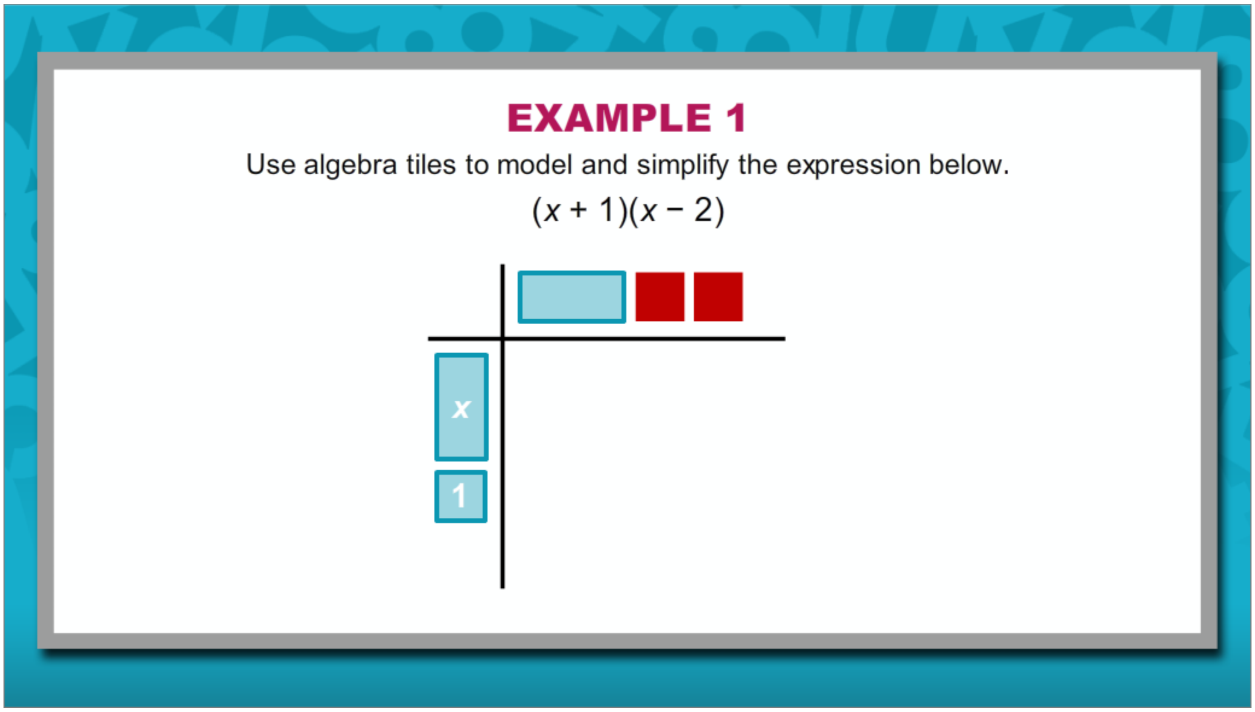
Use algebra tiles to model and simplify the expression below.

$$(x+1)(x-2)$$

To multiply the binomials $(x+1)$ and $(x-2)$, you will need to set up the algebra tiles in a frame as follows. When you use algebra tiles to multiply first-degree polynomials, the result is a rectangle.

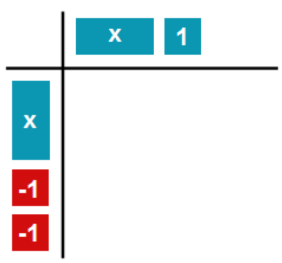
The length of this rectangle is $x-2$, represented by the tiles outside the top of the frame. There is 1 blue rectangle to represent x and 2 red 1-unit squares to represent -2.

Example 1 (continued)

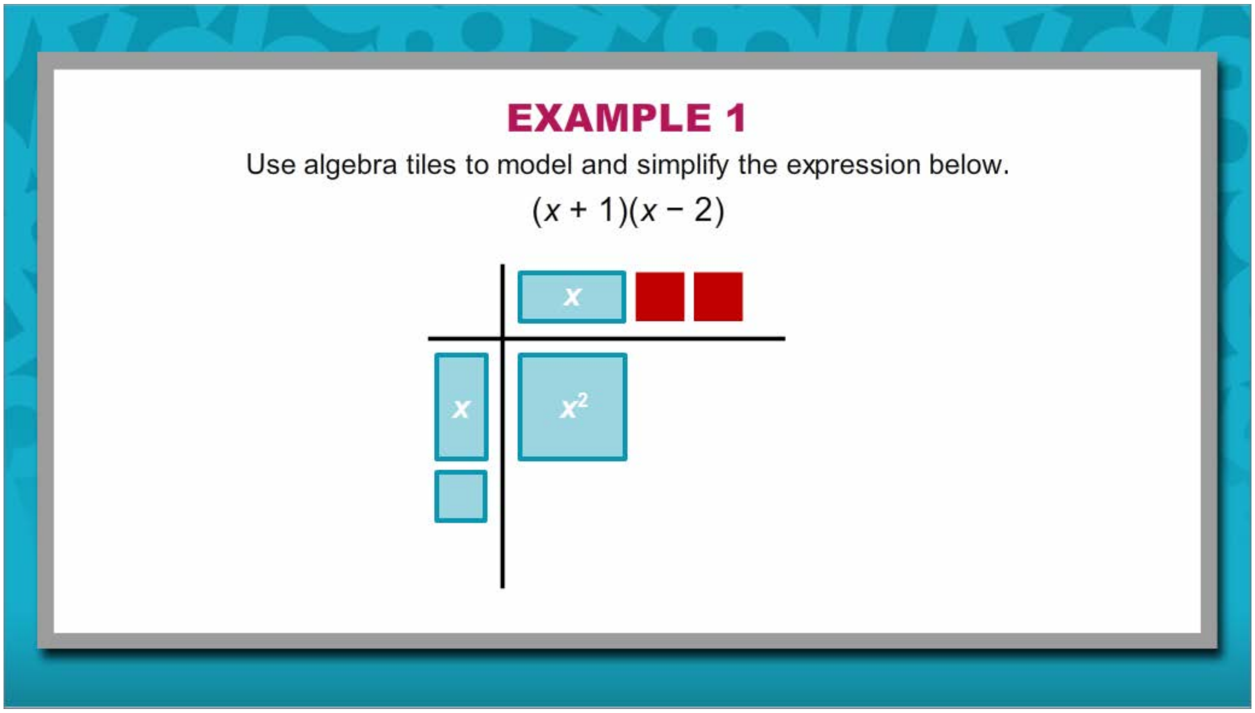


The width of this rectangle is $x + 1$, represented by the tiles outside the left of the frame. There is 1 blue rectangle and 1 blue 1-unit square to represent positive 1.

If you chose to represent the width as $x - 2$ and the length as $x + 1$, that would be acceptable as well.



Example 1 (continued)



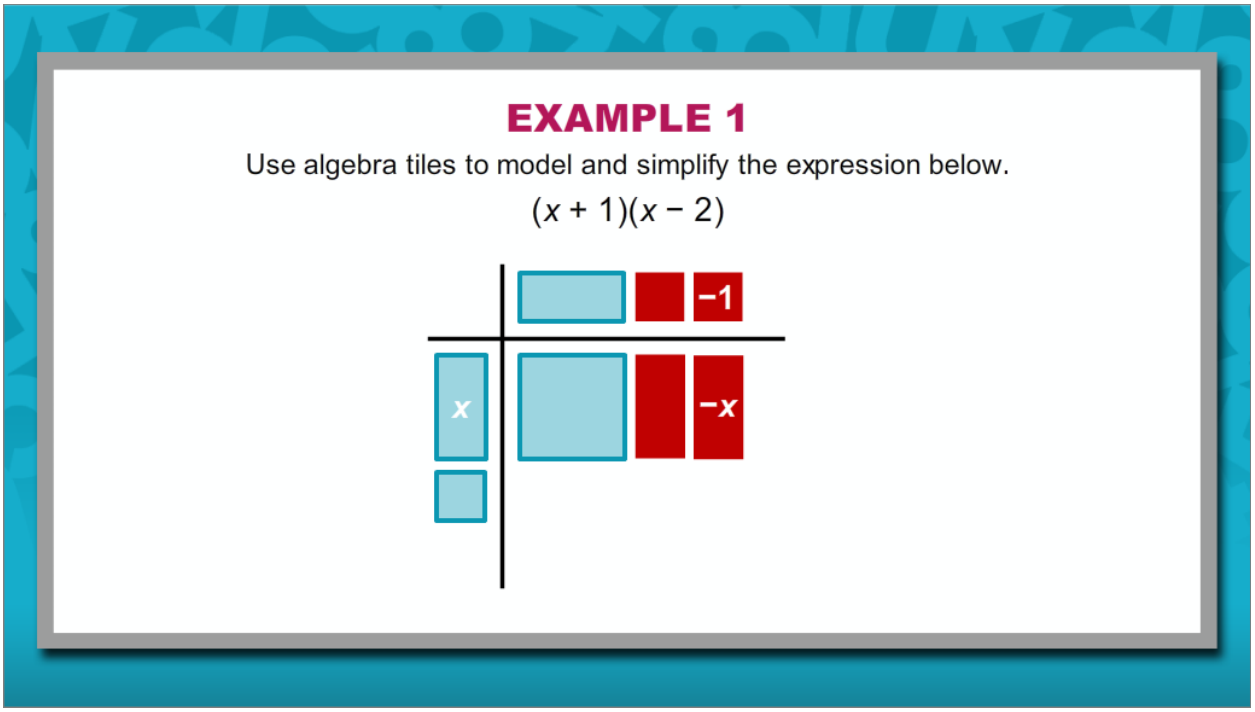
Now to determine the product of the binomials, you will need to complete a few multiplication problems.

Begin by multiplying by the first tile of width by each tile of the length.

$$x \cdot x = x^2$$

A blue x^2 tile in the area inside the frame represents this product.

Example 1 (continued)



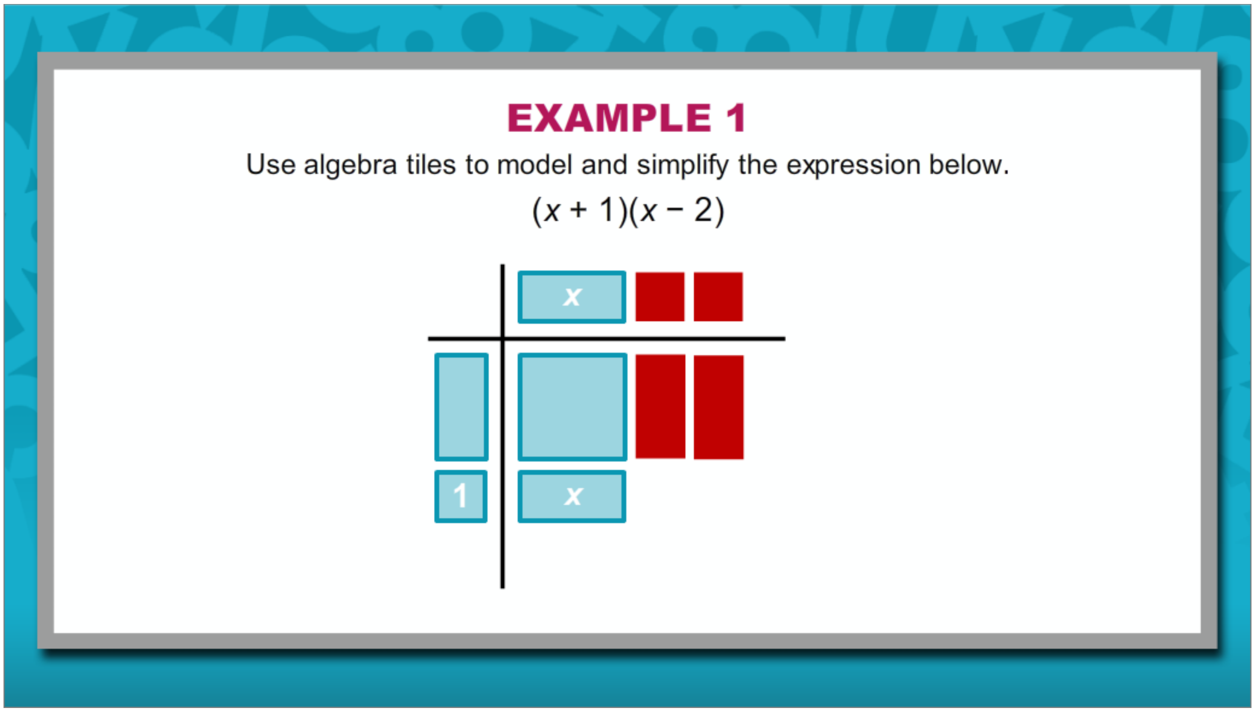
$x \cdot -1 = -x$

A red rectangle in the area inside the frame represents this product. And once again:

$x \cdot -1 = -x$

Another red rectangle in the area inside the frame represents this product.

Example 1 (continued)

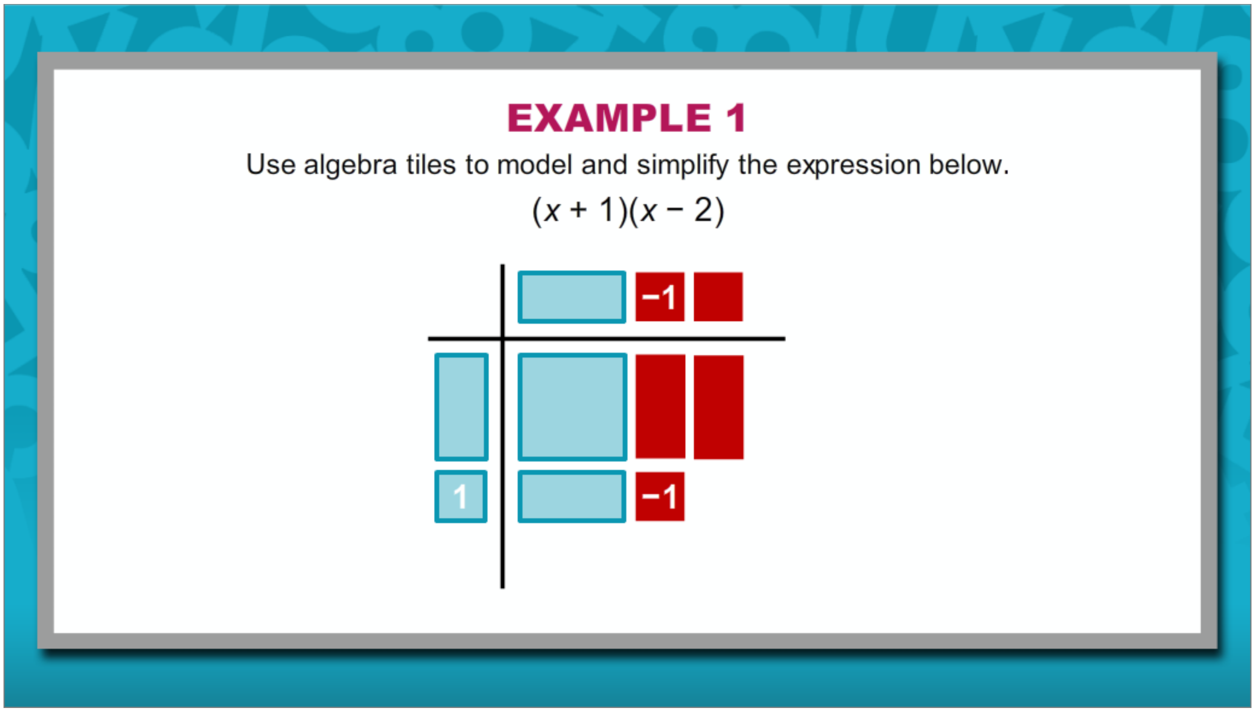


Now multiply the next tile of the width by each tile of the length.

$$1 \cdot x = x$$

A blue rectangle in the area inside the frame represents this product. Notice that this rectangle is laying horizontally. This shows that it is the result of multiplying a width of 1 by a length of x.

Example 1 (continued)



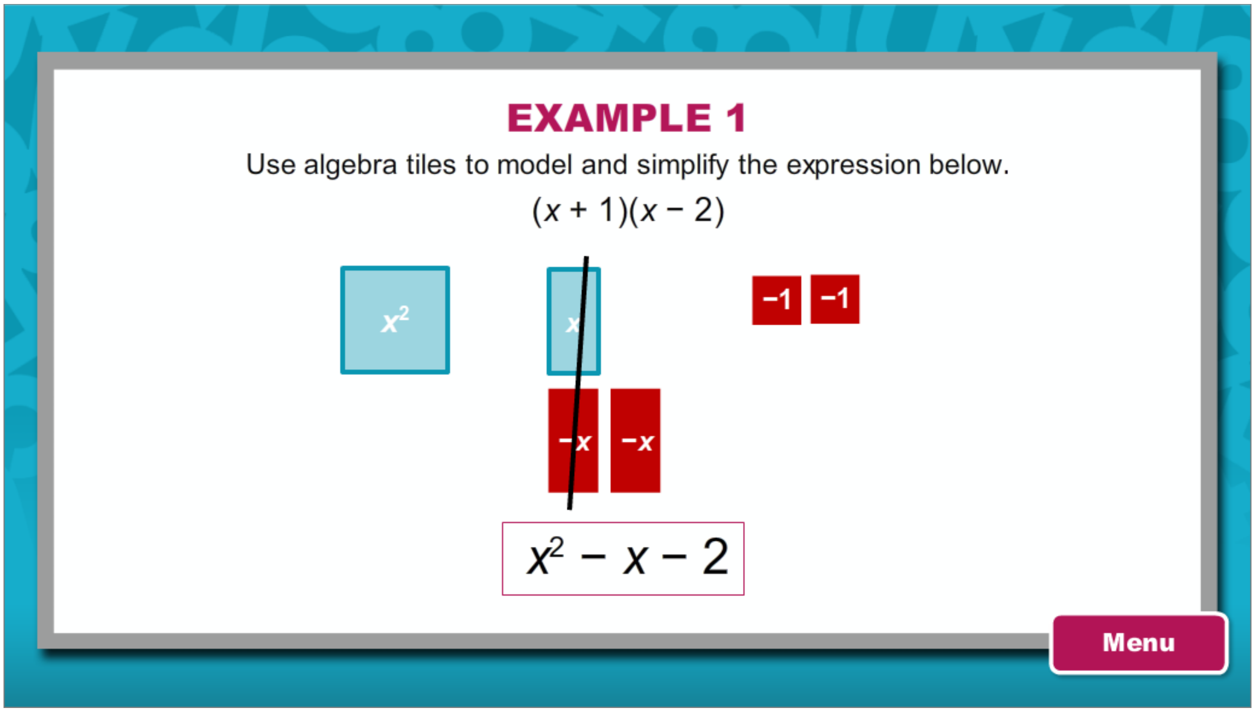
$1 \cdot -1 = -1$

A red 1-unit square in the area inside the frame represents this product.

$1 \cdot -1 = -1$

Another red 1-unit square represents this product.

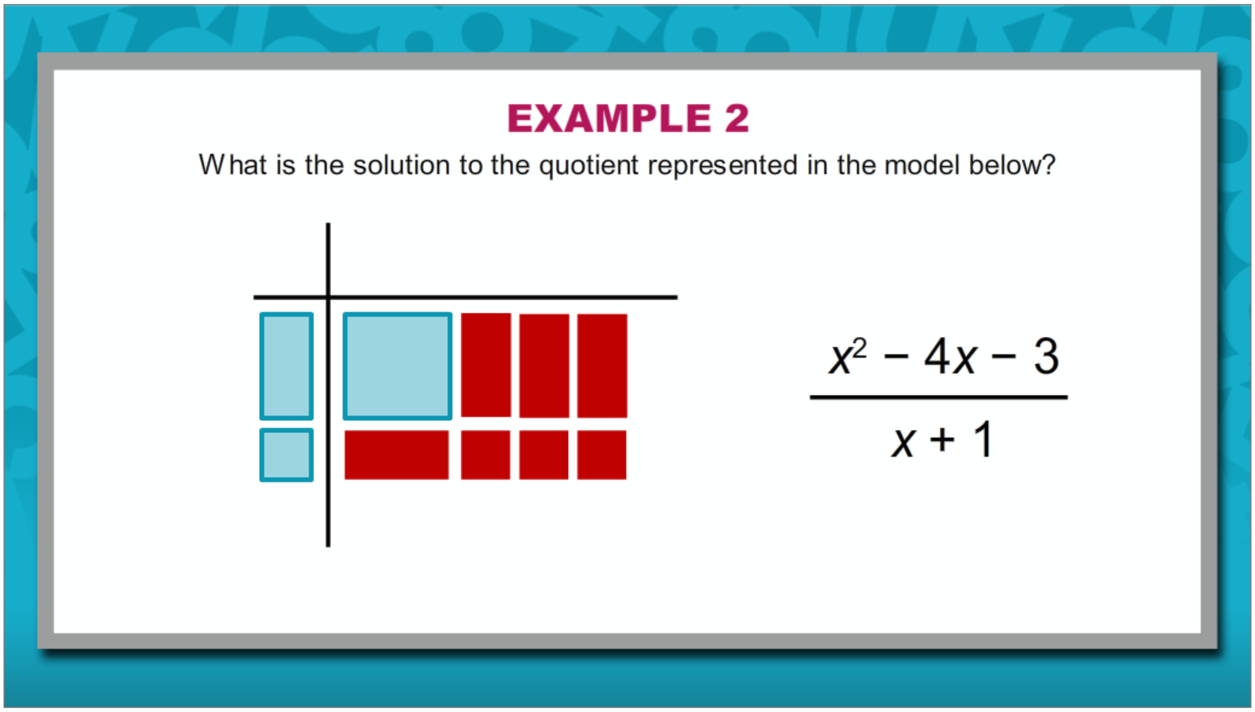
Example 1 (continued)



Now it's time to simplify the product.

Group the like tiles together. After eliminating the zero pair, you find that the product simplifies to $x^2 - x - 2$.

Example 2

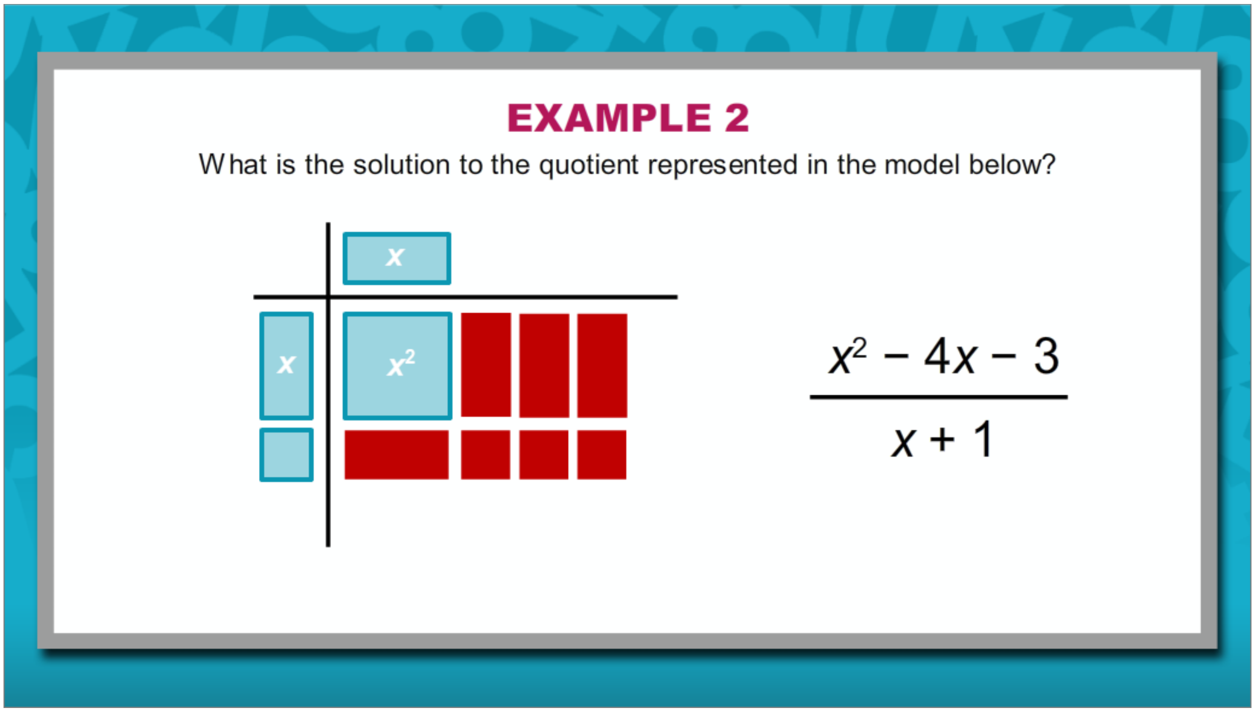


What is the solution to the quotient represented in the model below?

$$\frac{x^2 - 4x - 3}{x + 1}$$

The algebra tiles model the quotient of two polynomials. The tiles in the area inside the frame represent the trinomial, $x^2 - 4x - 3$. Along the width of the frame, the tiles represent the binomial, $x + 1$. You'll notice the tiles along the length of the frame are missing. Once you determine the quotient of the polynomials, you will determine the missing length.

Example 2 (continued)



Recall that the first row of algebra tiles inside the frame is generated by multiplying the first tile of the width by each tile of the length.

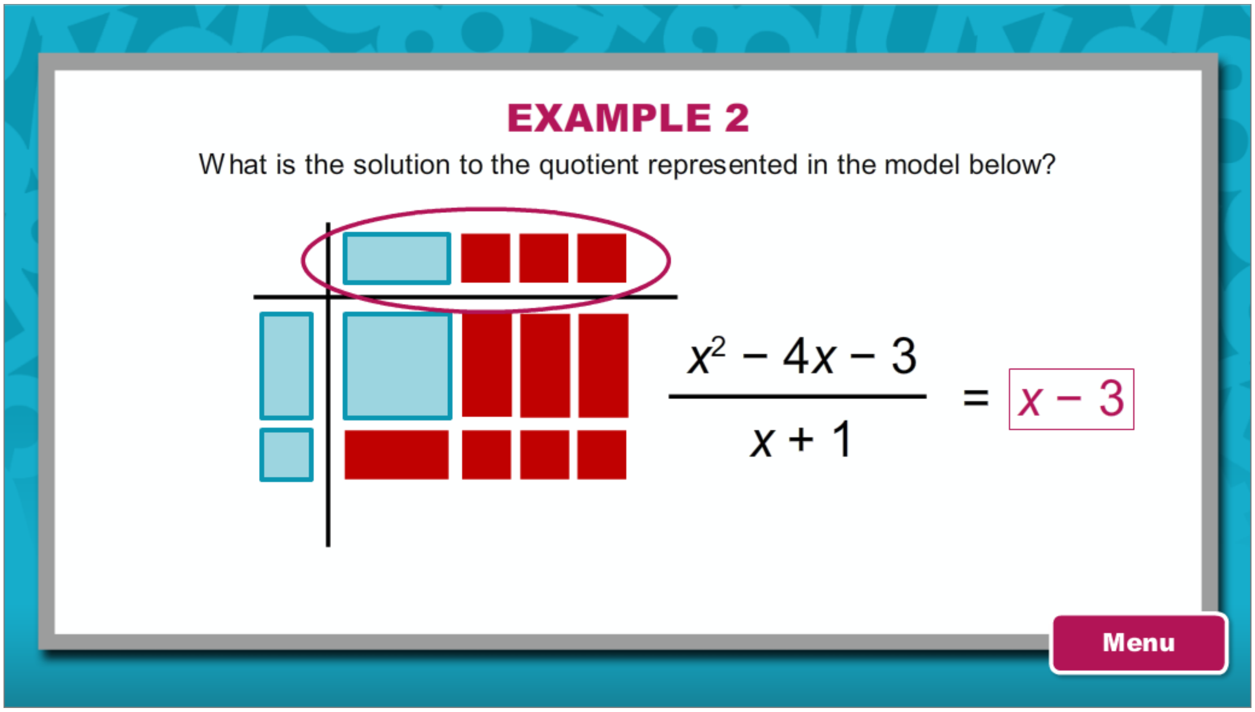
Remember that division is the inverse of multiplication. So, to determine the tiles needed for the length, you must divide each of the tiles in the first row inside the frame by the first tile of the width.

The first tile in the inside area is x^2.

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

So, the first tile of the length is x.

Example 2 (continued)



Now move on to the second tile in the first row inside the frame, $-x$.

$$\frac{-x}{x} = -1$$

So, the second tile of the length is -1. The third tile in the inside area is also $-x$.

$$\frac{-x}{x} = -1$$

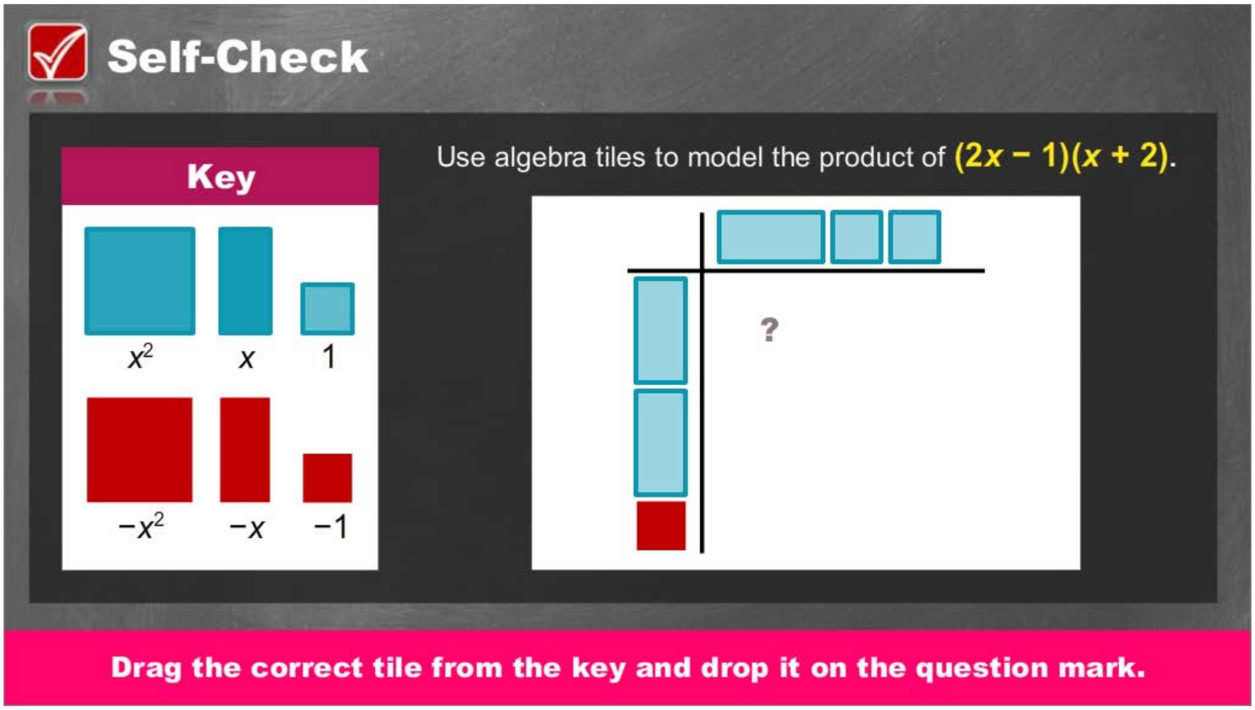
The third tile of the length is -1. The fourth tile in the inside area is also $-x$.

$$\frac{-x}{x} = -1$$

The fourth tile of the length is also -1. You have determined the tiles needed for the unknown length. They represent the binomial $x - 3$.

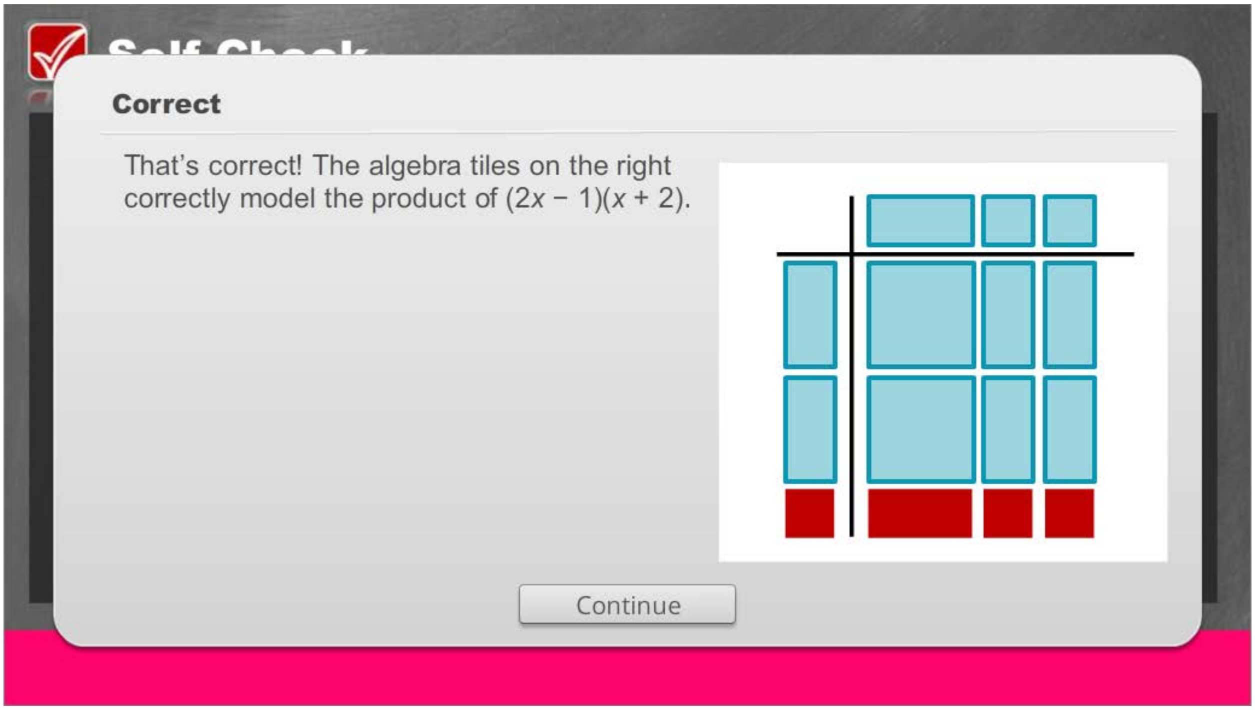
$$\frac{x^2 - 4x - 3}{x + 1} = x - 3$$

Self-Check 1



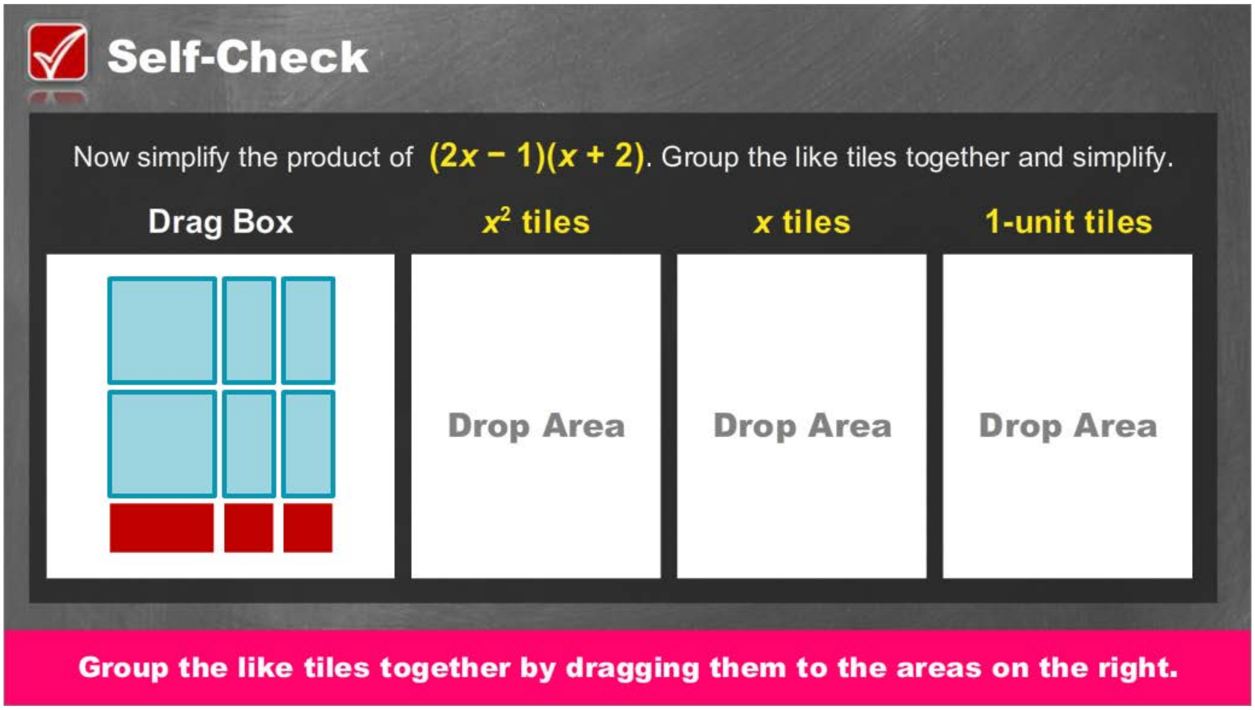
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



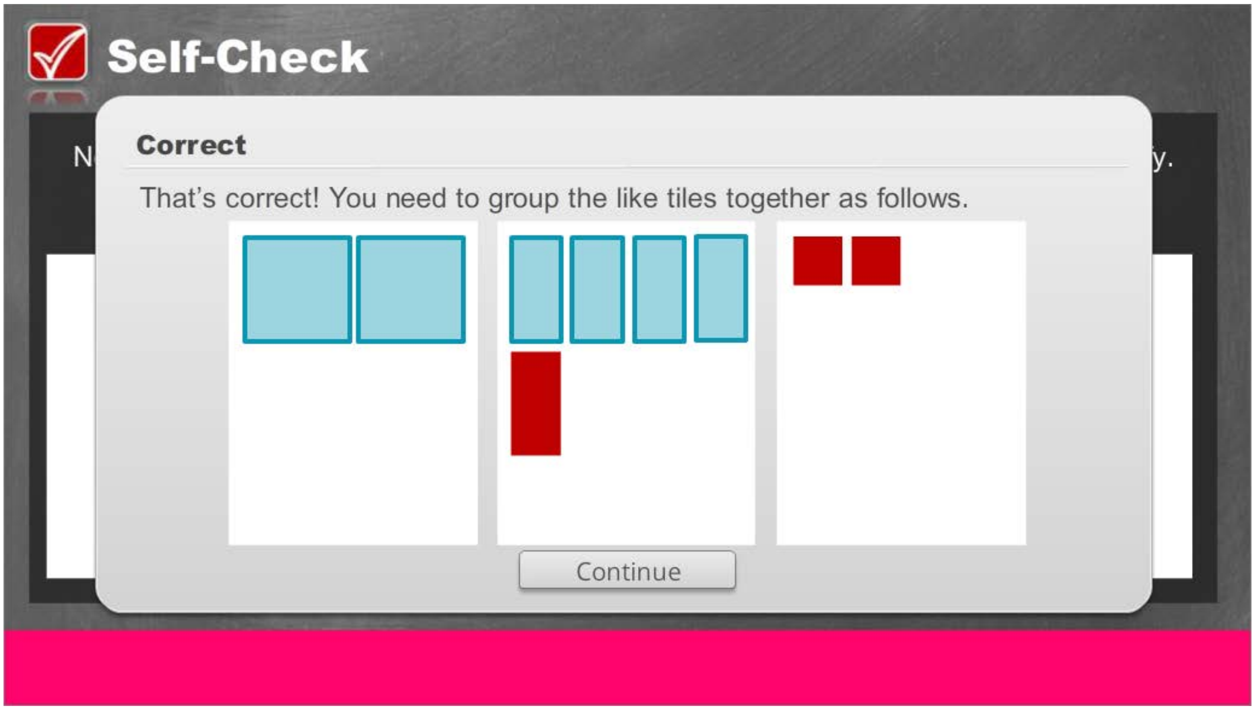
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



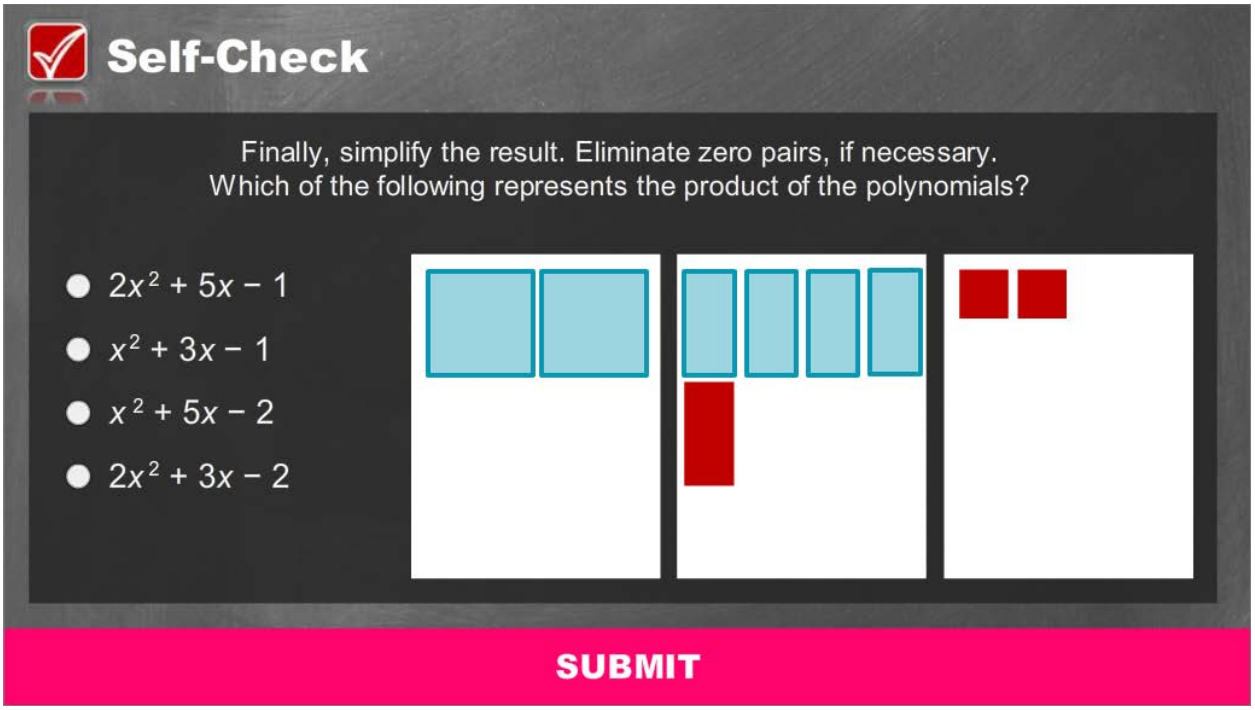
Solve the problem in the image above to check your understanding of the content.

Self-Check 2: Answer



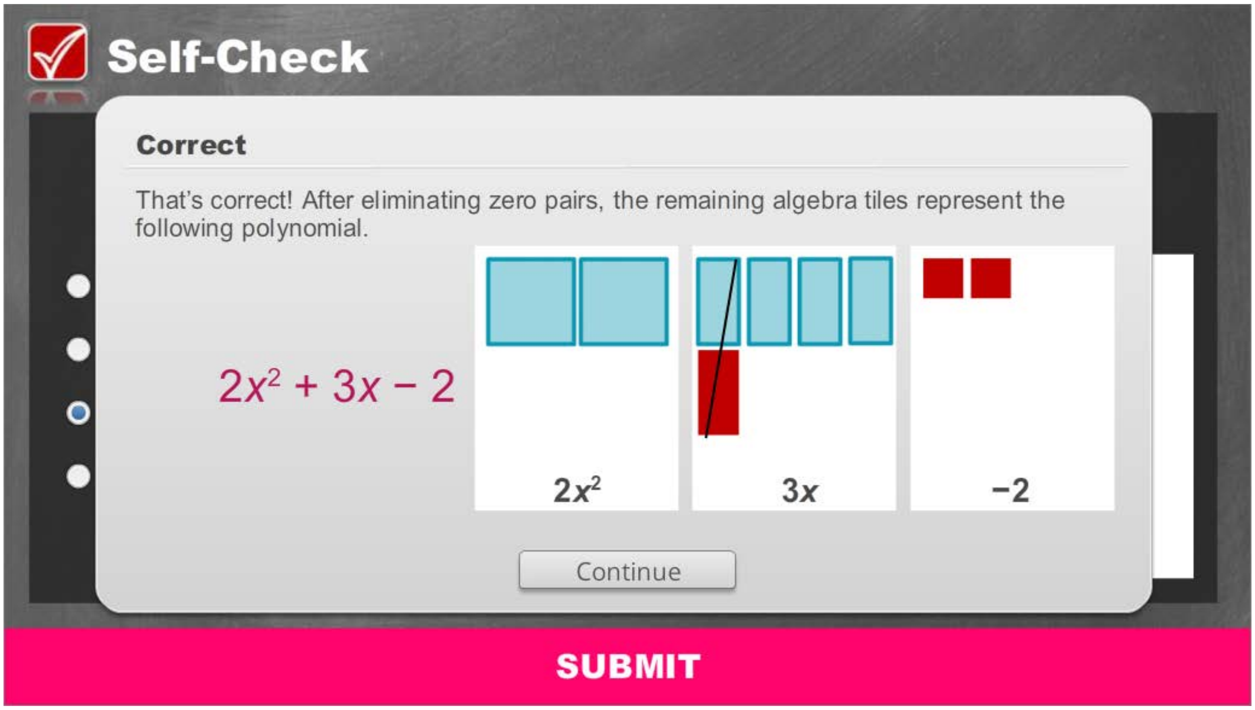
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 3



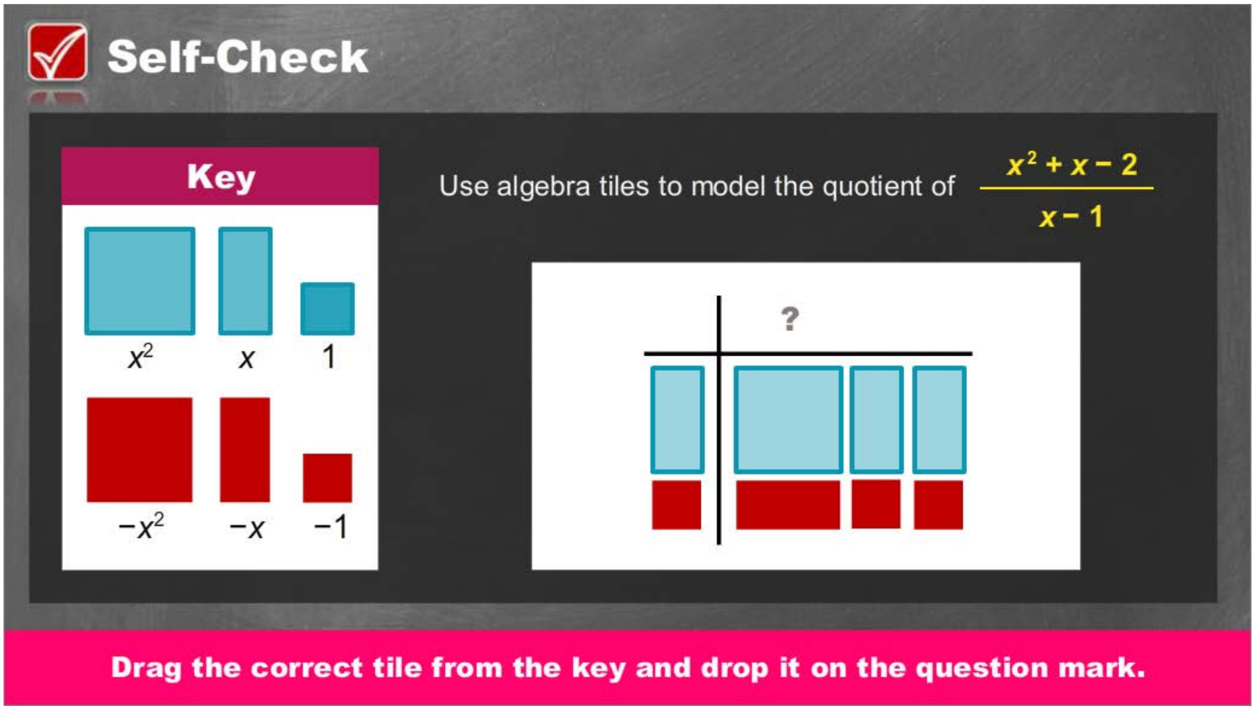
Solve the problem in the image above to check your understanding of the content.

Self-Check 3: Answer



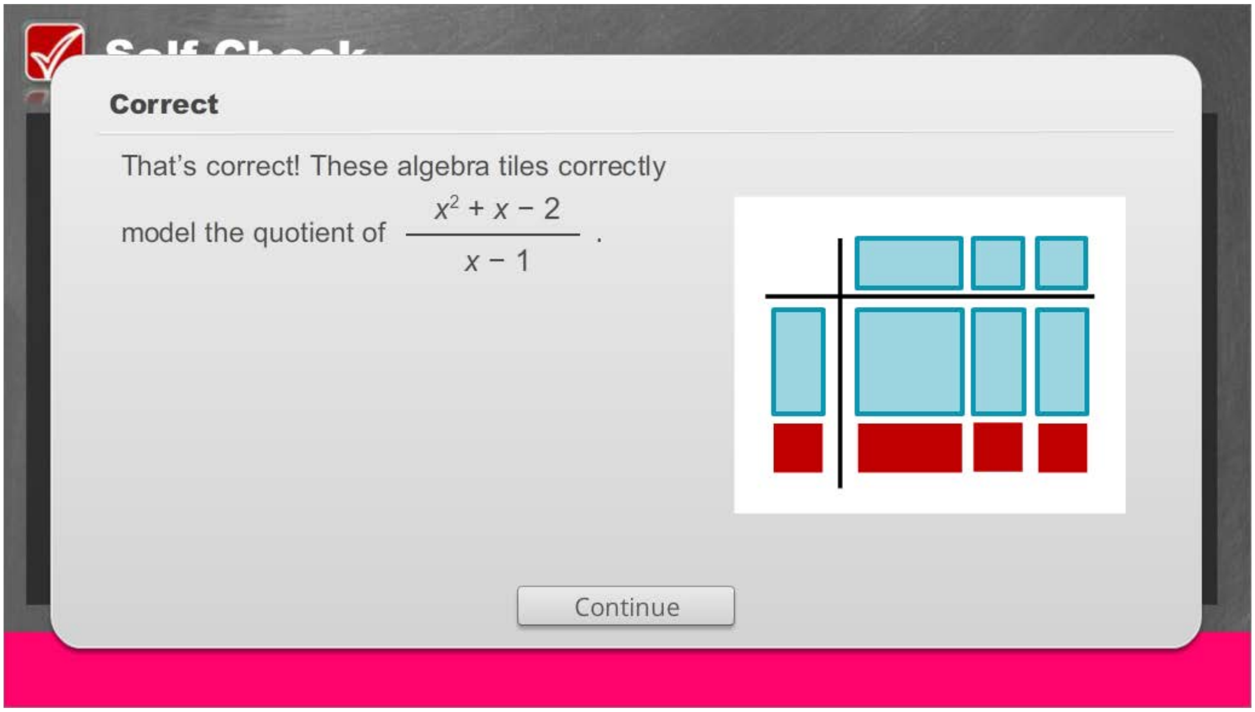
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 4



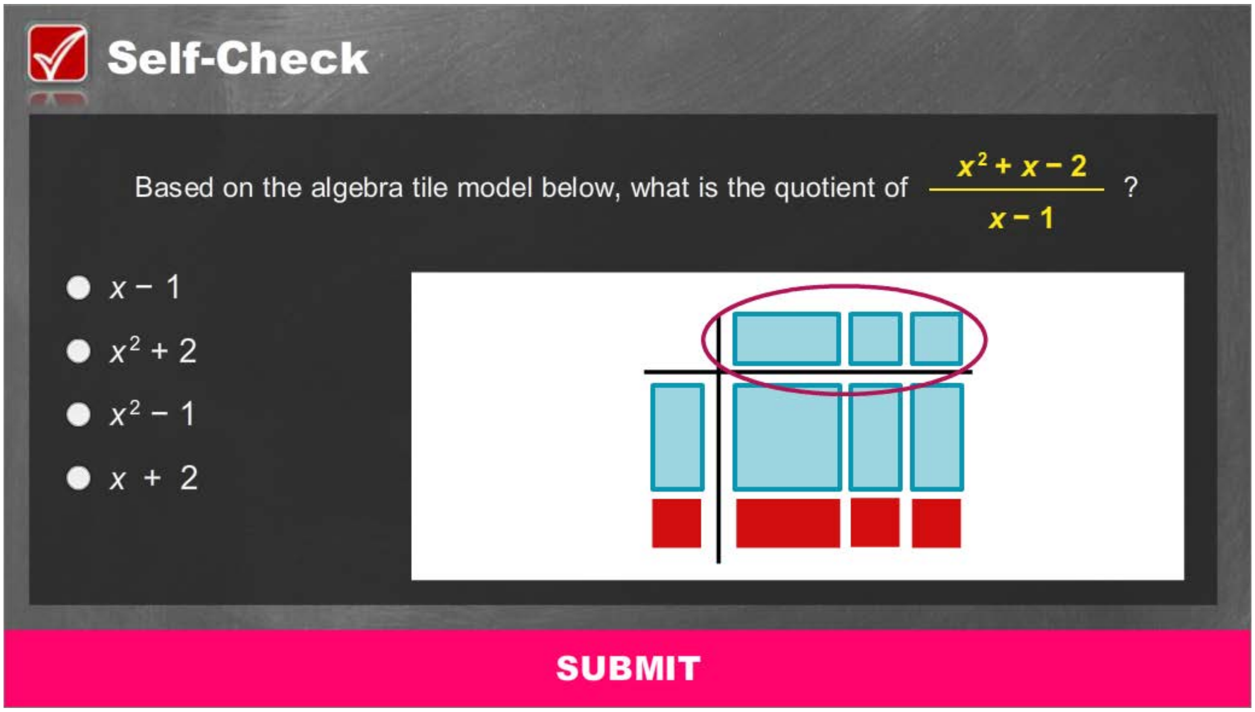
Solve the problem in the image above to check your understanding of the content.

Self-Check 4: Answer



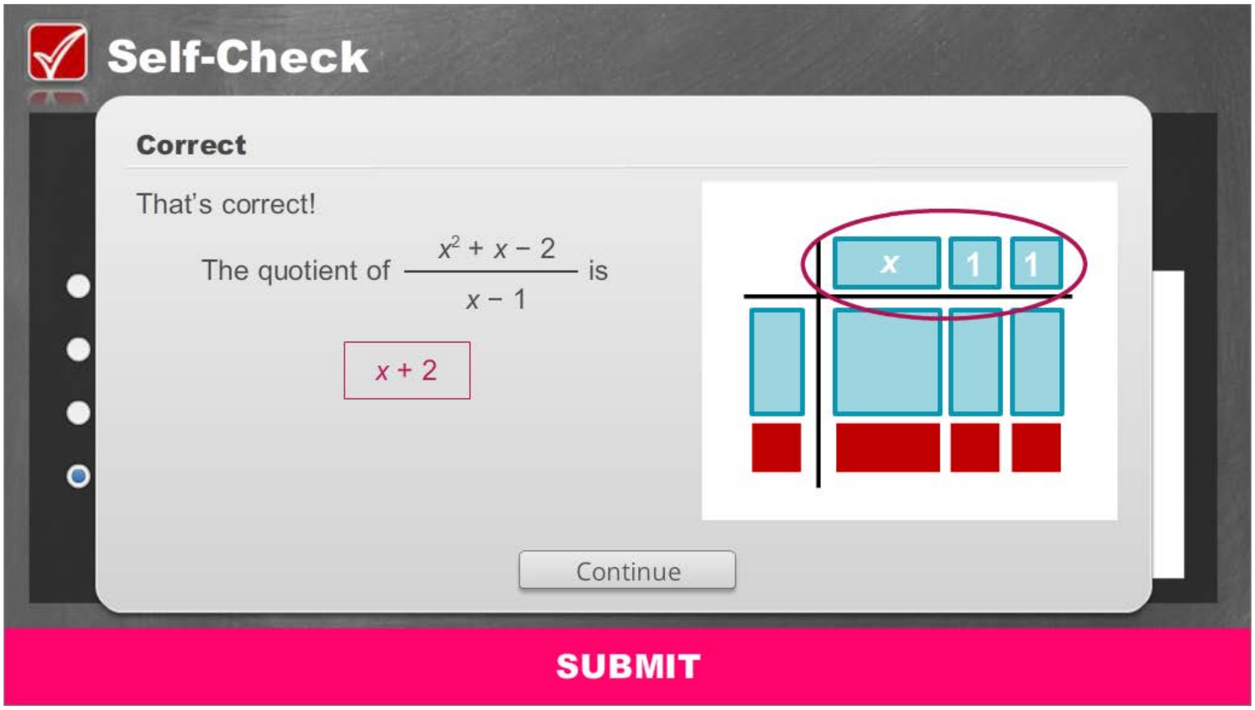
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 5



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

Self-Check 5: Answer



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

Conclusion

Congratulations! You have reached the conclusion of this lesson in Algebra I. In this lesson, you were able to apply your knowledge of algebra tiles to model and simplify products and quotients of polynomial expressions.