

## Completing the Square

Solving a Quadratic Equation by Completing the Square

0. Check to see if the left side is a PST already. If so, skip to step 4.
1. Write equation in the form  $ax^2 + bx = c$
2. Divide all terms by  $a$ .
3. Divide the new coefficient of  $x$  by 2 then square it.  
Add this number to both sides of the equation.
4. Write the left-hand side as a PST. Simplify the right-hand side.
5. Take square roots of both sides.
6. Isolate the  $x$ .

$$x^2 + 20x + 100 = 81$$

$$(x + 10)^2 = 81$$

$$\sqrt{(x + 10)^2} = \sqrt{81}$$

$$x + 10 = \pm 9$$

$$\begin{array}{cc} -10 & -10 \end{array}$$

$$x = -10 \pm 9 \begin{cases} -10 + 9 = -1 \\ -10 - 9 = -19 \end{cases}$$

$$x^2 - 10x + 1 = 0$$

$$x^2 - 10x = -1$$

$$x^2 - 10x + 25 = -1 + 25$$

$$(x - 5)^2 = 24$$

$$\sqrt{(x - 5)^2} = \sqrt{24}$$

$$x - 5 = \pm \sqrt{24}$$

$$\begin{array}{cc} +5 & +5 \end{array}$$

$$x = 5 \pm \sqrt{24}$$

$$x = 5 \pm \sqrt{4} \sqrt{6}$$

$$x = 5 \pm 2\sqrt{6}$$

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$$\frac{10}{2} = 5$$

$$5^2 = 25$$