Discovering Completing the Square

Review: Factor the following trinomials and solve for zeros.

a=1 x-method

1. $x^2 - 6x + 9 = 0$

9 (x) (x-3)(x-3) $(x-3)^2$

-3 -3

-6 (+)

$x-3=0$

$x=3$

a=1 x-method

2. $x^2 + 10x + 25 = 0$

25 (x) (x+5)(x+5) $(x+5)^2$

+5 +5

10 (+)

$x+5=0$

$-5\ -5$

$x=-5$

a=1 x-method

3. $x^2 + 10x - 6 = 0$

-6 (x)

10 (+)

not factorable

-6 | 10

$-1+6=5$

$2\ 3 \neq 1$

How can we solve for the zeros of a trinomial that is "non factorable"? One method, is by completing the square

Solving by Completing the Square

Non Factorable Methods		
Completing the Square	**Finding Square Roots**	**Quadratic Formula**
$ax^2 + bx + c = 0$, when $a = 1$ and b is an even #	$ax^2 - c = 0$ Parenthesis in equation	$ax^2 + bx + c = 0$ Any equation in standard form Large coefficients
Examples $x^2 - 6x + 11 = 0$ $x^2 - 2x - 20 = 0$	**Examples** $2x^2 + 5 = 9$ $5(x + 3)^2 - 5 = 20$ $x^2 - 36 = 0$	**Examples** $3x^2 + 9x - 1 = 0$ $20x^2 + 36x - 17 = 0$

You can use the Completing the Square when factoring any trinomial, but the most common time we use this method is when our trinomial is not factorable. Below is a guided example, along with a video tutorial, on how to solve by completing the square.

Basic

Video Link: goo.gl/hiGFt1

$x^2 + 10x - 6 = 0$

$x^2 + 10x - 6 = 0$

$+6 \quad +6$

Move constant to the other side

$x^2 + 10x = 6$

½ of 10 → 5 → 25 ← Square 5

$x^2 + 10x + 25 = 6 + 25$

Add 25 to both sides

$x^2 + 10x + 25 = 31$ *Easily Factors*

$(x+5)(x+5) = 31$ *Can be re-written*

$(x+5)^2 = 31$ *Take the square root of both sides*

$\sqrt{(x+5)^2} = \sqrt{31}$ Don't forget ± .

$x + 5 = \pm\sqrt{31}$ Isolate x

$-5 \quad -5$

$x = -5 \pm \sqrt{31}$ *OR* $x \approx 0.5678$ *or* -10.5678

Solve the following by completing the square.

1. $x^2+10x-19=0$

$+19 \quad +19$

$x^2+10x+25=19+25$

$\div 2 \quad 5^2 \rightarrow 25$

$x^2+10x+25=44$

$(x+5)(x+5)=44$

$\sqrt{(x+5)^2}=\sqrt{44}$

$x+5=\pm 2\sqrt{11}$

$-5 \quad -5$

$x=-5\pm 2\sqrt{11}$

$\sqrt{44}$

$\sqrt{4}\ \sqrt{11}$

$2\sqrt{11}$

2. $x^2-12x+2=0$

$-2 \quad -2$

$x^2-12x+36=-2+36$

$\div 2 \quad 6^2 \rightarrow 36$

$x^2-12x+36=34$

$(x-6)(x-6)=34$

$\sqrt{(x-6)^2}=\sqrt{34}$

$x-6=\pm\sqrt{34}$

$+6 \quad +6$

$x=6\pm\sqrt{34}$

3. $x^2+12x-8=0$

$+8 \quad +8$

$x^2+12x+36=8+36$

$\div 2 \quad 6^2 \rightarrow 36$

$x^2+12x+36=44$

$(x+6)(x+6)=44$

$\sqrt{(x+6)^2}=\sqrt{44}$

$x+6=\pm 2\sqrt{11}$

$-6 \quad -6$

$x=-6\pm 2\sqrt{11}$

4. $x^2-5x-4=0$

5. $2x^2-8x-14=0$

6. $3x^2-18x-5=0$