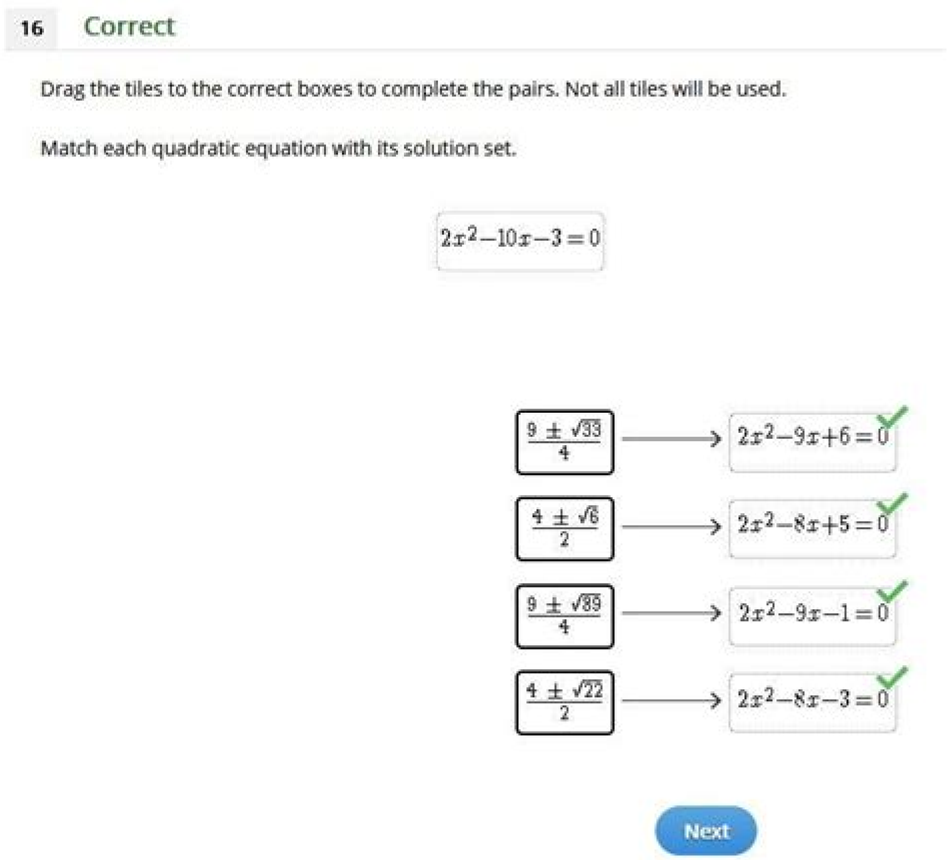
Match Each Quadratic Equation With Its Solution Set



Match each quadratic equation with its solution set is an essential exercise in algebra that helps students understand the relationship between quadratic equations and their corresponding roots. Quadratic equations, which take the standard form \(ax^2 + bx + c = 0 \), can possess up to two solutions, depending on the discriminant \(D \) calculated as \(D = b^2 - 4ac \). In this article, we will explore various quadratic equations, determine their solution sets, and provide insights into how these solutions are derived.

Understanding Quadratic Equations

Quadratic equations are polynomial equations of degree two. They can be solved using several methods, including:

1. Factoring: Expressing the quadratic as a product of its linear factors.
2. Completing the square: Rewriting the equation in a perfect square form.
3. Quadratic Formula: Using the formula \(x = \frac{-b \pm \sqrt{D}}{2a} \) to find the roots.

The nature of the roots is determined by the value of the discriminant \(D \):

- If \(D > 0 \): Two distinct real roots.

- If $D = 0$: One real root (or a repeated root).
- If $D < 0$: No real roots (the roots are complex).

Matching Quadratic Equations with Their Solution Sets

To effectively match quadratic equations with their respective solution sets, we will analyze a list of quadratic equations and solve them step-by-step.

Examples of Quadratic Equations

Below are several quadratic equations with their corresponding solution sets:

1. **Equation 1:** $x^2 - 5x + 6 = 0$
   - Factoring: $(x - 2)(x - 3) = 0$
   - Roots: $x = 2, 3$
   - Solution Set: $\{2, 3\}$

2. **Equation 2:** $x^2 + 4x + 4 = 0$
   - Factoring: $(x + 2)^2 = 0$
   - Root: $x = -2$ (repeated root)
   - Solution Set: $\{-2\}$

3. **Equation 3:** $x^2 + 2x + 5 = 0$
   - Discriminant: $D = 2^2 - 4 \cdot 1 \cdot 5 = 4 - 20 = -16$
   - No real roots; complex roots are: $x = -1 \pm 2i$
   - Solution Set: $\{-1 + 2i, -1 - 2i\}$

4.

Equation 4: \(2x^2 - 8x + 6 = 0 \)

- Factoring: \(2(x^2 - 4x + 3) = 0 \) leads to \((x - 1)(x - 3) = 0 \)
- Roots: \(x = 1, 3 \)
- Solution Set: \(\{1, 3\} \)

5. **Equation 5:** \(x^2 - 4 = 0 \)

   - Factoring: \((x - 2)(x + 2) = 0 \)
   - Roots: \(x = 2, -2 \)
   - Solution Set: \(\{2, -2\} \)

Analyzing the Solution Sets

The solution sets derived from the equations above can be categorized based on the nature of the roots:

1. Distinct Real Roots

Quadratic equations producing two distinct real roots include:

- Equation 1: \(x^2 - 5x + 6 = 0 \) with solution set \(\{2, 3\} \).
- Equation 4: \(2x^2 - 8x + 6 = 0 \) with solution set \(\{1, 3\} \).
- Equation 5: \(x^2 - 4 = 0 \) with solution set \(\{2, -2\} \).

2. Repeated Real Roots

The equation with a repeated real root is:

- Equation 2: \(x^2 + 4x + 4 = 0 \) with solution set \(\{-2\} \).

3. Complex Roots

The only equation yielding complex roots is:

- Equation 3: $x^2 + 2x + 5 = 0$ with solution set $\{-1 + 2i, -1 - 2i\}$.

Conclusion

In conclusion, matching each quadratic equation with its solution set is a fundamental skill in algebra that promotes a deeper understanding of polynomial behavior. By analyzing the discriminant and employing various methods for finding roots, students can confidently identify the nature of solutions for a variety of quadratic equations.

The importance of understanding these relationships extends beyond academic exercises; it forms the basis for solving real-world problems involving projectile motion, optimization, and other applications in science and engineering. As students practice these concepts, they will develop a robust toolkit for approaching quadratic equations in their future studies.

Frequently Asked Questions

What is the solution set for the quadratic equation $x^2 - 5x + 6 = 0$?

{2, 3}

How do you find the solution set for the quadratic equation $x^2 + 4x + 4 = 0$?

{-2}

Identify the solution set for the quadratic equation $x^2 - 9 = 0$.

{3, -3}

What are the roots of the quadratic equation $x^2 + 2x + 1 = 0$?

{-1}

Determine the solution set for the quadratic equation $2x^2 - 8x = 0$.

{0, 4}

What is the solution set for the quadratic equation x^2 + 5x +

6 = 0?

{-2, -3}

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This MATLAB function returns 1 (true) if str contains the specified pattern, and returns 0 (false) otherwise.

strcmp - Compare strings - MATLAB - MathWorks
This MATLAB function compares s1 and s2 and returns 1 (true) if the two are identical and 0 (false) otherwise.

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