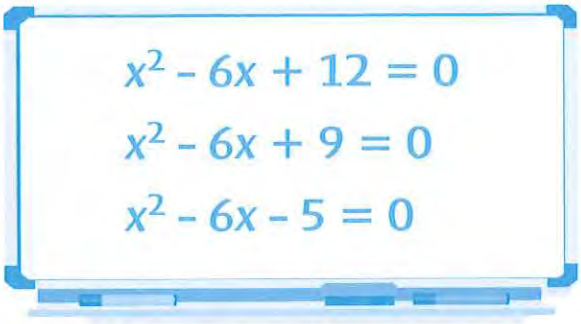
Activity

9-6 The Quadratic Formula and the Discriminant

PearsonRealize.com

EXPLORE & REASON

Three quadratic equations are shown on the whiteboard.



A. How many real solutions are there for each of the quadratic equations shown? Explain your answer.

B. **Use Appropriate Tools** Use your graphing calculator to graph the related function for each equation. What are the function equations for each graph's reflection over the *x*-axis? Explain how you found the function equations. © MP.5

C. What do you notice about the graphs that have zero *x*-intercepts? One *x*-intercept? Two *x*-intercepts?

HABITS OF MIND

Reason How can the number of solutions to a quadratic equation be determined by inspecting its graph? © MP.2

Notes

Assess

EXAMPLE 1 **Try It! Derive the Quadratic Formula**

1. What is the maximum number of solutions the quadratic formula can give? Explain

EXAMPLE 2 **Try It! Use the Quadratic Formula**

2. Find the solutions of each equation using the quadratic formula.

   a. $21 - 4x = x^2$

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

HABITS OF MIND

Look for Relationships Using the quadratic formula, how can you tell when a quadratic equation has only one solution? MP.7

EXAMPLE 3 **Try It! Find Approximate Solutions**

3. The height of another frog over time is modeled by the function $y = -16t^2 + 10t + 0.3$. How many seconds is this frog in the air before landing on the ground? Round your answer to the nearest hundredth.

EXAMPLE 4 **Try It! Understand and Use the Discriminant**

4. Use the discriminant to find the number of roots of each equation.

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

   b. $-x^2 - 6x - 10 = 0$

HABITS OF MIND

Reason If the equation $4x^2 - bx + 9 = 0$ has only 1 solution, what is the value of b? MP.2

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** When should you use the quadratic formula to solve equations?

2. **Reason** What value of b^2 is needed for there to be exactly one real solution of a quadratic equation? Explain. **MP.2**

3. **Vocabulary** How are the *roots* of a quadratic equation related to its *discriminant*?

4. **Error Analysis** A student says that the quadratic formula cannot be used to solve $-23x^2 + 5 = 0$. Explain the error the student made. **MP.3**

5. **Reason** When is completing the square better than using the quadratic formula? **MP.2**

Do You KNOW HOW?

Identify *a*, *b*, and *c* in each of the quadratic equations.

6. $4x^2 + 2x - 1 = 0$

7. $-x^2 + 31x + 7 = 0$

8. $2x^2 - 10x - 3 = 0$

9. $x^2 + x - 1 = 0$

Given the discriminant of a quadratic equation, determine the number of real solutions.

10. 8

11. −3

12. 0

13. 1