NOTES: Completing the Square Date: 1-29-18

There are multiple ways to solve a quadratic (x^2) function

METHOD 1: Solve by Factoring

- MAKE SURE x^2 IS POSITIVE AND EQUATION $= 0$

Example: $x^2 + 14x = -33$

$+33 \quad +33$

$x^2 + 14x + 33 = 0$

$(x+11)(x+3) = 0$

$x = -11 \quad x = -3$

METHOD 2: Solve by Taking Square Roots

- USE WHEN YOU HAVE x^2 AND (NO) x TERM

OR

- WHEN YOU HAVE A $(\ )^2$ ← PARENTHESIS SQUARED

Example: $\sqrt{(x+3)^2} = \sqrt{16}$

$x + 3 = \pm 4$

$-3 \quad -3$

$x = \pm 4 - 3$

OR

$x = 1 \quad x = -7$

Example: $x^2 - 12 = 0$

$+12 \quad +12$

$\sqrt{x^2} = \sqrt{12}$

$x = \pm 2\sqrt{3}$

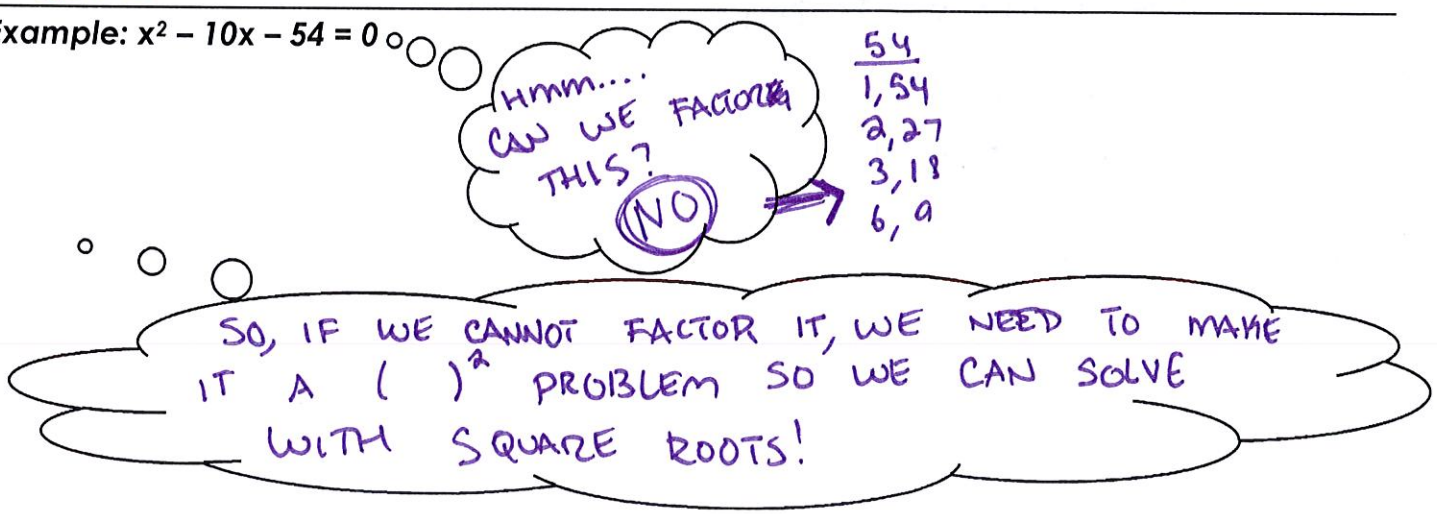
OR

$x \approx 3.46$

NEW: Method 3: Completing the Square

USED TO MAKE SOMETHING THAT (CANNOT) BE FACTORED INTO A $(\ )^2$ ← SQUARE EQUATION SO WE CAN SOLVE WITH SQUARE ROOTS

Example: $x^2 - 10x - 54 = 0$



METHOD 3: Completing the Square

Algebra	Steps/explanation
$x^2 - 10x - 54 = 0$	ORIGINAL EQUATION
$+54 \quad +54$	Keep the x^2 term and x term on one side, and move the constant to the right
$x^2 - 10x = 54$	
$x^2 - 10x + \left(\frac{-10}{2}\right)^2 = 54 + \left(\frac{-10}{2}\right)^2$	WE will ADD IN A SPECIAL SQUARE $\left(\frac{b}{2}\right)^2$ to BOTH SIDES
$x^2 - 10x + 25 = 54 + 25$	Simplify!
$x^2 - 10x + 25 = 79$	
$(x-5)^2 = 79$	FACTOR THE LEFT INTO A PERFECT SQUARE! ★ THIS METHOD ALWAYS CREATES A PERFECT FACTOR SQUARE!
$\sqrt{(x-5)^2} = \sqrt{79}$	NOW SOLVE USING SQUARE ROOTS!
$x - 5 = \pm\sqrt{79}$	
$x = \pm\sqrt{79} + 5$	
OR IN DECIMAL FORM	
$x \approx 13.9$	
$x \approx -3.9$	