Algebra II

Name ________________________________

Period __________

<table>
<tr><td>Date:

Unit 2: Quadratic Equations

Lesson 7: Completing the Square</td><td>Essential Question: What does “completing the square” mean in the context of solving quadratic equations?</td></tr>
<tr><td>Standard: A-REI.4a</td><td>Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.</td></tr>
<tr><td>Learning Target :</td><td>80% of the students will be able to solve $4x^2 - 12x - 7 = 0$ by completing the square.

If you can transform a quadratic equation in standard form

$$ax^2 + bx + c = 0,$$
into one that has the form

$$(x + q)^2 = r,$$
you can solve it by taking the square root of both sides.

$$x + q = \pm\sqrt{r}$$
$$x = -q \pm \sqrt{r}$$
This is called completed square form. We can solve a quadratic expression by completing the square.</td></tr>
<tr><td colspan="2">Summary

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***Example 1*:**	Solve $x^2 + 4x + 4 = 9.$ $x^2 + 4x + 4 = (x+2)^2 = 9$ $\sqrt{(x+2)^2} = \sqrt{9} = \pm 3$ $x + 2 = \pm 3$ $x = -2 \pm 3$ $x = -5, 1$
***Exercise 1*:**	Solve $x^2 + 2x + 1 = 4.$ What we need is a prescription for converting a quadratic expression into a complete square.
***Example 2*:**	Solve $x^2 - 6x - 16 = 0$ $x^2 - 6x \quad = 16$ $x^2 - 6x + 9 = 16 + 9$ $(x-3)^2 = 25$ $x - 3 = \pm\sqrt{25}$ $x = 3 \pm 5$ $\therefore$ the solution set is $\{8, \ -2\}$.

Exercise 2:	Solve $x^2 - 8x - 9 = 0$
Prescription:	***Solving $ax^2 + bx + c = 0$ by Completing the Square***
Step 1	Transform the equation so that the constant term *c* is alone on the right side.
Step 2	If *a*, the coefficient of the second-degree term, is not equal to 1, then divide both sides by *a*.
Step 3	Add the square of half the coefficient of the first-degree term, $\left(\frac{b}{2a}\right)^2$ to *both sides.* (Completing the square).
Step 4	Factor the left side as the square of a binomial.
Step 5	Complete the solution using the fact that $(x+q)^2 = r$is equivalent to $x + q = \pm\sqrt{r}$.

Example 3	Solve $2y^2 + 2y + 5 = 0.$
Step 1	$2y^2 + 2y = -5$
Step 2	$y^2 + y = -\frac{5}{2}$
Step 3	$y^2 + y + \left(\frac{1}{2}\right)^2 = -\frac{5}{2} + \left(\frac{1}{2}\right)^2$ $y^2 + y + \frac{1}{4} = -\frac{5}{2} + \frac{1}{4}$
Step 4	$\left(y + \frac{1}{2}\right)^2 = -\frac{9}{4}$
Step 5	$y + \frac{1}{2} = \pm\sqrt{-\frac{9}{4}} = \pm\frac{3}{2}i$ $y = -\frac{1}{2} \pm \frac{3}{2}i$
Exercise 3:	Solve by completing the square $2x^2 - 8x - 3 = 0.$
Class work:	p 260: 1-13
Homework:	p 260: 15-57 odd, 58, 60-83