**Activity 2.2.6 Deriving the Quadratic Formula**

**Directions**: In Column 1, you are given precise instructions on the steps you need to take in order to “complete the square” to solve the quadratic equation below. In Column 2, **show** the manipulation you are making to the quadratic equation using numbers. In Column 3, **show** the exact same manipulation you perform in Column 2, but to a quadratic equation in standard form with the variables *a*, *b*, and *c*.

Solve the quadratic equation .

|  |  |  |
| --- | --- | --- |
| Column 1: Steps to Complete the Square | Column 2: Show with Numbers for  | Column 3: Show with Variables for  |
| Step 1: Isolate the *x* terms by using the Addition Property of Equality. |  |  |
| Step 2: Change the coefficient of the quadratic term to 1 by dividing both sides of the equation by the coefficient of the quadratic term. |  |  |
| Step 3: Divide the coefficient of the linear term in half and square it. Add the result to both sides of the equation using the Addition Property of Equality. This creates a perfect square trinomial, which can be factored into the square of a binomial. |  |  |
| Step 4: Factor the perfect square trinomial you just created into the square of a binomial. |  |  |
| Find a common denominator to add together the rational expressions. |  |  |
| Take the square root of both sides of the equation and simplify. |  |  |
| Solve for *x* and simplify the expression. |  | Assume *a* > 0. |

You have just derived the quadratic formula!!!

NOTE: A quadratic equation in standard form is expressed as . For the given quadratic equation , and . Substitute these values into the quadratic formula and simplify your result below.

Does your result match the result in the last box of column two?

**Applying the Quadratic Formula**



**Directions**: Now that you have derived the quadratic formula, use it to solve the following quadratic equations below. First, identify the coefficients *a*, *b*, and *c* in the spaces given. Then substitute those values into the quadratic formula and ***simplify*** the expression.

1.  2. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

3.  4. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

5.  6. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

7.  8. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

Recall that the square root of a negative number in not a Real Number. Therefore, if your quadratic formula results with a negative number inside the square root symbol, then the answer is “no Real Number solution”. Some of the following equations have a real number solution, and some do not:

 9.  10. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

 11.  12. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_ a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_

13. 

a = \_\_\_\_\_\_ b = \_\_\_\_\_\_ c = \_\_\_\_\_\_