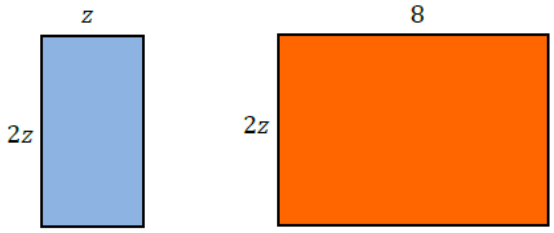
Lesson 4.1.1: Multiplying and Factoring Polynomial Expressions

Targets:

1. I understand how to multiply polynomials.
2. I understand how to factor polynomials.

Warm Up:

a. Write expressions for the areas of the two rectangles in the figures given below.



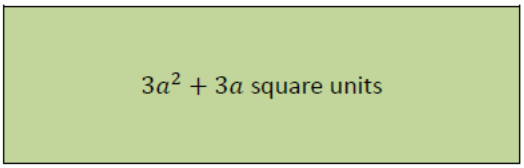
b. Now write an expression for the area of this rectangle:

c. Use the distributive property to rewrite this expression: $2z(z + 8)$

d. Use a rectangle to demonstrate this as an area problem: $8x(4x + 5)$

Practice 1

The area of a rectangle is represented by $3a^2 + 3a$ for some real number a. Find the dimensions of the length and width. How many possible answers are there? List the answer(s) you find.



Practice 2

Factor each by factoring out the greatest common factor:

a.) $10ab + 5a$

b.) $3g^3h - 9g^2h + 12h$

c.) $6x^2y^3 + 9xy^4 + 18y^5$

Vocabulary

Find a definition that you understand for each term:

a.) Polynomial

b.) Standard form of a Polynomial

c.) Binomial

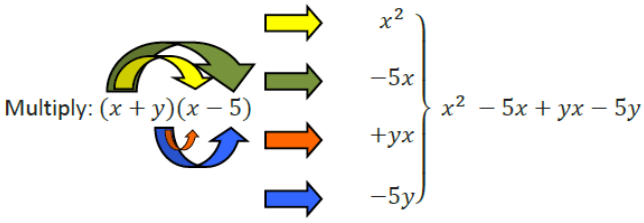
d.) Factor

Practice 3

a. Fill in the table to identify the partial products of $(x+2)(x+5)$. Then, write the product of $(x+2)(x+5)$ in standard form.

	x	+	5
x			
+			
2			

Regardless of whether or not we make use of a table as an aid, the multiplying of two binomials is an application of the distributive property. Both terms of the first binomial distribute over the second binomial. In the example below, the colored arrows match each step of the distribution with the resulting partial product:



b. Use the table method and then write the product of $(2x+3)(x+4)$:

c. Use the arrow method and then write the product of $(2x+3)(x+4)$:

Practice 4: The Difference of Squares

The expression $(x+2)(x-2)$ is called "the difference of squares." Look at the two examples below of how we might find the difference of squares.

With the use of a table:

	x	$+$	2
x	x^2		$2x$
$+$			
-2	$-2x$		-4

$x^2 - 4$

Without the use of a table:

$$(x)(x) + (x)(-2) + (2)(x) + (+2)(-2) = x^2 - 2x + 2x - 4 = x^2 - 4$$

Factor the following examples of the difference of squares. Look for a pattern.

a.) $t^2 - 25$ b.) $4x^2 - 9$ c.) $16h^2 - 36k^2$

Write a general rule for finding the difference of squares:

Write $a^2 - b^2$ in factored form.

Practice 5: The Square of a Binomial

To square a binomial, such as $(x+3)^2$, multiply the binomial by itself.

$$\begin{aligned}(x+3)(x+3) &= (x)(x) + (3)(x) + (x)(3) + (3)(3)\\ &= x^2 + 3x + 3x + 9\\ &= x^2 + 6x + 9\end{aligned}$$

Square the following general examples to determine the general rule for squaring a binomial:

a. $(a+b)^2$ b. $(a-b)^2$

Exit Ticket

1. Factor out the greatest common factor:
   a. $6y^2 + 18$ b. $27x^2 + 18$ c. $21b - 15a$

2. Factor each of the following differences of squares:
   a. $9y^2 - 100z^2$ b. $4 - b^2$ c. $16a^2 - 36$

3. Multiply:
   a. $(n-5)(n+5)$ b. $(k+10)^2$ c. $(4-y)(4+y)$