

Name:

Date:

Period:

4.5 Solving Quadratic Equations by Completing the Square Notes

<p>Warm Up</p>	<p>Put into vertex form by completing the square.</p> $f(x) = x^2 + 14x + 45$ $f(x) = (x^2 + 14x + \frac{49}{2}) + 45 - \frac{49}{2}$ $(\frac{14}{2})^2 = (7)^2 = 49$ $f(x) = (x+7)^2 - 4$
<p>Solving Quadratics by Completing the Square</p>	<p>Given a quadratic equation in the form $ax^2 + bx + c = 0$, if it's <i>not</i> factorable, then solve by completing the square.</p> <ol style="list-style-type: none"> 1. REWRITE as $ax^2 + bx = c$ 2. DIVIDE both sides by a. → <i>Factor out and divide.</i> 3. COMPLETE THE SQUARE by taking $1/2$ (dividing by 2) of b, square it, and add it to both sides. 4. FACTOR the perfect square trinomial. 5. SQUARE ROOT both sides. Don't forget the \pm. 6. SOLVE both equations.

Directions: Solve each quadratic equation below by completing the square.

Ex1: $x^2 + 12x + 43 = 0$

① $x^2 + 12x + \frac{36}{2} = -43 + \frac{36}{2}$

③ $(\frac{12}{2})^2 = (6)^2 = 36$

④ $(x+6)^2 = -7$

⑤ $\sqrt{(x+6)^2} = \pm\sqrt{-7}$

$x+6 = \pm\sqrt{-7}$

$x+6 = \sqrt{-7}$ $x+6 = -\sqrt{-7}$

$x = \sqrt{-7} - 6$ $x = -\sqrt{-7} - 6$

$x = \{-6 + i\sqrt{7}, -6 - i\sqrt{7}\}$

$x = \{-6 - i\sqrt{7}, -6 + i\sqrt{7}\}$

Ex2: $2x^2 - 16x = -30 \rightarrow 2(x^2 - 8x) = -30$

Ex3: $x^2 + 16x - 21 = -5$

You don't divide when putting into vertex form.

② $x^2 - 8x = -15$

$x^2 - 8x + \frac{16}{2} = -15 + \frac{16}{2}$

$(\frac{-8}{2})^2 = (-4)^2 = 16$ ③

$x^2 - 8x + 16 = 1$

④ $(x - 4)^2 = 1$

⑤ $x - 4 = \pm \sqrt{1}$

$x - 4 = \pm 1$

⑥ $x - 4 = 1$ $x - 4 = -1$

$x = 5$ $x = 3$

$x = \{3, 5\}$

$x^2 + 16x = 16$ ①

$x^2 + 16x + \frac{64}{2} = 16 + \frac{64}{2}$

$(\frac{16}{2})^2 = (8)^2$ ③

$x^2 + 16x + 64 = 80$

$(x + 8)^2 = 80$ ④

$x + 8 = \pm \sqrt{80}$ ⑤

$x + 8 = \pm \sqrt{16} \sqrt{5}$

$x + 8 = \pm 4\sqrt{5}$

$x = \pm 4\sqrt{5} - 8$ ⑥

$x = \{4\sqrt{5} - 8, -4\sqrt{5} - 8\}$

Ex4: $3x^2 - 30x = 69 \rightarrow 3(x^2 - 10x) = 69$

② $x^2 - 10x = 23$

$x^2 - 10x + \frac{25}{2} = 23 + \frac{25}{2}$

$(\frac{-10}{2})^2 = (-5)^2 = 25$

$x^2 - 10x + 25 = 48$

$(x - 5)^2 = 48$

$x - 5 = \pm \sqrt{48}$

$x - 5 = \pm 4\sqrt{3}$

$x = 5 \pm 4\sqrt{3}$
 $x = \{5 + 4\sqrt{3}, 5 - 4\sqrt{3}\}$