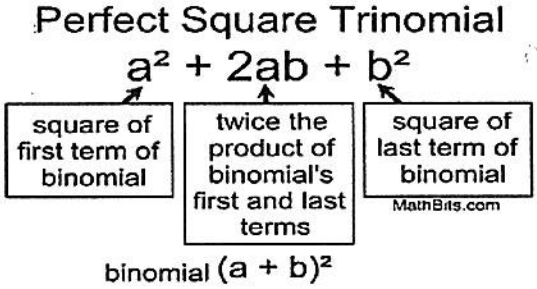
Essential Question: How do we solve quadratic equations by completing the square?

Do Now:

a) Simplify $(x - 5)(x - 5)$ $x^2 - 10x + 25$

b) Factor $x^2 + 8x + 16$ $(x+4)(x+4)$

The polynomial expressions in the Do Now are Perfect Square Trinomials:



Find the value of c that makes each quadratic trinomial a perfect square.

a) $x^2 + 6x$ ___+9___ $(6 \div 2)^2$ b) $x^2 - 2x$ ___+1___ $(-2 \div 1)^2$ c) $x^2 - 14x$ ___+49___ $(-14 \div 2)^2$

We can solve Quadratic Equations using a method called Completing The Square. It requires creating perfect square trinomials.

1. Be sure that the coefficient of the highest power is one. If it is not, divide each term by that value to create a leading coefficient of one.	$x^2 + 8x - 4 = 0$
2. Move the constant term to the right hand side.	$x^2 + 8x = 4$
3. Prepare to add the needed value to create the perfect square trinomial. Be sure to balance the equation. The boxes may help you remember to balance.	$x^2 + 8x + \square = 4 + \square$
4. To find the needed value for the perfect square trinomial, take half of the coefficient of the *middle term* (x-term), square it, and add that value to both sides of the equation. Take half and square ↓ $x^2 + 8x + \square = 4 + \square$	$x^2 + 8x + \boxed{16} = 4 + \boxed{16}$
5. Factor the perfect square trinomial.	$(x+4)^2 = 20$
6. Take the square root of each side and solve. Remember to consider both plus and minus results.	$x + 4 = \pm\sqrt{20}$ $x = -4 \pm \sqrt{20} = -4 \pm 2\sqrt{5}$ $x = -4 + 2\sqrt{5}$ $x = -4 - 2\sqrt{5}$

Solve each quadratic equation below by completing the square.

(1) $x^2 - 6x - 14 = 0$

$x^2 - 6x = 14$

$(-6 \div 2)^2$

$x^2 - 6x + 9 = 14 + 9$

$(x-3)^2 = 23$

$(x-3)^2$

$\sqrt{(x-3)^2} = \pm\sqrt{23}$

$x - 3 = \pm\sqrt{23}$

$x = 3 \pm \sqrt{23}$

$\{3+\sqrt{23}, 3-\sqrt{23}\}$

(2) $x^2 + 2x - 7 = 0$

$x^2 + 2x = 7$

$(2 \div 2)^2$

$x^2 + 2x + 1 = 7 + 1$

$(x+1)^2 = 8$

$\sqrt{(x+1)^2} = \pm\sqrt{8}$

$x + 1 = \pm\sqrt{8}$

$x = -1 \pm \sqrt{8}$

$x = -1 \pm \sqrt{4}\sqrt{2}$

$x = -1 \pm 2\sqrt{2}$

$\{-1+2\sqrt{2}, -1-2\sqrt{2}\}$

(3) $\frac{2x^2}{2} + \frac{16x}{2} = \frac{4}{2}$

$x^2 + 8x = 2$

$(8 \div 2)^2$

$x^2 + 8x + 16 = 2 + 16$

$(x+4)^2 = 18$

$\sqrt{(x+4)^2} = \pm\sqrt{18}$

$x + 4 = \pm\sqrt{9}\sqrt{2}$

$x + 4 = \pm 3\sqrt{2}$

$x = -4 \pm 3\sqrt{2}$

$\{-4+3\sqrt{2}, -4-\sqrt{2}\}$

(4) $\frac{-x^2}{-1} + \frac{8x}{-1} = \frac{-9}{-1}$

$x^2 - 8x = 9$

$x^2 - 8x + 16 = 9 + 16$

$(x-4)^2 = 25$

$\sqrt{(x-4)^2} = \pm\sqrt{25}$

$x - 4 = \pm 5$

$x = 4 \pm 5$

$\{9, -1\}$

There is another method we can use to solve a quadratic equation. It involves dividing b by two, squaring the result and adding that value to both sides of the equation. This is known as completing the square.