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**UNIT 3 • MODELING AND ANALYZING QUADRATIC FUNCTIONS**  
**Lesson 1: Creating and Solving Quadratic Equations in One Variable**

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**Instruction****Lesson 3.1.3: Factoring Expressions with  $a = 1$** **Georgia Standard of Excellence**

MGSE9–12.A.SSE.2

**Warm-Up 3.1.3 Debrief**

Erica and her dad want to plant a rectangular vegetable garden in their backyard, and are trying to determine the best size. They need to know how much area will be taken up by the different options they have in mind for the length and width. Use the formula for the area of a rectangle,  $A = lw$ , to complete the following problems.

1. If the length is  $(x + 5)$  feet and the width is  $(x + 3)$  feet, what expression represents the area of the garden?

Since the area of a rectangle is equal to the length times the width, multiply  $(x + 5)$  by  $(x + 3)$  to find the area.

$$A = lw \quad \text{Formula for the area of a rectangle}$$

$$A = (x + 5)(x + 3) \quad \text{Substitute } (x + 5) \text{ for } l \text{ and } (x + 3) \text{ for } w.$$

$$A = x^2 + 3x + 5x + 15 \quad \text{Multiply by distributing.}$$

$$A = x^2 + 8x + 15 \quad \text{Combine like terms.}$$

The expression representing the area of the garden is  $(x^2 + 8x + 15)$  square feet.

2. If the length is  $(x + 4)$  feet and the width is  $(x - 4)$  feet, what expression represents the area of the garden?

Again, multiply the length  $(x + 4)$  by the width  $(x - 4)$  to find the area.

$$A = lw \quad \text{Formula for the area of a rectangle}$$

$$A = (x + 4)(x - 4) \quad \text{Substitute } (x + 4) \text{ for } l \text{ and } (x - 4) \text{ for } w.$$

$$A = x^2 + 4x - 4x - 16 \quad \text{Multiply by distributing.}$$

$$A = x^2 - 16 \quad \text{Combine like terms.}$$

The expression representing the area of the garden is  $(x^2 - 16)$  square feet.

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#### Instruction

3. If they want the area to be  $(x^2 + 7x)$  square feet with a length of  $x$  feet, what does the width need to be?

Substitute the given values for the area and the length into  $A = lw$  and solve for the width.

$$A = lw$$

Formula for the area of a rectangle

$$(x^2 + 7x) = (x)w$$

Substitute  $(x^2 + 7x)$  for  $A$  and  $x$  for  $l$ .

$$x(x + 7) = xw$$

Factor the polynomial.

$$x + 7 = w$$

Divide both sides by  $x$ .

The width of the garden would need to be  $(x + 7)$  feet.

#### Connection to the Lesson

- Students will continue to factor expressions by the greatest common factor.
- Students will factor trinomials.
- Students will factor binomials using the difference of two squares.