5-6 The Quadratic Formula

A quadratic equation may have two real solutions, one real solution, or two nonreal complex solutions. For a quadratic equation of the form $ax^2 + bx + c = 0$, you can use the values of a, b, and c to determine the type and number of solutions.

1. Complete the table. Use any method to solve each quadratic equation, and then use its values of a, b, and c to evaluate the expression $b^2 - 4ac$.

Equation	Solutions	Value of $b^2 - 4ac$
$x^2 + 5x + 6 = 0$		
$x^2 + 2x + 1 = 0$		
$x^2 + 4 = 0$		
$x^2 - 6x + 9 = 0$		
$x^2 + 10 = 0$		
$x^2 + 3x - 4 = 0$		

2. Based on the table, what type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is 0?

3. What type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is less than 0?

4. What type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is greater than 0?

THINK AND DISCUSS

5. **Describe** how you can determine the type and number of solutions of $x^2 + 4x - 30 = 0$ without solving the equation.

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1. Complete the table. Use any method to solve each quadratic equation, and then use its values of a, b, and c to evaluate the expression $b^2 - 4ac$.

Equation	Solutions	Value of $b^2 - 4ac$
$x^2 + 5x + 6 = 0$	$-3, -2$	1
$x^2 + 2x + 1 = 0$	-1	0
$x^2 + 4 = 0$	$\pm 2i$	-16
$x^2 - 6x + 9 = 0$	3	0
$x^2 + 10 = 0$	$\pm i\sqrt{10}$	-40
$x^2 + 3x - 4 = 0$	$-4, 1$	25

2. Based on the table, what type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is 0?

3. What type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is less than 0?

4. What type and number of solutions does a quadratic equation have if the value of $b^2 - 4ac$ is greater than 0? **2 real solutions**

THINK AND DISCUSS

5. **Describe** how you can determine the type and number of solutions of $x^2 + 4x - 30 = 0$ without solving the equation.

2. **1 real solution**

3. **2 nonreal complex solutions**

5. **Find the value of $b^2 - 4ac$. For the equation $x^2 + 4x - 30 = 0$, this value is 136. Because the value of $b^2 - 4ac$ is greater than 0, the equation has 2 real solutions.**

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