

10-4b Solving Quadratic Equations by Completing the Square

	Example 1: $x^2 + 16x + 15 = 0$	Example 2: $3x^2 - 12x = 36$
Step 1: Write the equation in the form $x^2 + bx = c$ (*a MUST be 1)	$x^2 + 16x = -15$ <small>-15 -15</small>	$x^2 - 4x = 12$ <small>3 3 3</small>
Step 2: Find $(\frac{b}{2})^2$	$(\frac{16}{2})^2 = (8)^2 = 64$	$(\frac{-4}{2})^2 = (-2)^2 = 4$
Step 3: Complete the square by adding the value found in the previous step $(\frac{b}{2})^2$ to BOTH sides of the equation.	$x^2 + 16x + 64 = -15 + 64$ $x^2 + 16x + 64 = 49$	$x^2 - 4x + 4 = 12 + 4$ $x^2 - 4x + 4 = 16$
Step 4: Factor the perfect square trinomial.	$x^2 + 16x + 64 = 49$ $(x+8)^2 = 49$	$x^2 - 4x + 4 = 16$ $(x-2)^2 = 16$
Step 5: Take the square root of both sides.	$\sqrt{(x+8)^2} = \sqrt{49}$ $x+8 = \pm 7$	$\sqrt{(x-2)^2} = \sqrt{16}$ $x-2 = \pm 4$
Step 6: Write two equations, using both the positive and negative square root, and solve each equation.	$x+8=7$ $x+8=-7$ <small>-8 -8 -8 -8</small> $x=-1$ $x=-15$	$x-2=4$ $x-2=-4$ <small>+2 +2 +2 +2</small> $x=6$ $x=-2$
Step 7: Check BOTH answers	$x^2 + 16x + 15 = 0$ $(-1)^2 + 16(-1) + 15 = 0$ $(-15)^2 + 16(-15) + 15 = 0$ $1 - 16 + 15 = 0$ $225 - 240 + 15 = 0$ $-15 + 15 = 0 \checkmark$ $-15 + 15 = 0$ $0 = 0 \checkmark$ $0 = 0 \checkmark$	$3x^2 - 12x = 36$ $3(6)^2 - 12(6) = 36$ $3(36) - 12(6) = 36$ $108 - 72 = 36$ $36 = 36$ $3(-2)^2 - 12(-2) = 36$ $3(4) - 12(-2) = 36$ $12 + 24 = 36$ $36 = 36 \checkmark$