The Box Method

ID: 12510

Time required
15–20 minutes

Activity Overview

Students will discover how to factor a quadratic function using the Box Method. This activity is an advanced concept for beginning algebra students, and should not be taught as the only way to factor quadratics.

Topic: Factoring by the Box Method

- *Organizing in a particular way so that the student can obtain a pair of binomial factors for an otherwise difficult polynomial to factor.*

Teacher Preparation and Notes

- *Teachers need to download the calculator program and send it to all student calculators.*
- *Teachers should work with a variety of polynomials to factor. Avoid very basic quadratics where students would be better off recognizing a pattern or factoring out a GCD prior to the factoring process.*
- *Working with Algebra Tiles by hand or through interactive Web sites would be very helpful. Visualizing the dimensions of a rectangle that are binomial expressions will help the student to understand the concept more thoroughly.*
- *Students will use a program to create the binomial factors. An explanation of what the GCD is and why you are using it will help students through parts of this activity.*
- ***To download the student worksheet and calculator program, go to education.ti.com/exchange and enter "12510" in the keyword search box.***

Associated Materials

- *BoxMethod_Student.doc*
- *BOXMTHD.8xp*

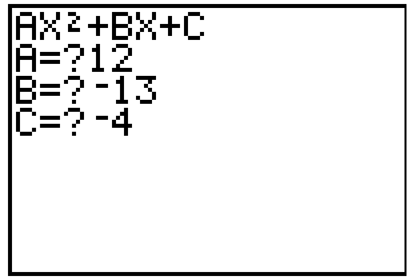
Suggested Related Activities

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

- *Reviewing Factoring Quadratics (TI-84 Plus and TI-Navigator) — 8790*
- *Explore Graphs and Factors (TI-84 Plus family) — 6328*
- *Factoring Special Cases (TI-84 Plus family) — 9604*

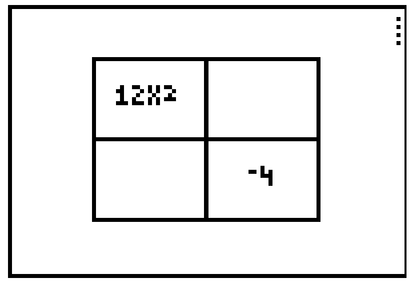
Activity

Students will work through factoring the quadratic equation $12x^2 - 13x - 4$ using the Box Method. A program (**BOXMTHD**) is provided that will walk students through the box method, helping them identify what to put in each quadrant of the box.



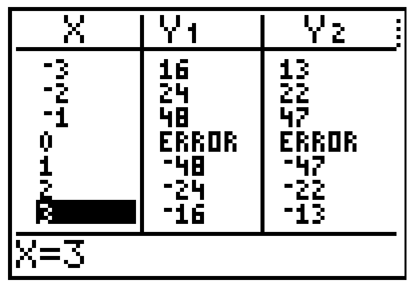
To run the program, press PRGM and scroll down to **BOXMTHD** and press ENTER. At the prompts for **A**, **B**, and **C**, enter 12, –13 and –4, pressing ENTER after each number.

Students are asked to place the quadratic term and the constant term into the 2 × 2 table on their worksheets.



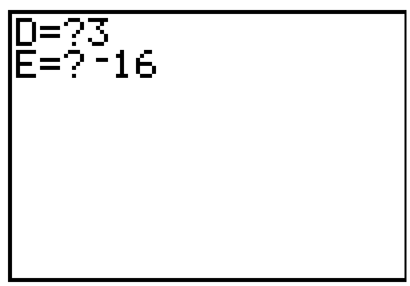
When the program has paused to display information or request information, pressing ENTER will move to the next step.

The product $ax^2 \cdot c$ is found for this example: $12x^2 \cdot -4 = -48x^2$.



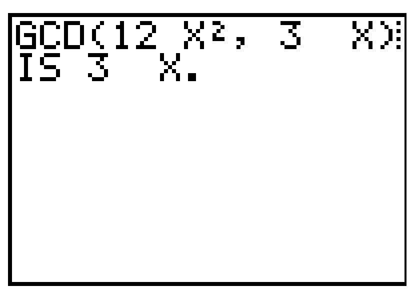
The program next displays a table showing possible factors and their sums. The first two columns (**X** and **Y1**) display possible factors. **Y2** shows the sum of the two factors. Students will use this table to find the factors that give the needed sum (**Y2** column). In this case, 3 and –16 give the needed sum of –13.

Students store the factors found in the table to **D** and **E**.



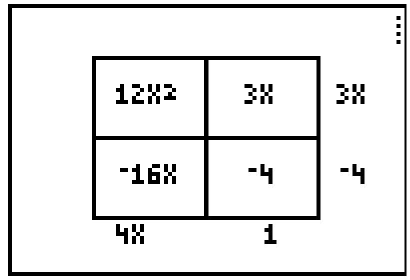
Observe where these values appear in the box. Students should update the chart on their worksheets at this time.

Now that the chart is filled, students must think about factoring out the greatest common factors in each row and column of the box.



The program next finds the GCD of each pair of terms in each row and each column.

Once the “factors” appear outside of the box, lined up with each row and column, observe how each is indeed the GCD of the two numbers, and will also contribute to the factorization of the original polynomial.



Finally, students are asked to check the factorization by multiplying the pair of binomials. Be aware that there could be some necessary adjustments with negative signs if they were left out earlier.

Another option for checking solutions is for students to graph the original polynomial and the factors to determine if they are equivalent.

Additional Practice

The student is engouraged to try some problems for additional practice. Students should repeat the procedure, starting from the beginning with each polynomial. Again, make special note when negative factors are required.

1. $10x^2 + 17x + 3 = (5x + 1)(2x + 3)$

2. $9x^2 + 9x – 4 = (3x + 4)(3x – 1)$

3. $8x^2 + 22x + 5 = (4x + 1)(2x + 5)$

4. $6x^2 + 29x – 5 = (6x – 1)(x + 5)$

