We can change a perfect square trinomial into the square of a binomial

Example 1

$x^2 + 10x + 25$

$(x + 5)(x + 5)$

$\boldsymbol{(x + 5)^2}$

Example 2

$x^2 - 18x + 81$

$(x - 9)(x - 9)$

$\boldsymbol{(x - 9)^2}$

Let's create some perfect square trinomials. We'll use the middle term to find the missing third term. This process is called **completing the square**.

Example 3

$$x^2 + 16x + \blacksquare$$

Step 1- Find the coefficient of the middle term

The middle term is $16x$, so the coefficient is 16.

Step 2- Divide that number by 2

$16 \div 2 = 8$

Step 3- Square that number and make the result the third term (in for the ■). We made a perfect square trinomial!

$(8)^2 = 64$, so we will change the ■ to 64.

$$x^2 + 16x + \blacksquare \longrightarrow x^2 + 16x + 64$$

Step 4- Change the perfect square trinomial into the square of a binomial

$x^2 + 16x + 64$

$(x + 8)(x + 8)$

$$\boxed{\boldsymbol{(x + 8)^2}}$$

Do you notice that the second number of the binomial square is the same as the number we obtained in Step 2?

Example 4

$$x^2 - 11x + \blacksquare$$

Step 1- Find the coefficient of the middle term

The middle term is $11x$, so the coefficient is -11.

Step 2- Divide that number by 2

$-11 \div 2 = -\frac{11}{2}$

Step 3- Square that number and make the result the third term (in for the ■). We made a perfect square trinomial!

$\left(-\frac{11}{2}\right)^2 = \frac{121}{4}$, so we will change the ■ to $\frac{121}{4}$.

$$x^2 - 11x + \blacksquare \longrightarrow x^2 - 11x + \frac{121}{4}$$

Step 4- Change the perfect square trinomial into the square of a binomial

$$x^2 - 11x + \frac{121}{4}$$

$$\left(x - \frac{11}{2}\right)\left(x - \frac{11}{2}\right)$$

$$\boxed{\left(x - \frac{11}{2}\right)^2}$$

Do you notice that the second number of the binomial square is the same as the number we obtained in Step 2?