Algebra/Geometry Institute Summer 2002

Lesson Planning Guide 2

Faculty Name: Brown, J.
School: Greenville - Weston High School (Weston Campus)
Grade Level: 9-12

1 Teaching objective(s)

E. Factor polynomials using algebraic methods and geometric models.

2 Instructional Activities

Describe completely the class activities for your lesson.

- **Lesson Opener:** Give several binomial multiplication problems and allow students to find the solution with the aid of Algebra tiles.
- **Teacher will review relevant terms such as: factors, product, division and factoring.** The students will relate factors of integers and monomials to their product as a review.
- **Teacher will have students to point out the factors and products on their model and note their position.** The student will label each of their models, making note of the trinomial solution and the binomial factors.
- **Teacher will relate how working backwards through their model gives the product.** The student will take several polynomial models and arrange the algebra tiles into rectangles, using the largest tiles first. Write the dimensions, which will be its factors.
- **After students are comfortable with this relationship the teacher will introduce another method of modeling factors of trinomials: Tic- Tac –Toe.** The students will be given a list of instructions and several examples of how to factor polynomials of the type $ax^2 + bx + c$, when a= 1and c > 1, using the Tic-Tac-Toe method. Have them point out the difference between the solution when b < 1 and b > 1. After they are comfortable with the method, they will be asked to expand on this when c < 1. After several trials, ask can they make a generalization. (Note that the two signs between the binomials must be different.)
- **Teacher will introduce trinomials of the form $ax^2 + bx + c$, when $a \neq 1$.** The student will decide if the trinomials will work in their model. If so, how? Does the rule they came up with for c< 1 still apply?

3 Materials and Resources

Identify various materials and equipment needed for lesson activities. Provide complete references (include textbook and additional resources)

- McDougal/Littel , *Algebra I* 2002
- Algebra Tiles
- Overhead projector
- Handouts

4 Assessment

Describe completely the assessment to be used for this lesson.

- ✓ Teacher observation of activities
- ✓ Handouts will be self-checked

5 Enrichment (Optional)

Include activities that engage learners in additional projects that are related to this lesson.

- ♦ Students will be asked to try special polynomials that are the difference of squares or have the same factors. (i.e. $x^2 - 4$, and $x^2 + 8x + 16$)

Algbra Tile factoring problems

Directions: Arrange the model of the following polynomials in a rectangular array, then list the dimensions(factors)

1. $x^2 + 13x + 36$
2. $x^2 + 6x + 8$

Solutions.

1. $(x + 9)(x + 4)$
2. $(x + 4)(x + 2)$

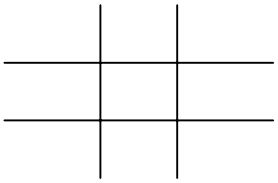
Tic - Tac - Toe Polynomials for factoring

1. $x^2 + 5x + 6$	2. $x^2 + 8x + 12$	3. $x^2 + 3x + 2$
4. $x^2 - 7x + 12$	5. $x^2 - 9x + 18$	6. $x^2 - 2x + 1$
7. $x^2 + 6x - 16$	8. $x^2 - 4x - 5$	9. $x^2 - 14x - 32$
10. $3x^2 + 16x + 5$	11. $4x^2 + 27x + 35$	12. $6x^2 + x - 70$

Tic – Tac – Toe Method for solving Polynomials

To solve polynomials of the form $ax^2 + bx + c$ you may use a tic – tac- toe board to arrange your factors.

Step 1. Draw your board.



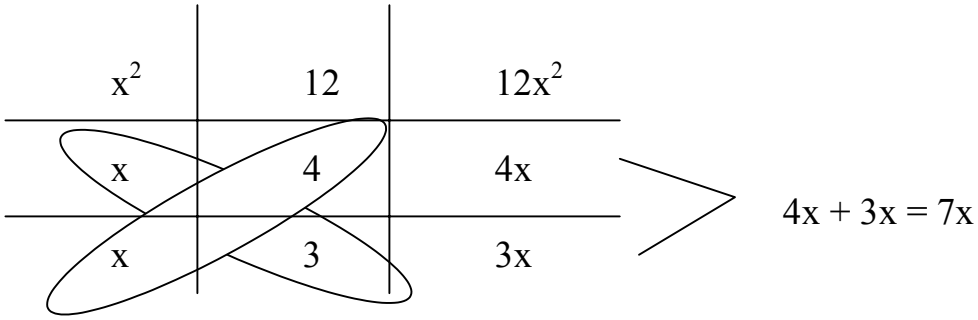
Step 2. Insert the value from the problem into the appropriate space.

ax^2	c	(their product) acx^2

Step 4. In column 3 rows 2 and 4, place the two factors of acx^2 that can be added to get bx.

Step 5. Fill in the remaining spaces with factors of the first row and last column in such a way as that when multiplied from the bottom up and from right to left the product will be correct.

Ex. $x^2 + 7x + 12$



Solution: (x + 4) (x + 3)

Warm-up Exercises

Directions: Multiply the following binomials, use your algebra tiles to model the solution.

1. $(x + 3)(x + 4)$
2. $(x - 5)(x + 5)$
3. $(x-4)^2$

Solutions to the exercises.

1. $x^2 + 11x + 24$
2. $x^2 - 25$
3. $x^2 - 8x + 16$