Area – "FOILed" Again!

ID: 12431

Time required
20 minutes

Activity Overview

In this activity, students will practice finding rectangular areas with algebraic expressions for the lengths of the sides. In the first problem, students use the distributive property and in the second problem, students use the FOIL method.

Topic: Polynomial Multiplication

- *Distribution Property*
- *FOIL method*
- *Adding together rectangular areas to find the total area of the figure*

Teacher Preparation and Notes

- *Students will practice finding areas of rectangular figures by using either the Distributive property or FOIL. Some instruction on these methods is assumed.*
- *It is likely that students will need more "paper and pencil" practice after this activity.*
- *Since the problems are presented as dimensions of rectangles, most of the numbers used (as coefficients and constants) are positive. This may make more sense to students than using negative numbers as part of those expressions. Emphasize, however, that those expressions simply represent the relationship between the two numbers that are the length and width of the given rectangle. For example, if a rectangle has sides of length 7 and 12, the two could be described algebraically as 4x – 5 and 6x – 6. The negative numbers in those expressions do NOT mean the rectangle has any negative lengths!*
- *In option 1 of the program AREA, students can only enter positive values for W. In option 2, students can only enter positive values for A and C, but can enter negative and positive values for B and D.*
- ***To download the student worksheet, go to education.ti.com/exchange and enter "12431" in the quick search box.***

Associated Materials

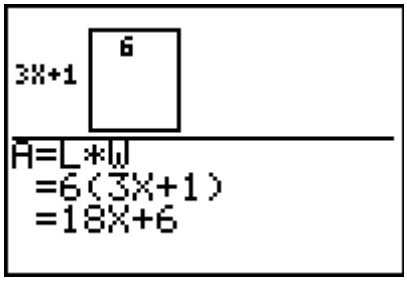
- *FOILed_Student.doc*
- *AREA.8xp (program)*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Binomial Multiplication (TI-84 Plus family) — 8188*
- *Multiplying Binomials (TI-84 Plus family) — 7592*
- *FOIL Review (TI-84 Plus family) — 8081*

Problem 1 – Introduction to area of a rectangle



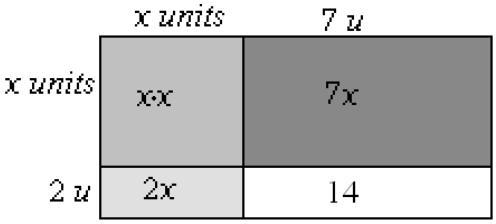
Using option 1 of the program **AREA**, students will change the width of the rectangle, and will find the change in the calculation for area. Several problems are provided on the student worksheet. Pressing ENTER after the calculation is shown will return students to the main menu of the program.

Students should see that when one of the sides of a rectangle is a number or a monomial, the **distributive property** can be used to simplify the expression for the area.

Student worksheet answers

1. $3x + 1$ and 6
2. $18x + 6$
3. when $w = 4$, $A = 12x + 4$ and when $w = 9$, $A = 27x + 9$
4. the value of the width is multiplied by the x term and the constant term of the length (distributive property)

Problem 2 – Areas of small rectangles



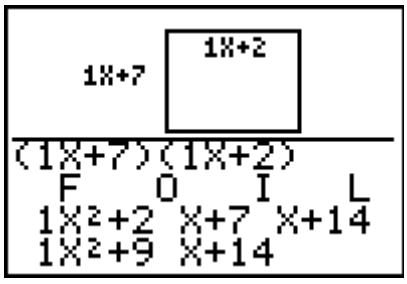
At the right, the rectangle is shaded so that the students will see the four different pieces that must be added together to find the total area. The sides of the entire rectangle are of length $x + 7$ and $x + 2$.

Students should find the area of each of the parts of the rectangle and then add them together. The whole area is $x^2+9x+14$.

Student worksheet answers

5. x^2, $2x$, $7x$, and 14 6. $x^2 + 9x + 14$

Problem 3 – FOIL method



Using option 2 from the program AREA, students will enter the coefficients and constants of the binomial dimensions.

Help students make the connection between the 4 terms shown in the middle step of the calculation and the area of the four smaller rectangles shown in Problem 2.

Pressing ENTER after the calculation is shown will return students to the main menu of the program.

Selecting option **3:QUIT** in the main menu will exit students out of the program and the split-screen mode.

Student worksheet answers

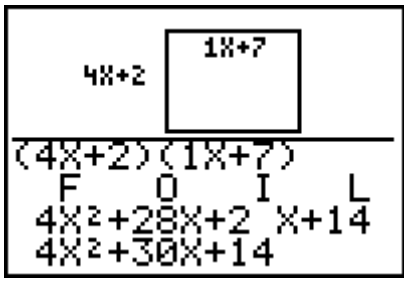
7. Each term under the letters F, O, I, and L is connected with one of the smaller rectangles in the diagram in Problem 2.

8. $18x^2 + 36x + 10$

9. a. $12x^2 + 39x + 9$ b. $7x^2 + 59x + 24$ c. $10x^2 + x - 24$

Homework/Extensions

Exercise 1 presents an area problem for students to do: $(4x + 2)(x + 7)$. Students may be encouraged to show each step if necessary.



Again, students can check any binomial multiplication using option 2 of the program.

Students can enter the binomail $(2x - 3)$ in the program by entering A as 2 and B as –3.

In Exercise 2, a rectangle is shown with a trinomial as the length of one side, and a binomial for the other side. You may wish to have students use the FOIL model of showing their distributive steps. Underlining like terms is also a good idea.

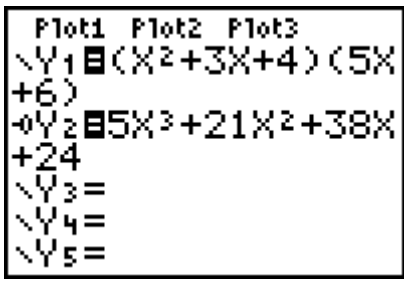
Students are to determine the formula used to find the 6 terms of the expression for area before like terms are combined. The formula or pattern is:

$(ax^2 + bx + c)(dx + e) =$

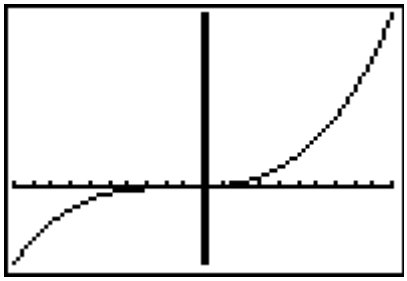
$(a \cdot d)x^3 + (a \cdot e)x^2 + (b \cdot d)x^2 + (b \cdot e)x + (c \cdot d)x + (c \cdot e)$

This formula invokes the use of the distributive property.

Another way to check any multiplication problem is by graphing. Students should enter the multiplication problem in **Y1** and then enter the simplified expression in **Y2**. They need to change the graph style of Y2, by arrowing to the left of the = sign and pressing enter until **–0** appears.



Then students can press ZOOM and select **ZoomFit** to view the graph. Ensure they understand that two graphs that coincide are equivalent equations.



Other Possible Extension Ideas:

A rectangular prism could be introduced with algebraic expressions for length, width and height. Other geometric figures could also be created with various algebraic expressions as dimensions.