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Date _____
Algebra 2

Solving Quadratic Equations Using Completing the Square

$(\frac{-6}{2})^2 = 9$
1. $x^2 - 6x = 9$

$x^2 - 6x + 9 = 9 + 9$
 $(x-3)(x-3) = 18$
 $\sqrt{(x-3)^2} = \sqrt{18}$
 $x-3 = \pm\sqrt{18}$
 $+3 \quad +3$
 $x = 3 \pm \sqrt{18}$

$x = 3 \pm 3\sqrt{2}$

$(\frac{4}{2})^2 = 4$

2. $x^2 + 4x + 6 = 0$

$-6 -6$
 $x^2 + 4x = -6$
 $x^2 + 4x + 4 = -6 + 4$
 $(x+2)(x+2) = -2$
 $\sqrt{(x+2)^2} = \sqrt{-2}$
 $x+2 = \pm i\sqrt{2}$
 $-2 \quad -2$

$x = -2 \pm i\sqrt{2}$

3. $x^2 + 2x = 4$

$(\frac{2}{2})^2 = 1$
 $x^2 + 2x + 1 = 4 + 1$
 $(x+1)(x+1) = 5$
 $\sqrt{(x+1)^2} = \sqrt{5}$
 $x+1 = \pm\sqrt{5}$
 $-1 \quad -1$
 $x = -1 \pm \sqrt{5}$

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

4. $x^2 = 10x - 45$

$25 -10x -10x$
 $x^2 - 10x = -45$
 $x^2 - 10x + 25 = -45 + 25$
 $(x-5)(x-5) = -20$
 $\sqrt{(x-5)^2} = \sqrt{-20}$
 $x-5 = \pm i\sqrt{20}$
 $+5 \quad +5$

$x = 5 \pm i\sqrt{20}$
 $x = 5 \pm 2i\sqrt{5}$

5. $x^2 - 6x = 18$

$(\frac{-6}{2})^2 = 9$
 $x^2 - 6x + 9 = 18 + 9$
 $(x-3)(x-3) = 27$
 $\sqrt{(x-3)^2} = \sqrt{27}$
 $x-3 = \pm\sqrt{27}$
 $+3 \quad +3$
 $x = 3 \pm \sqrt{27}$
 $\sqrt{27}$
 $\sqrt{9}\sqrt{3}$
 $3\sqrt{3}$
 $x = 3 \pm 3\sqrt{3}$

$(\frac{-12}{2})^2 = 36$

6. $x^2 - 12x + 4 = 0$

$36 -4 -4$
 $x^2 - 12x = -4$
 $x^2 - 12x + 36 = -4 + 36$
 $(x-6)(x-6) = 32$
 $\sqrt{(x-6)^2} = \sqrt{32}$
 $x-6 = \pm\sqrt{32}$
 $+6 \quad +6$
 $x = 6 \pm \sqrt{32}$
 $x = 6 \pm 4\sqrt{2}$

$$\left(\frac{-2}{2}\right)^2 = 1$$

$$7. x^2 - 2x + 26 = 0$$

$-26 \quad -26$

$$x^2 - 2x = -26$$

$$x^2 - 2x + \boxed{1} = -26 + \boxed{1}$$

$$(x-1)(x-1) = -25$$

$$\sqrt{(x-1)^2} = \sqrt{-25}$$

$$x-1 = \pm 5i$$

$$x = 1 \pm 5i$$

$$9. -4x^2 = 8x + 16$$

$-8x \quad -8x$

$$\frac{-4x^2}{-4} = \frac{8x}{-4} + \frac{16}{-4}$$

$$x^2 + 2x = -4$$

$$x^2 + 2x + \boxed{1} = -4 + \boxed{1}$$

$$(x+1)(x+1) = -3$$

$$\sqrt{(x+1)^2} = \sqrt{-3}$$

$$11. 4x^2 = 8x + 1$$

$-8x \quad -8x$

$$\frac{4x^2}{4} - \frac{8x}{4} = \frac{1}{4}$$

$$x^2 - 2x = \frac{1}{4}$$

$$x^2 - 2x + \boxed{1} = \frac{1}{4} + \boxed{1}$$

$$(x-1)(x-1) = \frac{5}{4}$$

$$\sqrt{(x-1)^2} = \sqrt{\frac{5}{4}}$$

$$x-1 = \pm \frac{\sqrt{5}}{2}$$

$-1 \quad -1$

$$\left(\frac{-2}{2}\right)^2 = 1$$

$$x = -1 \pm \frac{\sqrt{5}}{2}$$

$$\left(\frac{8}{2}\right)^2 = 16$$

$$8. x^2 + 5x = -3x - 20$$

$+3x \quad +3x$

$$x^2 + 8x = -20$$

$$x^2 + 8x + \boxed{16} = -20 + \boxed{16}$$

$$(x+4)(x+4) = -4$$

$$\sqrt{(x+4)^2} = \sqrt{-4}$$

$$x+4 = \pm 2i$$

$-4 \quad -4$

$$x = -4 \pm 2i$$

$$10. 2x^2 + 2x + 26 = 0$$

$-26 \quad -26$

$$\frac{2x^2 + 2x}{2} = \frac{-26}{2}$$

$$x^2 + x = -13$$

$$x^2 + x + \boxed{\frac{1}{4}} = -13 + \boxed{\frac{1}{4}}$$

$$(x+\frac{1}{2})(x+\frac{1}{2}) = \frac{-51}{4}$$

$$\sqrt{(x+\frac{1}{2})^2} = \sqrt{\frac{-51}{4}}$$

$$x+\frac{1}{2} = \pm \sqrt{\frac{-51}{4}}$$

$$x+\frac{1}{2} = \pm \sqrt{\frac{-51}{4}}$$

$-\frac{1}{2} \quad -\frac{1}{2}$

$$x = -\frac{1}{2} \pm \frac{i\sqrt{51}}{2}$$

$$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$12. 2x^2 - 8x + 15 = 0$$

$-15 \quad -15$

$$\left(\frac{-4}{2}\right)^2 = 4$$

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

$$x^2 - 4x = -\frac{15}{2}$$

$$x^2 - 4x + \boxed{4} = \frac{-15}{2} + \boxed{4}$$

$$(x-2)(x-2) = \frac{-7}{2}$$

$$\sqrt{(x-2)^2} = \sqrt{\frac{-7}{2}}$$

$$x-2 = \pm \sqrt{\frac{-7}{2}}$$

$+2 \quad +2$

$$x = 2 \pm i\sqrt{\frac{7}{2}}$$