

# Bellwork: Algebra 1

1. Happy Thursday!!!
2. You need a calculator and your composition book.
3. Answer the following question on your THURSDAY Bellwork:

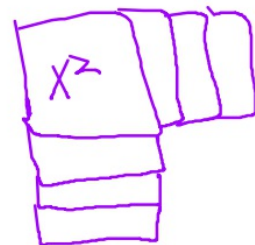
Determine what c term you need to complete the square

	X	3	
X	X <sup>2</sup>	3X	
3	3X	c	c=9

$$x^2+6x+c$$

$$x^2+6x+9$$

$$(x+3)(x+3) = (x+3)^2$$



$$\begin{aligned} 3^2 + 3^2 \\ 9 + 9 = 18 \\ 18 = 36 \end{aligned}$$

$$(x+4)(x+4)$$

<p><b>WARM-UP:</b> Perfect Square Trinomials</p>	<p>Factor the following trinomials.</p>	
	<p>① <math>x^2 + 8x + 16 = (x+4)^2</math></p> <p>② <math>x^2 + 2x + 1 = (x+1)^2</math></p>	<p>③ <math>x^2 - 18x + 81 = (x-9)^2</math></p> <p>④ <math>x^2 - 10x + 25 = (x-5)^2</math></p>
	<p>These are called <b>perfect square trinomials</b>. If you have a perfect square trinomial, you can solve the quadratic equation by square roots!</p>	
<p><b>EXAMPLES</b></p> <p><math>a =</math> <math>b =</math> <math>2ab =</math></p>	<p><b>Directions:</b> Factor the perfect square trinomial, then solve the equation by square roots. Remember a positive number always has two square roots, so you must solve for both cases.</p>	
	<p>1. <math>x^2 + 4x + 4 = 25</math></p> <p><math>\sqrt{(x+2)^2} = \sqrt{25} \leftarrow</math></p> <p><math>x+2 = 5</math>      <math>x+2 = -5</math>  <math>\quad -2 \quad -2</math>      <math>\quad -2 \quad -2</math>  <math>x = 3</math>              <math>x = -7</math></p> <p><math>x = \{-7, 3\}</math></p>	<p>2. <math>x^2 - 12x + 36 = 81</math></p>
	<p>3. <math>x^2 - 14x + 49 = 4</math></p>	<p>4. <math>x^2 + 6x + 9 = 1</math></p>

# COMPLETING THE SQUARE

(when  $a = 1$ )

When you do not have a perfect square trinomial, you can create one. This process is called **completing the square**. Follow the steps below to solve the equation by completing the square.

## Steps

## Example

- 1 Rewrite as  $x^2 + bx = c$
- 2 Take half of  $b$ , square it, then add this to both sides.
- 3 Factor the perfect square trinomial.
- 4 Take the square root of both sides and solve for both cases.

$$x^2 + 8x + 7 = 0$$

$$-7 \quad -7$$

$$(x^2 + 8x + 16) = -7 + 16$$

$$\sqrt{(x+4)^2} = \sqrt{9}$$

$$x+4 = 3 \quad x+4 = 5$$

**Directions:** Solve each equation by completing the square.

## YOU TRY!

5.  $x^2 - 12x + 27 = 0$

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

$$x = -1$$

$$x = \{-7, -1\}$$

$$ax^2 + bx = c$$

## IRRATIONAL SOLUTIONS

$$\sqrt{75}$$

$$\sqrt{25} \sqrt{3}$$

$$\pm 5\sqrt{3}$$

~~$$x+4 = \pm 5\sqrt{3}$$~~

**Directions:** Solve each equation by completing the square. Simplify all irrational solutions.

11.  $x^2 + 7x + 7 = 66 - x$   
 $\quad \quad \quad -7 \quad -7$

$$x^2 + 7x = 59 - x$$

$$\quad \quad \quad +x \quad \quad \quad +x$$

$$(x^2 + 8x + 16) = 59 + 16$$

$$\frac{8}{2} = 4^2$$

$$\sqrt{(x+4)^2} = \sqrt{75}$$

$$x+4 = 5\sqrt{3}$$

$$\quad -4 \quad -4$$

$$x = -4 + 5\sqrt{3}$$

$$x+4 = -5\sqrt{3}$$

$$\quad -4 \quad -4$$

$$x = -4 - 5\sqrt{3}$$

$$x = \{-4 \pm 5\sqrt{3}\}$$

12.  $x^2 - 2 = 6x - 3$

COMPLETING THE SQUARE (when $a > 1$ )	Steps		Example
		①	Rewrite as $ax^2 + bx = c$
	②	Divide the equation by $a$ .	$4x^2 + 8x = 5$
	③	Take half of $b$ , square it, then add this to both sides.	$4(x^2 + 2x + 1) =$
	④	Factor the perfect square trinomial.	$4(x+1)^2 = 9$
	⑤	Take the square root of both sides and solve for both cases.	$\sqrt{4(x+1)^2} = \sqrt{\frac{9}{4}}$
$4(x+1)(x+1)$	<b>Directions:</b> Solve each equation by completing the square.		
<b>YOU TRY!</b>	1. $2x^2 - 8x + 6 = 0$		2. $3x^2 - 18x - 48 = 0$
	$+ \frac{3}{2} - \frac{2}{2}$		$x+1 = -\frac{3}{2}$ $x+1 = +\frac{3}{2}$ $-1 - \frac{1}{2}$ $-1 - \frac{1}{2}$ $x = -\frac{5}{2}$ $x = \frac{1}{2}$ $x = \left\{ -\frac{5}{2}, \frac{1}{2} \right\}$
$\frac{3}{2} \times \frac{3}{2} = \frac{9}{4}$			

## IRRATIONAL SOLUTIONS

**Directions:** Solve each equation by completing the square. Simplify all irrational solutions.

9.  $3x^2 - 6x - 3 = 90$

10.  $5x^2 + 30x - 4 = 16$