Manchester College
Education Department

Lesson Plan by Daniel Haffner

Lesson: Factoring Trinomials
Length: 50 min.
Age or Grade Level Intended: Algebra 1

Academic Standard(s): A1.6.7 Factor the difference of two squares and other quadratics

Performance Objective(s): Given 10 problems, the students will factor the difference of two squares with 80% accuracy.

Assessment: The students will be given 10 problems. The teacher will check to see that the student got at least 8 out of the 10 problems correct.

Advance Preparation by Teacher:
- Deck of cards (have all face cards -Jacks, Queens, and Kings - tens, and nines, and one joker, and other random cards to have the total of cards equal the number of students in the class).
- Chalkboard, chalk
- Copies of the worksheet for each student

Procedure:

Introduction:

1. First, ask the students if they can tell you the standard form of a trinomial? Answer: $ax^2 + bx + c$ where a, b and c are real numbers. (Bloom's: knowledge). Tell students that for now we are only going to concentrate on trinomials, where a=1and that an example of factoring would be turning 1 trinomial into 2 binomials.
2. On the board write x^2 on the left and x in the middle, and put constant on the right.
3. Pass out or let the students draw a card from the deck so that everyone has a card.
4. Have all the students who got a face card or an ace go to the right side of the board and the people who got nines and tens to move to the middle of the board and the joker goes to the left. There should be: 1 joker (x^2) term, 8 nines and tens (x)term, and 12 king queen and jacks (constant) term. (Bloom's: knowledge, comprehension; Gardner's: Bodily-Kinesthetic, interpersonal, visual-spatial)
5. For the other students who did not move to the board, they get to work with you, to help move the students who formed the trinomial, have to turn them into 2 binomials.
6. The students at the desk first need to find out how many people are on the constant side of the board. Tell all the students that the first thing they need to do is find all the factors to the constant term. The students at the desk work together and tell everyone all the answers. Then find all the factors of that number. Answer: (1 and 12), (2 and 6), (3 and 4)
7. Now tell everyone that the next step would be to find the factor sum that equals the number of x terms there are. People at the desk should say, 6 and 2. 6+2=8
8. Now ask the students what times what give you x^2.answer is x*x

9. Now tell them that use the: what times what give you x^2 for the first term of each polynomial, and then the second term of each polynomial would be the factors who sum is the number of x terms there were in the trinomial. Have the students at the desk go to the board and write the two polynomials. Answer: (x+2)(x+6) (Bloom's: knowledge, comprehension; Gardner's: Bodily-Kinesthetic, interpersonal, visual-spatial)

Step by Step

1. Now have them go back to their seats and have them try $x^2 + 7x + 10, and\ x^2 + 21x + 20$ in pairs. (Bloom's: knowledge, comprehension; Gardner's: intrapersonal, logical-mathematical, visual-spatial)
2. When most are finished go through each with them to make sure they fully understand.
3. $x^2 + 7x + 10 = (x + 5)(x + 2), and\ x^2 + 21x + 20 = (x + 1)(x + 20)$. Make sure the sum of the factors is correct.
4. Now give them $x^2 - 17x + 42$. Ask the students what would be the rules for this type of problem? Ask students to defend their answer. Answer: find the negative factors of 42. That sum up to -17. (Bloom's: comprehension, application, evaluation; Gardner's: verbal-linguistic, logical-mathematical, visual-spatial)
5. Negative factors of 42 would be (-1 and -42), (-2 and -21), and (-3 and -14) and the sum that adds up to -17 is -3 and -14. So factoring $x^2 - 17x + 42\ give\ (x - 3)(x - 14)$.
6. Now have the students find $x^2 - 10x + 25\ and\ \ x^2 - 11x + 18$. Have students explain/defend their answers. They can work in pairs again. (Bloom's: knowledge, comprehension. evaluation; Gardner's: interpersonal, logical-mathematical, visual-spatial)
7. Then go through the answers with them to make sure they get the correct answer. $x^2 - 10x + 25 = (x - 5)(x - 5) and\ \ x^2 - 11x + 18 = (x - 2)(x - 9)$.
8. Now give them the worksheet and have them work on it for the rest of class and if they do not finish it then it is homework.

Closing

1. Ask the students what is the steps to factor a trinomial when every term is positive?
   a. Find the factors of the constant term and then find the sum of the factors that match x term and then find what times what gives you the first term of the trinomial (Bloom's: knowledge, comprehension; Gardner's: interpersonal, logical-mathematical, verbal-linguistic)
2. Now ask the students what are the steps to factor a trinomial when the x term is negative?
   a. Find the negative factors of the constant terms and then find the sum of the factors who's the same as the middle term (x), and then find what times what give you the term of the first in the trinomial. (Bloom's: knowledge, comprehension; Gardner's: interpersonal, logical-mathematical, verbal-linguistic)
3. Now tell the students that tomorrow they will be learning to factor trinomials with a negative c term, and factoring with trinomials with two variables.

Adaptations

Enrichment – Have the student visit the website http://www.mathcats.com/crafts/stringart.html to look at examples of string art created using polynomials. The student will write about what is happening with the slope of the lines from the beginning to the end of the animation. Then the

student will print out one of the string art patterns and make their own string art pattern using colored pencils. The student could also make up their own story problem that uses polynomials and quadratics in a real life situation or using the deck of cards from the activity at the beginning of class and present the problem to the class. Have the students compare Pascal's triangle to the factoring of difference of two squares and other quadratic equations.

Reflections

- Did I get the student's interested in the lesson?
- Do the students remember information from the previous lesson?
- Are they studying their vocabulary cards on their own or do they not understand the mathematical terms I use?
- Was the lesson too long or too short?
- Were my adaptations effective?
- What would make the lesson go better next time?

Name_____

Worksheet

Factoring Trinomials

1. $x^2 + 13x - 30$

2. $x^2 - 15x + 36$

3. $x^2 + 4x + 3$

4. $x^2 + 6x + 8$

5. $x^2 - 16x + 28$

6. $x^2 + 21x + 38$

7. $x^2 - 3x + 2$

8. $x^2 - 9x + 8$

9. $x^2 - 18x + 45$

10. $x^2 + 19x + 18$

Name_____KEY_____

Worksheet

Factoring Trinomials

1. $x^2 + 13x - 30$

$\mathbf{(x-2)(x+15)}$

2. $x^2 - 15x + 36$

$\mathbf{(x-3)(x-12)}$

3. $x^2 + 4x + 3$

$\mathbf{(x+1)(x+3)}$

4. $x^2 + 6x + 8$

$\mathbf{(x+4)(x+2)}$

5. $x^2 - 16x + 28$

$\mathbf{(x-14)(x-2)}$

6. $x^2 + 21x + 38$

$\mathbf{(x+19)(x+2)}$

7. $x^2 - 3x + 2$

$\mathbf{(x-2)(x-1)}$

8. $x^2 - 9x + 8$

$\mathbf{(x-8)(x-1)}$

9. $x^2 - 18x + 45$

$\mathbf{(x+19)(x+2)}$

10. $x^2 + 19x + 18$

$\mathbf{(x+18)(x+1)}$

Gifted and Talented

In this unit, I will use the website http://www.fcpsteach.org/gt_renzulli/default.cfm as an idea board for creating activities that challenge my gifted students. I like the idea of using a board where the students have choices about the activities they can complete and it would be something that would be easy to adapt to this unit on polynomials. I do not want to just give the students more homework problems because that doesn't seem fair to the students. The students probably already know how to do the work so to give them more homework problems doesn't really make sense. I could present the chart of options to the students at the beginning of the unit and allow them to work through the activities at their own pace. Each square of the chart would be for a student with a different type of learning intelligence or learning style. For example, I could an activity about genetics, figuring out the different colors for a dog breed like Labradors, and how polynomials could affect breeders. This way, a student who is interested in nature or mathematics would still be learning about polynomials but in a way that interests them.

In this lesson, I had the students go to a website that was about the patterns of string art. Polynomials are used to make string art and I could extend this lesson into other earlier lessons when polynomials were first introduced. I would have the student research different types of art that polynomials can be used to make. Then I would have the student compare and contrast those types of art work and write a paragraph or two explaining their favorite artwork and why. Then I would have the student imitate that artwork by making their own with colored pencils. The student would not be using polynomials to create the artwork, because expensive computer programs are needed for that, but they would be copying it and making it their own with colored pencils. This would meet the needs of students who were visual-spatial learners, logical-mathematical learners, and intrapersonal learners.

Finally, I could have students do research how polynomials were used in past and present movies like Ghost Busters or the Matix. The student could research how the same polynomials are still being used but how things have changed as computer programs get better and designers come up with formulas that look more realistic. I would have the student create a comparison chart that would allow the student to write about the similarities and differences between the movies, polynomial formulas, and graphic techniques that were used. The student could present their report to the class and show video clips of different transformations. The students would enjoy seeing the graphics of movies that morphed or changed from the 1980s and 1990s because they look so different to movie characters that morph today.