

12-5 Methods of Solution

Objective: To choose the best method for solving a quadratic equation.

Methods for Solving a Quadratic Equation	When to Use the Method
1. Using the quadratic formula	1. If an equation is in the form $ax^2 + bx + c = 0$, especially if you use a calculator.
2. Factoring	2. If an equation is in the form $ax^2 + bx = 0$, or if the factors are easily seen.
3. Using the property of square roots of equal numbers	3. If an equation is in the form $ax^2 + c = 0$.
4. Completing the square	4. If an equation is in the form $x^2 + bx + c = 0$ and b is an even number.

Example Solve each quadratic equation using the most appropriate method.

a. $6x^2 - 54 = 0$ b. $2x^2 - 7x + 5 = 0$

c. $2t^2 - 28t = 0$ d. $n^2 + 6n - 16 = 0$

Solution a. $6x^2 - 54 = 0$ The equation has the form $ax^2 + c = 0$.
 $6x^2 = 54$ Therefore, use the property of square roots of equal numbers.
 $x^2 = 9$
 $x = \pm 3$

The solution set is $\{-3, 3\}$.

b. $2x^2 - 7x + 5 = 0$ The equation has the form $ax^2 + bx + c = 0$.

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(5)}}{2(2)} \quad \text{Therefore, use the quadratic formula.}$$

$$= \frac{7 \pm \sqrt{49 - 40}}{4}$$

$$= \frac{7 \pm \sqrt{9}}{4}$$

$$= \frac{7 \pm 3}{4}$$

$$x = \frac{7 + 3}{4} = \frac{10}{4} \quad \text{or} \quad x = \frac{7 - 3}{4} = \frac{4}{4}$$

The solution set is $\left\{\frac{5}{2}, 1\right\}$.

c. $2t^2 - 28t = 0$ The equation has the form $ax^2 + bx = 0$.
 $2t(t - 14) = 0$ Therefore, factor.
 $2t = 0$ or $t - 14 = 0$
 $t = 0$ or $t = 14$

The solution set is $\{0, 14\}$.

12-5 Methods of Solution (continued)

d. $n^2 + 6n - 16 = 0$

$n^2 + 6n = 16$

$n^2 + 6n + 9 = 16 + 9$

$(n + 3)^2 = 25$

$n + 3 = \pm\sqrt{25}$

$n = -3 \pm 5$

The solution set is $\{-8, 2\}$.The equation has the form $x^2 + bx + c = 0$.

Therefore, complete the square.

Solve each quadratic equation using the most appropriate method.**Write irrational answers in simplest radical form. You may wish to use a calculator.**

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

2. $x^2 - 2x = 24$

3. $6x^2 = 96$

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

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

6. $2x^2 + x = 10$

7. $x^2 + 5x = 6$

8. $2x^2 - 7x + 3 = 0$

9. $4x^2 - 36x = 0$

10. $(x - 2)^2 = 9$

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

12. $4x^2 + 4x - 3 = 0$

13. $x^2 - 4x = 12$

14. $x^2 - 11x + 24 = 0$

15. $x^2 + 3x = 18$

16. $x^2 - 2x = 1$

17. $m^2 - 2m = 35$

18. $2x^2 - 8x + 8 = 0$

19. $2x^2 + 5x = -2$

20. $3x^2 - 7x = 6$

21. $4x^2 + 4x - 15 = 0$

22. $6y^2 - 13y - 8 = 0$

23. $5n^2 + 14n - 3 = 0$

24. $2x^2 + 3x = 27$

25. $2x^2 - 9x + 7 = 0$

26. $\frac{1}{x} = \frac{2x - 5}{3}$

27. $\frac{x - 1}{2x + 1} = \frac{x + 1}{3x - 1}$

Mixed Review Exercises**Evaluate if $x = 1$, $y = 3$, and $z = -4$. Write irrational expressions in simplest radical form.**

1. $\pm\sqrt{y^2 - 4xz}$

2. $-\sqrt{y^2 + 4x}$

3. $\sqrt{z^2 - 4xy}$

4. $\sqrt{z^2 + 4xy}$

5. $\pm\sqrt{x^2 - 4yz}$

6. $\sqrt{x^2 + 4yz}$

Solve. Write irrational roots in simplest radical form.

7. $4x^2 + 4x - 15 = 0$

8. $2d^2 - 3d - 77 = 0$

9. $2(x + 1)(x + 3) = (2x + 1)(x + 5) - 2$

10. $c^2 - 3c - 1 = 0$

11. $3p^2 + 4p + 1 = 0$

12. $8y^2 + 14y = -3$