

1. Write the Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Simplify each radical. Remember, square roots have both + and - values.

2. $\sqrt{75}$

$$\sqrt{25} \cdot \sqrt{3}$$

$$\pm 5\sqrt{3}$$

3. $\sqrt{144}$

$$\sqrt{12 \cdot 12}$$

$$\pm 12$$

4. $\sqrt{108}$

$$\sqrt{36} \cdot \sqrt{3}$$

$$\pm 6\sqrt{3}$$

5. $\sqrt{80}$

Create a factor tree

```

    80
   /  \
  2    40
     /  \
    2    20
       /  \
      2    10
         /  \
        2    5
    
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← stays under the $\sqrt{\quad}$

$$\pm 4\sqrt{5}$$

Determine the number of solutions for each quadratic equation using the discriminant. Then, use the Quadratic Formula to find the solutions.

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

$a = 1, b = -4, c = 4$

$$b^2 - 4ac$$

$$(-4)^2 - 4(1)(4)$$

$$16 - 16 = 0$$

1 solution

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{4 \pm \sqrt{0}}{2(1)}$$

$$x = \frac{4}{2} = 2$$

$$\boxed{x = 2}$$

7. $2x^2 + 10x - 9 = 0$

$a = 2, b = 10, c = -9$

$$b^2 - 4ac$$

$$10^2 - 4(2)(-9)$$

$$100 + 72 = 172$$

2 solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-10 \pm \sqrt{172}}{2(2)}$$

$$x = \frac{-10 \pm 2\sqrt{43}}{4}$$

Divide by 2.

$$x = \frac{-5 \pm \sqrt{43}}{2}$$

$$x = \frac{-5 + \sqrt{43}}{2}, x = \frac{-5 - \sqrt{43}}{2}$$

8. $3x^2 + 2x + 15 = 0$

$a = 3, b = 2, c = 15$

$$b^2 - 4ac$$

$$2^2 - 4(3)(15)$$

$$4 - 180$$

$$-176$$

no real solution

stop!

Solve each quadratic equation by Completing the Square.

$$9. \quad x^2 - 6x - 39 = 0$$

$$x^2 - 6x \quad = 39$$

$$\left(\frac{-6}{2}\right)^2 = (-3)^2 = 9$$

$$x^2 - 6x + 9 = 39 + 9$$

$$(x-3)^2 = 48$$

$$\sqrt{(x-3)^2} = \pm\sqrt{48}$$

$$\begin{array}{r} x-3 = \pm 4\sqrt{3} \\ +3 \quad +3 \end{array}$$

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

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

$$10. \quad x^2 - 2x - 63 = 0$$

$$x^2 - 2x \quad = 63$$

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

$$x^2 - 2x + 1 = 63 + 1$$

$$(x-1)^2 = 64$$

$$\sqrt{(x-1)^2} = \pm\sqrt{64}$$

$$\begin{array}{r} x-1 = \pm 8 \\ +1 \quad +1 \end{array}$$

$$x = 1 \pm 8$$

$$x = 1 + 8 = 9$$

$$\boxed{x=9}$$

$$x = 1 - 8 = -7$$

$$\boxed{x=-7}$$

$$11. \quad x^2 + 22x + 85 = 0$$

$$x^2 + 22x \quad = -85$$

$$\left(\frac{22}{2}\right)^2 = 11^2 = 121$$

$$x^2 + 22x + 121 = -85 + 121$$

$$(x+11)^2 = 36$$

$$\sqrt{(x+11)^2} = \pm\sqrt{36}$$

$$\begin{array}{r} x+11 = \pm 6 \\ -11 \quad -11 \end{array}$$

$$x = -11 \pm 6$$

$$x = -11 + 6 = -5$$

$$\boxed{x=-5}$$

$$x = -11 - 6 = -17$$

$$\boxed{x=-17}$$

Solve each quadratic equation using the Quadratic Formula.

$$12. \quad 4x^2 - 5x - 84 = 0$$

$$a=4, \quad b=-5, \quad c=-84$$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(4)(-84)}}{2(4)}$$

$$x = \frac{5 \pm \sqrt{25 + 1344}}{8}$$

$$x = \frac{5 \pm \sqrt{1369}}{8}$$

$$x = \frac{5 \pm 37}{8}$$

$$x = \frac{5+37}{8} = \frac{42}{8} = \frac{21}{4} \text{ or } 5.25$$

$$x = \frac{5-37}{8} = \frac{-32}{8} = -4$$

$$13. \quad 2x^2 + 4x - 7 = 0$$

$$a=2, \quad b=4, \quad c=-7$$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-7)}}{2(2)}$$

$$x = \frac{-4 \pm \sqrt{16 + 56}}{4}$$

$$x = \frac{-4 \pm \sqrt{72}}{4}$$

$$x = \frac{-4 \pm 6\sqrt{2}}{4}$$

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

$$x = \frac{-2 + 3\sqrt{2}}{2}, \quad x = \frac{-2 - 3\sqrt{2}}{2}$$