

To factor the quadratic trinomial  $x^2 + 6x + 9$ , we look for a specific algebraic pattern. This expression fits the form of a **Perfect Square Trinomial**, which follows the algebraic identity:

$$a^2 + 2ab + b^2 = (a + b)^2$$

Let's break down the given expression step-by-step to see how it matches this identity:

1. **Identify the first term ( $a^2$ ):** The first term is  $x^2$ , which means our  $a$  value is  $x$ .
2. **Identify the constant term ( $b^2$ ):** The last term is 9. Since 9 is a perfect square ( $3 \cdot 3 = 3^2$ ), our  $b$  value is 3.
3. **Verify the middle term ( $2ab$ ):** According to the pattern, the middle term must be equal to two times the product of  $a$  and  $b$ . Multiplying them together gives:  $2 \cdot (x) \cdot (3) = 6x$ . This matches the middle term of our expression exactly.

Since all conditions of the identity are satisfied, we can smoothly rewrite the trinomial into its factored binomial square form:  $(x + 3)^2$ .

#### **CALCULATOR TIPS:**

Because a factored expression is mathematically identical to the original equation, they will yield the exact same output for any number you substitute into  $x$ .

1. Type the original expression into your calculation screen:  $X^2 + 6X + 9$ .
2. Press the **CALC** button. The screen will prompt you for a value for  $x$ . Type a simple, random integer like 5 and press =.
3. Note the result:  $5^2 + 6(5) + 9 = 64$ .
4. Now, test the multiple-choice options by plugging in that same value. For option (a), type  $(X + 3)^2$ , hit **CALC**, enter 5, and press =. It immediately outputs **64**. None of the other options will yield 64, allowing you to confidently pick (a).