

Unit 2C: Quadratic Functions – Working With Equations
PRE-TEST

Simplify each of the given Square Roots:

$$\begin{aligned} 1. \sqrt{68} &= \sqrt{4 \cdot 17} \\ &= \sqrt{4} \cdot \sqrt{17} \\ &= \boxed{2\sqrt{17}} \end{aligned}$$

$$\begin{aligned} 2. \sqrt{448} &= \sqrt{64 \cdot 7} \\ &= \sqrt{64} \cdot \sqrt{7} \\ &= \boxed{8\sqrt{7}} \end{aligned}$$

$$\begin{aligned} 3. \sqrt{-375} &= \sqrt{-1 \cdot 25 \cdot 15} \\ &= \sqrt{-1} \cdot \sqrt{25} \cdot \sqrt{15} \\ &= i \cdot 5 \cdot \sqrt{15} \\ &= \boxed{5i\sqrt{15}} \end{aligned}$$

$$\begin{aligned} 4. \sqrt{-52} &= \sqrt{-1 \cdot 4 \cdot 13} \\ &= \sqrt{-1} \cdot \sqrt{4} \cdot \sqrt{13} \\ &= i \cdot 2 \cdot \sqrt{13} \\ &= \boxed{2i\sqrt{13}} \end{aligned}$$

Perform the indicated operation on the Complex Numbers:

$$\begin{aligned} 5. (-2 + 3i) + (-4i - 1) \\ \underline{-2 + 3i - 4i - 1} \\ \boxed{-3 - i} \end{aligned}$$

$$\begin{aligned} 6. (8 - 6i) - (4 - 3i) \\ \underline{8 - 6i - 4 + 3i} \\ \boxed{4 - 3i} \end{aligned}$$

$$\begin{aligned} 7. (-5 + 3i)(2 - 3i) \\ -5(2 - 3i) + 3i(2 - 3i) \\ -10 + 15i + 6i - 9i^2 \\ -10 + 21i - 9(-1) \\ -10 + 21i + 9 \\ \boxed{-1 + 21i} \end{aligned}$$

$$\begin{aligned} 8. \frac{(4+2i)(2-i)}{(2+i)(2-i)} &= \frac{4(2-i) + 2i(2-i)}{2(2-i) + i(2-i)} = \frac{8 - 4i + 4i - 2i^2}{4 - 2i + 2i - i^2} \\ &= \frac{8 - 2(-1)}{4 - 1(-1)} = \frac{8 + 2}{4 + 1} = \frac{10}{5} = \boxed{2} \end{aligned}$$

Solve each of the following using Square Roots. Give exact solutions:

$$\begin{aligned} 9. 4x^2 + 13 &= 253 \\ \underline{-13 \quad -13} \\ 4x^2 &= 240 \\ \frac{4x^2}{4} &= \frac{240}{4} \\ \sqrt{x^2} &= \sqrt{60} \\ x &= \pm \sqrt{60} \\ x &= \pm \sqrt{4 \cdot 15} = \boxed{\pm 2\sqrt{15}} \end{aligned}$$

$$\begin{aligned} 10. 9(x-2)^2 &= 121 \\ \frac{9(x-2)^2}{9} &= \frac{121}{9} \\ \sqrt{(x-2)^2} &= \frac{\sqrt{121}}{\sqrt{9}} \\ x-2 &= \pm \frac{11}{3} \\ x &= \frac{2}{1} \pm \frac{11}{3} \\ x &= \frac{6}{3} \pm \frac{11}{3} \end{aligned}$$

$$x = \frac{6}{3} + \frac{11}{3} = \boxed{\frac{17}{3}}$$

$$x = \frac{6-11}{3} = \boxed{\frac{-5}{3}}$$

Solve each of the following by Factoring. Give exact solutions:

$$\begin{aligned} 11. 15x^2 &= 7x + 2 \\ \underline{-7x-2 \quad -7x-2} \\ 15x^2 - 7x - 2 &= 0 \\ (15x^2 - 10x) + (3x - 2) &= 0 \\ 5x(3x - 2) + 1(3x - 2) &= 0 \\ (5x + 1)(3x - 2) &= 0 \\ 5x + 1 = 0 & \quad 3x - 2 = 0 \\ \boxed{x = -\frac{1}{5}} & \quad \boxed{x = \frac{2}{3}} \end{aligned}$$

$$\begin{array}{r} 15(2) = 30 \\ \quad 1 \quad 30 \\ + 3x - 10x \\ \hline 5 \quad 6 \end{array}$$

$$\begin{aligned} 12. 6x^2 - 17x &= -12 \\ 6x^2 - 17x + 12 &= 0 \\ (6x^2 - 8x) - (9x - 12) &= 0 \\ 2x(3x - 4) - 3(3x - 4) &= 0 \\ (2x - 3)(3x - 4) &= 0 \\ 2x - 3 = 0 & \quad 3x - 4 = 0 \\ \boxed{x = \frac{3}{2}} & \quad \boxed{x = \frac{4}{3}} \end{aligned}$$

$$\begin{array}{r} 6(2) = 12 \\ \quad 1 \quad 12 \\ \quad 2 \quad 36 \\ \quad 3 \quad 24 \\ \quad 4 \quad 18 \\ \quad 6 \quad 12 \\ \hline -8x + 9x \end{array}$$

Solve each of the following by Completing the Square. Give exact solutions:

13. $x^2 - 6x + 3 = 0$

$$x^2 - 6x + \underline{\quad} = -3 + \underline{\quad}$$

$$x^2 - 6x + (-3)^2 = -3 + (-3)^2$$

$$(x-3)^2 = -3 + 9$$

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

$$x-3 = \pm\sqrt{6}$$

$$\boxed{x = 3 \pm \sqrt{6}}$$

14. $4x^2 - 8 = -13x$

$$4x^2 + 13x + \underline{\quad} = 8 + \underline{\quad}$$

$$x^2 + \frac{13}{4}x + \underline{\quad} = \frac{8}{4} + \underline{\quad}$$

$$x^2 + \frac{13}{4}x + \left(\frac{13}{8}\right)^2 = \frac{8}{4} + \left(\frac{13}{8}\right)^2$$

$$\sqrt{\left(x + \frac{13}{8}\right)^2} = \frac{\sqrt{297}}{\sqrt{64}}$$

$$x + \frac{13}{8} = \pm \frac{\sqrt{297}}{8}$$

$$x = -\frac{13}{8} \pm \frac{\sqrt{297}}{8} = -\frac{13}{8} \pm \frac{\sqrt{9 \cdot 33}}{8} = \boxed{-\frac{13}{8} \pm \frac{3\sqrt{33}}{8}}$$

Solve each of the following by using the Quadratic Formula. Give exact solutions:

15. $-x^2 - 3x + 1 = 0$

$a = -1$
 $b = -3$
 $c = 1$

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

$$x = \frac{3 \pm \sqrt{9 + 4}}{-2}$$

$$\boxed{x = \frac{3 \pm \sqrt{13}}{-2}}$$

or

$$\boxed{x = \frac{-3 \pm \sqrt{13}}{2}}$$

16. $5x^2 - 3 = 2x$

$$5x^2 - 2x - 3 = 0$$

$a = 5$
 $b = -2$
 $c = -3$

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

$$x = \frac{2 \pm \sqrt{4 + 60}}{10}$$

$$x = \frac{2 \pm \sqrt{64}}{10}$$

$$x = \frac{2 \pm 8}{10}$$

$$x = \frac{2+8}{10} = \frac{10}{10} = \boxed{1}$$

$$x = \frac{2-8}{10} = \frac{-6}{10} = \frac{-3}{5} = \boxed{-\frac{3}{5}}$$

17. Given that the standard form of a quadratic equation is $ax^2 + bx + c = 0$, use the method of completing the square to prove the quadratic formula works.