MULTIPLYING BINOMIALS

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Objective: The purpose of this lesson is to show four different ways for students to multiply binomials. One of the four is Algebra tiles as per the requirements of the class and the other three are Grid, Vertical, and FOIL.

Purpose: What we are hoping to do is have the students first, be exposed to several ways to do the same thing. Next, we hope that one of these methods will be better for each individual than the others. Finally, we hope that the students see some cross correlation between the methods and hopefully reach each student in the group using one method or another.

Procedures: Students will be divided into groups of four (ideally) or into four individual groups regardless of the size. Each group or person will then be given a problem to do using one of the methods; Algebra Tiles, Grid, Vertical, or FOIL. After all students in the group are finished, the students exchange methods of multiplying. After this is done the fourth time, each student should have been exposed to each of the methods. Try not to have the same example for all four problems and when the entire group is working on one method (like Algebra Tiles) have as many examples as students.

Sources: The idea for this lesson and the basic premise came from the web site,
http://regentsprep.org/Regents/math/polymult/Smul_bin.htm
which is a site from the State of New York Mathematics A Regency Exam, an exam that all the students of New York must pass to graduate high school. This site has practice tests for the exam and

on-line questions and games specifically for the seven test areas that are covered on the Regency Exam, a site well worth visiting.

Another site that has all four examples and shows a movie on how each works is listed under Web Links and is called Math iMovies.

Adaptations: All of these lessons can be easily adapted for any individual needs of any students. One of the easiest adaptations for Algebra Tiles is giving the students exactly the amount of tiles that they need for the question and the answer. This allows the students to try different configurations knowing that they must use all the tiles that they were given. For the foil method, highlighting the first terms to be multiplied then the outside and so forth would get the students ready for the actual multiplication. The Foil, the Grid and the Vertical methods can be adapted by having the problems in different stages of completion with the students finishing the problem. The first few may almost be finished with just the answer to be finished by the students.

Key

1

x

x squared

x+3

x+2

answer
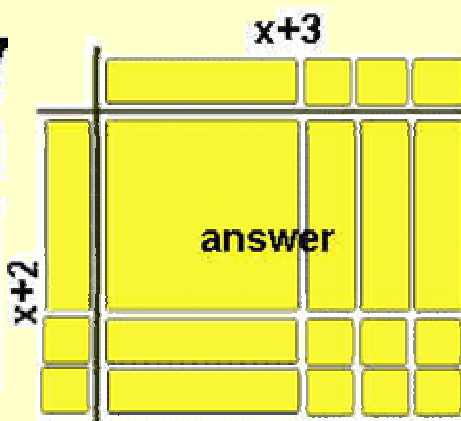
Using Algebra Tiles

To multiply binomials using algebra tiles, place one term at the top of the grid and the second term on the side of the grid. You MUST maintain straight lines when you are filling in the center of the grid. The tiles needed to complete the inner grid will be your answer.

Answer: x^2+5x+6

Grid Method

To multiply binomials using a grid, place one term at the top of the grid (separating the elements into each compartment of the grid) and the second term on the side of the grid. You then multiply the rows and columns of the grid as you would in a coordinate system. Finish by combining like terms.

	x +	3
2	2x	6
+ x	(x)(x)	3x

Answer: x^2+5x+6

Vertical Method:

$$x + 3$$
$$x + 2$$
_____

$$x^2 + 3x$$ multiply "x" from bottom term times "x+3"

Be sure to line up
the like terms.

$$2x + 6$$ multiply "2" from bottom term times "x+3"
_____

$$x^2 + 5x + 6$$ add the like terms

FOIL Method: multiply **F**irst **O**uter **I**nner **L**ast

F: $(x + 3)(x + 2)$
O: $(x + 3)(x + 2)$
I: $(x + 3)(x + 2)$
L: $(x + 3)(x + 2)$

$(x + 3)(x + 2)$

$$= x^2 + 2x + 3x + 6$$
$$= x^2 + 5x + 6$$

CSO's

AGP.1.1   identify and use properties of numbers (commutative, associative, distributive, etc).

A1.2.13   multiply and divide binomials by binomials or monomials.

AM2.2.7   multiply and divide binomials by binomials or monomials.

Performance Descriptors (MA.PD.A1.2)

Distinguished
The student demonstrates exceptional and exemplary performance with distinctive and sophisticated application of knowledge and skills that exceeds the standard in **Algebra I**. The student factors and performs operations on polynomials and simplifies algebraic expressions using laws of exponents.

Above Mastery
The student demonstrates competent and proficient performance and shows a thorough and effective application of knowledge and skills that exceeds the standard in **Algebra I**. The student simplifies algebraic expressions with integer exponents and factors and performs basic operations on simple polynomials.

Mastery
The student demonstrates fundamental course or grade level knowledge and skills by showing consistent and accurate academic performance that meets the standard in **Algebra I** The student simplifies algebraic expressions with whole number exponents and factors, adds, subtracts, and multiplies simple polynomials

Partial Mastery
The student demonstrates basic but inconsistent performance of fundamental knowledge and skills characterized by errors and/or omissions in **Algebra I**. Performance needs further development. The student inconsistently simplifies algebraic expressions with exponents and adds, subtracts, and multiplies simple polynomials

Novice
The student demonstrates substantial need for the development of fundamental knowledge and skills, characterized by fragmented and incomplete performance in **Algebra I.** Performance needs considerable development. The student, with procedural errors, attempts to simplify algebraic expressions.

Web Links

Similar
Foil
http://www.askeric.org/Virtual/Lessons/Mathematics/Algebra/ALG0002.html

Algebra Tiles
http://www.visi.com/~dethier/activities/algebra-tiles/mult-bin.htm
http://www.shs.springfield.k12.il.us/academics/math/chapters/chapt3/5MultiplyingBinomials.pdf

Interactive (lets one click for the next step of the problem)

http://www.mit.edu/afs/athena/software/webeq/currenthome/templates/binomials.html

Practice with answers and standardized test questions
http://www.glencoe.com/sec/math/prealg/mathnet/pr01/pdf/1406a.pdf

Math iMovies
http://mralmeida.org/math/math_imovies/mult_binomials.htm

Extensions
Further multiplication to trinomials and cubes of binomials
http://homepages.ius.edu/MARONNE/m007/notes-05/6-3.pdf
Difference of Squares, Trinomial Squares
http://www.savcds.org/ms/math/hickam/105matht.htm

Pre Requsites
Definition of binomial
http://www.learn.co.uk/default.asp?WCI=Unit&WCU=569