Algebra/Geometry Institute Summer 2003

Lesson Plan #2

Faculty Name: Polyneise Redd
School: Oakhurst Junior High
City: Clarksdale, MS
Grade Level: 8th Grade Algebra

1. Teaching objective(s)

   - Students will be able to use manipulative models to demonstrate operations for polynomials.

2. Instructional Activities

   - The teacher will start the lesson by writing the problem below on the projector and asking students to describe the possible ways of finding the product.

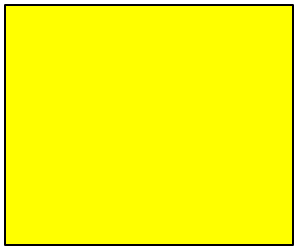
     $(2a + y)$ and $(2a + 5t – 6y + 5r)$

   - The teacher will distribute a bag of algebra tiles to each student. Each bag will contain two-color sided tiles in which there are 2 large squares, 12 rectangles, and 20 small squares.

   - The teacher will ask students to compare the algebra tiles to two-color counters. How are they different? Alike?

   - The teacher will identify each tile.

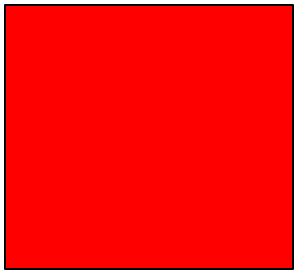
     The tiles below are yellow and represent positive terms.



x^2

x 1

The tiles below are red and represent negative terms.



x^2

x

1

- The teacher will inform students that the x^2 tile is x units wide and x units long. The x tile is 1 unit wide and x units long. The 1-tile is 1 unit wide and 1 unit long.

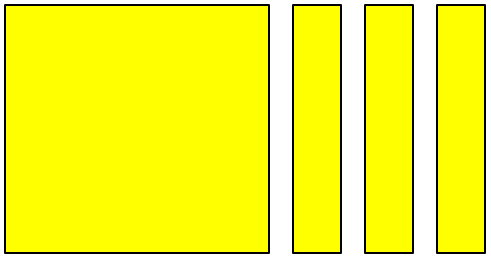
- The teacher will place three problems on the projector, model the problems, and demonstrate to students the procedure to finding the product. *

- The teacher will explain that each problem modeled will resemble a rectangle. The first expression should be placed horizontal to the x^2 tile and the second expression should be placed vertical to the x^2.

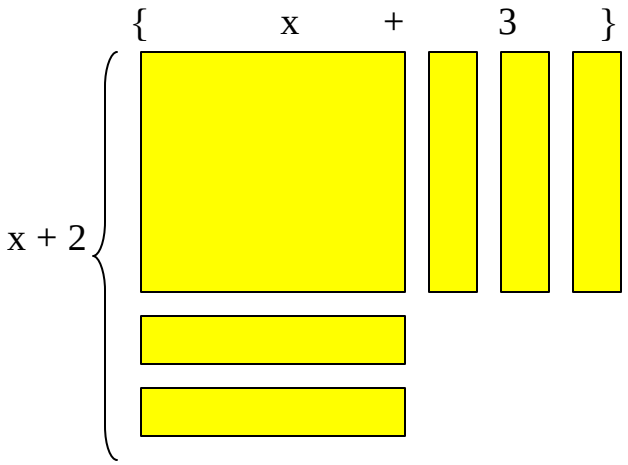
Example1:
$(x + 3)(x + 2)$

- First, the teacher will model $(x + 3)$ as a horizontal distance.

{ x + 3 }



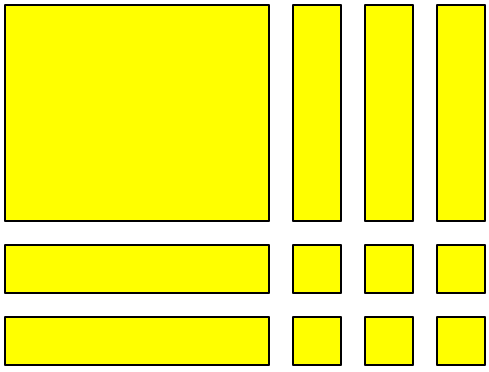
- Next, the teacher will model (x + 2). The teacher will remind students that the second expression should be vertical to x^2 tile.



- The teacher will now inform students that the open space must be filled with 1-tiles. First, the teacher will ask students the value of the horizontal x tiles. Are they positive or negative? Second, the teacher will ask students the value of the vertical x tiles. Third, the teacher will ask students, "What is a positive integer times a positive integer?"

- The teacher will inform students that the result of the x tiles determines what value the 1-tiles should have. So, therefore, the tiles should be yellow.

- The teacher will place 1-tiles in the model to complete the rectangle.

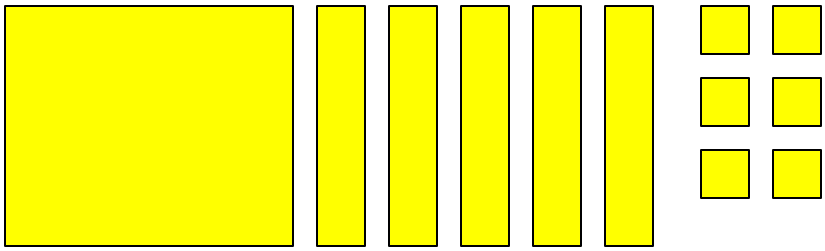


- After placing the 1-tiles in the model. The teacher will now show students how to read the product.

- How many x^2 tiles are there? How many x tiles are there? How many 1-tiles are there?

- The teacher will pull the model apart, answer the above questions, and show the product.

- The teacher will explain that there are $1(x^2)$ tile, 5(x) tiles and 6 (1) tiles. So, therefore the product is $x^2 + 5x + 6$.



Example 2:
$(x + 5)(x – 3)$

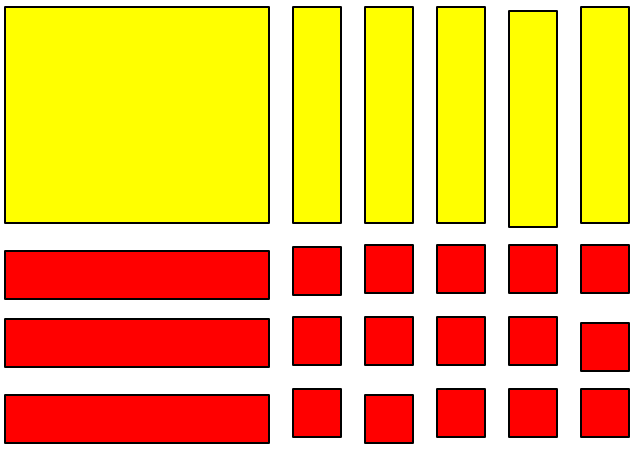
- The teacher will ask the students to model the first binomial. The teacher will ask students, "What do you observe about the tiles?

- The teacher will ask students to model the second binomial. The teacher will ask students, "What do you observe about the tiles?

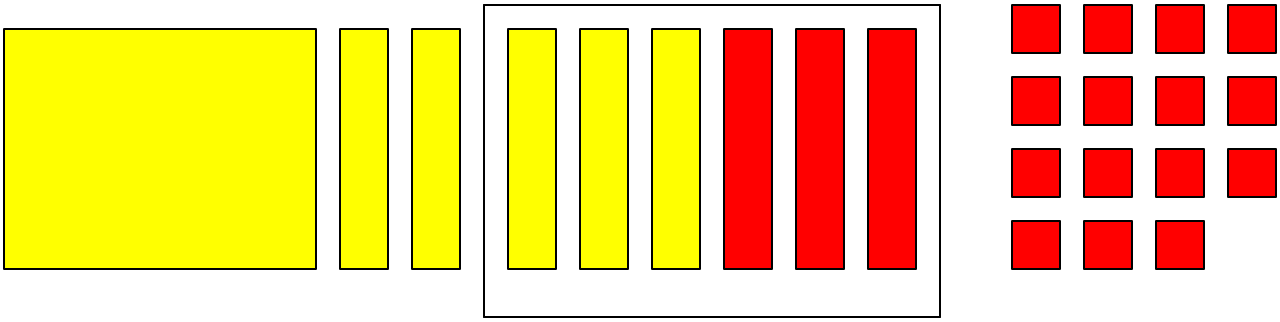
- The teacher will ask students what is the difference between the x tiles going horizontal and the x tiles going vertical.

- The teacher will remind students to multiply the x tiles to get the value of the 1-tiles. The teacher will ask the students, "What is a positive integer times a negative integer?

- The teacher will model the polynomial.



- To find the product of this problem, the teacher will ask students to recall what a "zero pair" is. The teacher will remind students that a zero pair is the pairing of a negative tile with a positive tile. In this polynomial, the zero pairs must be paired together and removed as shown below.



- The teacher will ask students three questions.
  1. "How many x^2 tiles are there?
  2. "How many x tiles are there?
  3. "How many 1-tiles are there?

- The teacher will use the answers from the above questions to give the product. So, therefore the product is $x^2 + 2x - 15$.

Example 3:
$(x - 2)(x - 2)$

- The teacher will ask students to model the first binomial. The teacher will ask students, "What do you observe about the tiles?"

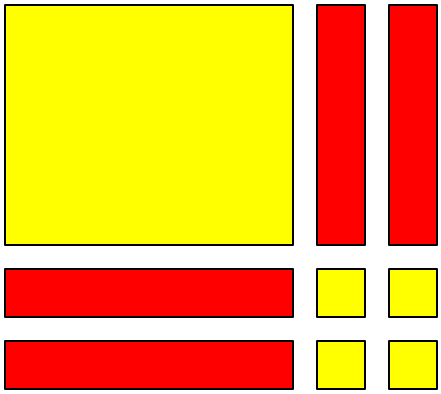
- The teacher will ask students to model the second binomial. The teacher will ask students, "What do you observe about the tiles?

- The teacher will ask students what they notice about the x tiles going horizontal and the x tiles going vertical.

- The teacher will remind students to multiply the x tiles to get the value of the 1-tiles. The teacher will ask the students, "What is a negative integer times a negative integer?

- The teacher will explain to students that the 1-tile value is determined by the fact that both tiles are negative. So, therefore the 1-tiles should be positive.

- The teacher will model the polynomial.



- The teacher will ask students for the product and wait for responses.

- The teacher will reply that the product is $x^2 - 4x + 4$.

- The teacher will administer a worksheet for students to work on in class. *(See attached worksheet)*

3. Materials and Resources

- ✓ Textbook: Merrill Algebra 1/Applications and Connections. Glencoe: Macmillan/McGraw-Hill, Publishing Company (1995). Pages A13 – A14.
- ✓ Algebra Tiles
- ✓ Pencil
- ✓ Paper
- ✓ Overhead Projector
- ✓ Overhead Algebra Tiles
- ✓ Markers (overhead)
- ✓ Markers or color pencils

4. Assessment

- ✓ Teacher Observation
- ✓ Oral and Written response
- ✓ Teacher-made worksheet

*Special note: There is space in all models of the algebra tiles. But, when students are modeling the tiles, there should not be any space. Observe students models.

Name_____ Date_____

Using algebra tiles, model the following polynomials. Draw a diagram of the algebra tiles for each polynomial below to illustrate the product. Color the tiles to indicate positive tiles or negative tiles. Make sure to write the product for each polynomial under your diagram.

1. $(x + 4)(x + 3)$

2. $(x + 5)(x + 2)$

3. $(x + 6)(x + 3)$

4. $(x – 5)(x + 1)$

5. $(x + 3)(x – 3)$

6. $(x – 8)(x + 2)$

7. $(x –1)(x – 1)$

8. $(x – 4)(x – 5)$

9. $(x – 6)(x – 2)$

10. $(x + 3)(x – 4)$