Name: **WORKED SOLUTIONS**　Date: ＿＿＿＿＿＿＿　Period: ＿＿＿＿＿

Solving Quadratics 4 by 4

Directions: For each level, you will have four quadratic equations to solve. You must give the <u>**exact solutions**</u> to all four of the questions in the boxes provided. You must use each of the following algebraic solving methods for each level 1) factoring 2) square roots 3) completing the square and 4) quadratic formula.

In the box next to the level, **the sum** of the real solutions and the real parts of the complex solutions for all four problems are listed.

Level One Beginner	**-2.33**	Level Two Intermediate	**12.67**

Level One — Beginner

Method: **factoring**

❶ $x^2 - 4x - 77 = 0$

$(x-11)(x+7) = 0$

$x-11 = 0 \quad x+7 = 0$

$x = 11 \quad x = -7$

Method: **square roots**

❷ $\dfrac{2x^2}{2} = \dfrac{32}{2}$

$x^2 = 16$

$\sqrt{x^2} = \sqrt{16}$

$x = \pm 4$

Method: **completing the square**

❸ $x^2 + 8x - 29 = 0$

$x^2 + 8x + \underline{16} = 29 + \underline{16}$

$(x+4)^2 = 45$

$\sqrt{(x+4)^2} = \pm\sqrt{45}$

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

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

Method: **quadratic formula**

❹ $3x^2 - 5x - 1 = 0$

$x = \dfrac{5 \pm \sqrt{(-5)^2 - 4(3)(-1)}}{2(3)}$

$x = \dfrac{5 \pm \sqrt{37}}{6}$

Level Two — Intermediate

Method: **square roots**

❶ $4x^2 + 25 = 0$

$(2x+5i)(2x-5i) = 0$

$2x+5i = 0 \quad 2x-5i = 0$

$2x = -5i \quad 2x = 5i$

$x = -\dfrac{5}{2}i \quad x = \dfrac{5}{2}i$

Method: **square roots or factoring**

❷ $\dfrac{18x^2}{18} = \dfrac{50}{18}$

$x^2 = \dfrac{25}{9}$

$\sqrt{x^2} = \sqrt{\dfrac{25}{9}}$

$x = \pm\dfrac{5}{3}$

Method: **quadratic formula**

❸ $3x^2 - 2x = 6$

$3x^2 - 2x - 6 = 0$

$x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}$

$x = \dfrac{2 \pm \sqrt{76}}{6}$

$x = \dfrac{2 \pm 2\sqrt{19}}{6}$

$x = \dfrac{1 \pm \sqrt{19}}{3}$

Method: **completing the square**

❹ $x^2 - 12x - 5 = 16$

$ +5 \quad +5$

$x^2 - 12x + \underline{36} = 21 + \underline{36}$

$(x-6)^2 = 57$

$\sqrt{(x-6)^2} = \pm\sqrt{57}$

$x-6 = \pm\sqrt{57}$

$x = 6 \pm \sqrt{57}$

Level Three Proficient	21.11	Level Four Master	-0.38

Method: completing the square

❶ $\dfrac{2x^2}{2} - \dfrac{16x}{2} - \dfrac{35}{2} = \dfrac{0}{2}$

$x^2 - 8x - \dfrac{35}{2} = 0$

$x^2 - 8x + \underline{16} = \dfrac{35}{2} + 16$

$(x-4)^2 = \dfrac{35}{2} + \dfrac{32}{2}$

$\sqrt{(x-4)^2} = \sqrt{\dfrac{67}{2}}$

$x - 4 = \pm\sqrt{\dfrac{67}{2}}$

$x = 4 \pm \sqrt{\dfrac{67}{2}}$

Method: Square roots

❷ $-3(x-7)^2 + 4 = 25$

$-3(x-7)^2 = 21$

$(x-7)^2 = -7$

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

$x - 7 = \pm i\sqrt{7}$

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

Method: quadratic formula

❸ $25x^2 - 10x = -2$

$25x^2 - 10x + 2 = 0$

$x = \dfrac{10 \pm \sqrt{(-10)^2 - 4(25)(2)}}{2(25)}$

$x = \dfrac{10 \pm \sqrt{-100}}{50}$

$x = \dfrac{10 \pm 10i}{50}$

$x = \dfrac{1}{5} \pm \dfrac{1}{5}i$

Method: factoring

❹ $49x^2 + 126x + 81 = 0$

$(7x+9)^2 = 0$

$7x + 9 = 0$

$7x = -9$

$x = -\dfrac{9}{7}$

Method: quadratic formula

❶ $6x + 19 = -11x^2$

$11x^2 + 6x + 19 = 0$

$x = \dfrac{-6 \pm \sqrt{(6)^2 - 4(11)(19)}}{2(11)}$

$x = \dfrac{-6 \pm \sqrt{-800}}{22}$

$x = \dfrac{-6 \pm 20i\sqrt{2}}{22}$

$x = \dfrac{-3 \pm 10i\sqrt{2}}{11}$

$x = -\dfrac{3}{11} \pm \dfrac{10\sqrt{2}}{11}i$

Method: completing the square

❷ $\dfrac{3x^2}{3} - \dfrac{15x}{3} + \dfrac{41}{3} = \dfrac{0}{3}$

$x^2 - 5x + \dfrac{41}{3} = 0$

$x^2 - 5x + \dfrac{25}{4} = \dfrac{-41}{3} + \dfrac{25}{4}$

$(x - \dfrac{5}{2})^2 = \dfrac{-89}{12}$

$\sqrt{(x-\dfrac{5}{2})^2} = \pm\sqrt{\dfrac{-89}{12}}$

$x - \dfrac{5}{2} = \pm i\sqrt{\dfrac{89}{12}}$

$x = \dfrac{5}{2} \pm i\sqrt{\dfrac{89}{12}}$

Method: factoring

❸ $4x^2 - 35 = x - 2x^2$

$6x^2 - x - 35 = 0$

$(3x+7)(2x-5) = 0$

$3x + 7 = 0 \qquad 2x - 5 = 0$

$3x = -7 \qquad 2x = 5$

$x = -\dfrac{7}{3} \qquad x = \dfrac{5}{2}$

Method: square roots

❹ $4(2x+5)^2 - 1 = 14$

$4(2x+5)^2 = 15$

$(2x+5)^2 = \dfrac{15}{4}$

$\sqrt{(2x+5)^2} = \pm\sqrt{\dfrac{15}{4}}$

$2x + 5 = \pm\dfrac{\sqrt{15}}{2}$

$2x = -5 \pm \dfrac{\sqrt{15}}{2}$

$x = -\dfrac{5}{2} \pm \dfrac{\sqrt{15}}{4}$