1.7 Complete the Square

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Completing the Square is when you add an expression to x^2+bx to make it a Perfect Square trinomial.

To complete the square for the expression x^2+bx add $\left(\frac{b}{2}\right)^2$

Solve a quadratic equation by finding square root

$x^2 - 8x + 16 = 25$	Write as square of binomial
$(x - 4)^2 = 25$	Square root
$x - 4 = \pm 5$	Add 4
$x = 9$ $x = -1$	

Making a Perfect Square Trinomial

X²+16x+c	Complete the square $\left(\frac{16}{2}\right)^2 = (8)^2 = 64$ c=64
$x^2 + 16x + 64$	Write as square of binomial
$(x + 8)^2$	

Solve ax²+bx+c=0 when a=1

$x^2 - 12x + 4 = 0$	Get x²+bx alone
$x^2 - 12x = -4$	Complete the square $\left(\frac{-12}{2}\right)^2 = (-6)^2 = 36$
$x^2 - 12x + 36 = -4 + 36$	Write as square of binomial
$(x - 6)^2 = 32$	Square root
$x - 6 = \pm\sqrt{32}$	Simplify the radical
$x - 6 = \pm 4\sqrt{2}$	Add 6
$x = 6 \pm 4\sqrt{2}$	

Solve ax²+bx+c=0 when a≠1

$2x^2 + 8x + 14 = 0$	Divide by each side by lead coefficient
$x^2 + 4x + 7 = 0$	Get x²+bx alone
$x^2 + 4x = -7$	Complete the square $\left(\frac{4}{2}\right)^2 = (2)^2 = 4$
$x^2 + 4x + 4 = -7 + 4$	Write square of binomial
$(x + 2)^2 = -3$	Square root
$x + 2 = \pm\sqrt{-3}$	Simplify radical
$x + 2 = \pm i\sqrt{3}$	Subtract 2
$x = -2 \pm i\sqrt{3}$	

Write a quadratic function in Vertex Form and Identify the Vertex and minimum/maximum

$y = x^2 - 10x + 22$	Prepare to complete the square
$y + \_\_\_ = (x^2 - 10x + \_\_\_) + 22$	Complete the square
$y + 25 = (x^2 - 10 + 25) + 22$	Write as the square of a binomial
$y + 25 = (x - 5)^2 + 22$	Get the y alone
$y = (x - 5)^2 - 3$	Identify the vertex and min/max $(5, -3) minimum - 3$