Algebra RH

Essential Question: How do we solve quadratic equations by completing the square?

Do Now: Solve for x.

1. $x^2 - 5x - 14 = 0$
2. $2(x + 1)^2 = 18$
3. $x^2 + 8x + 16 = 0$

Solving Quadratic Equations by Completing the Square

1. Refer to #3 from the Do Now. Is the quadratic trinomial $x^2 + 8x + 16$ a perfect square?

2. What value for c would make each quadratic trinomial a perfect square?

   a. $x^2 + 6x$ _____ b. $x^2 - 10x$ _____ c. $x^2 - x$ _____

How do we solve quadratic equations by completing the square?

$ax^2 + bx + c = 0$

1) Write the original equation (make sure the constant is on the right side) $x^2 - 5x - 14 = 0$

2) Create a perfect square on the left hand side of the equation (take half the middle term and square it). Make sure to add the same amount to the right hand side of the equation.

3) Factor the left hand side of the equation.

4) Find the square root of each side.

5) Solve for x.

Example #2: $x^2 + 3x - 4 = 0$

Example #3: $2x^2 - 11x + 12 = 0$

Note: If the leading coefficient of $\mathbf{a}x^2 + \mathbf{b}x + \mathbf{c} = \mathbf{0}$ is ***not*** 1, divide each side of the equation by the leading coefficient before completing the square!

Solve by completing the square. For #1 – 4, round solutions to the nearest tenth, if necessary.

1) $y^2 + 8y = 10$

2) $c^2 + 18c - 175 = 0$

3) $z^2 - 6z - 307 = 8$

4) $2b^2 + 16b = 4$

5) Solve by completing the square. Express the solution(s) in simplest radical form.

$w^2 + w = 3$

RESEARCH HONORS CHALLENGE

DERIVING THE QUADRATIC FORMULA

You have recently learned how to solve a quadratic equation by completing the square but can you take it to the next level? Did you know that the Arab mathematician, Al-Khwarizm derived the quadratic formula back in the 11th century? It has been said that perhaps earlier mathematicians knew the formula but Al-Khwarizm is the one who has been given credit for it. How did he do it? Well, he took the basic form of a quadratic equation: $ax^2 + bx + c = 0$ and used the procedure for completing the square to arrive at $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Challenge: Take $ax^2 + bx + c = 0$ and using the procedure to complete the square, show the steps that will transform $ax^2 + bx + c = 0$ into $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Hint: Use your notes to help you.

I'll help you get started…

Start: $ax^2 + bx + c = 0$ → The coefficient of x^2 must equal 1 when completing the square so your first step is to divide both sides of the equation by a.

Good Luck!