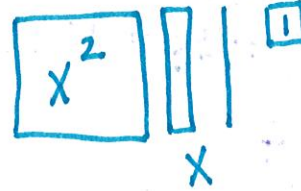


Name: _____ Date: _____

Completing the Square – Algebra Tiles

Factoring by Completing the Square

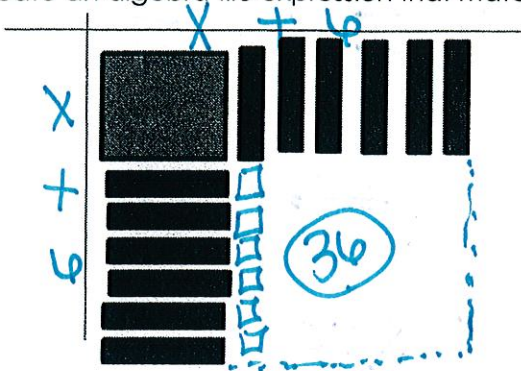
$$x^2 + 12x - 9 = 4$$



1. Rewrite so all terms containing x are on one side.

$$x^2 + 12x = 13$$

2. Create an algebra tile expression that matches the left side of the equation.



3. How many ones do I need to complete the square?

$$36 \rightarrow 6 * 6 = 36$$

4. How can we write the factors of $x^2 + 12x + 36$?

$$(x + 6)(x + 6)$$

OR

$$(x + 6)^2$$

5. So to show what we have done so far with our original equation:

$$x^2 + 12x = 13$$

$$x^2 + 12x + 36 = 13$$

$$(x + 6)^2 = 13$$

6. There is something wrong with this above equation. We failed to follow the Addition Property of Equality.

$$x^2 + 12x + 36 = 13$$

$$x^2 + 12x + 36 = \mathbf{13 + 36}$$

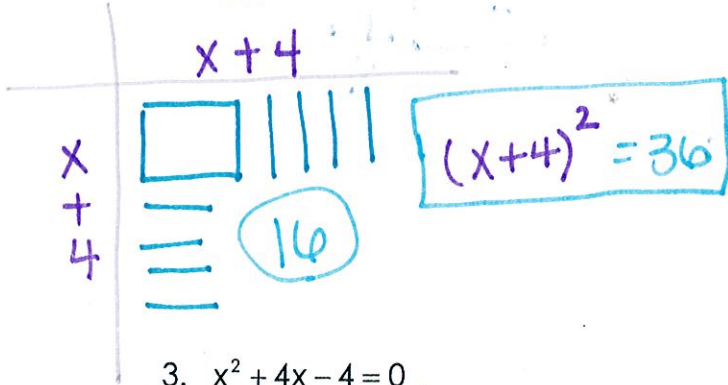
7. Thus our final answer should be.

$$(x + 6)^2 = 49$$

Completing the square using Algebra Tiles.

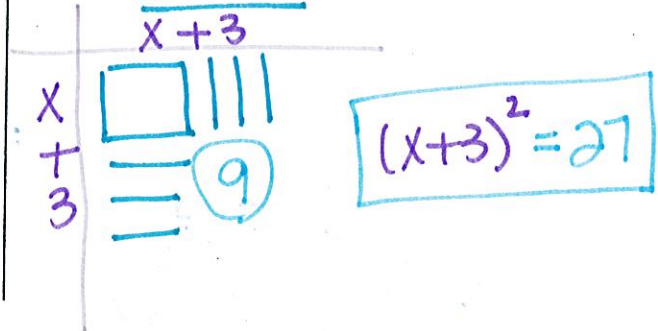
1. $x^2 + 8x - 20 = 0$

$+20 +20$
 $x^2 + 8x = 20 + 16$



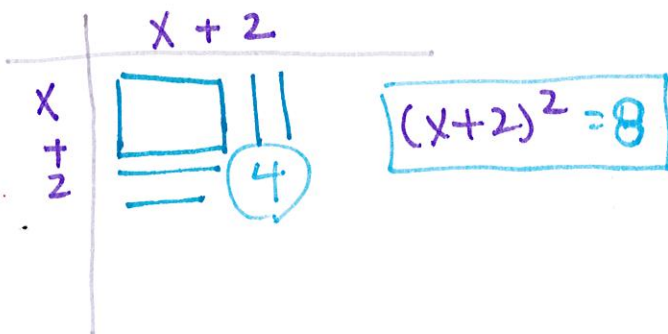
2. $x^2 + 6x - 18 = 0$

$+18 +18$
 $x^2 + 6x = 18 + 9$

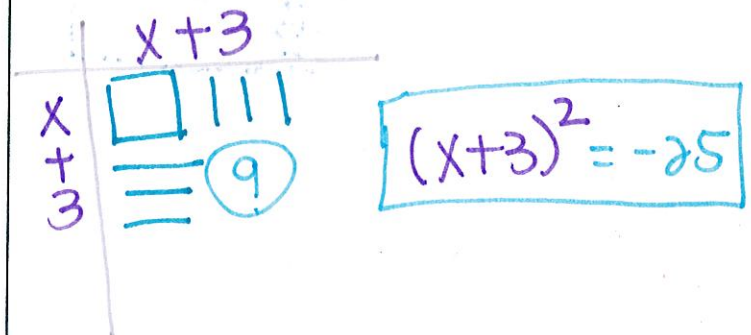


3. $x^2 + 4x - 4 = 0$

$+4 +4$
 $x^2 + 4x = 4 + 4$



4. $x^2 + 6x = -34 + 9$



Questions for thought:

Answer the Following.

1. What is the relationship between 8 in the original problem and 4 in the solution for #1?

4 is half of 8

2. What is the relationship between 4 in the original problem and adding 16 in the solution for #3?

#1 4^2 is 16

3. What do you notice we always do with the ones that complete the square?

Adding

4. Can you write 5 steps for completing the square without algebra tiles?

① Move the constant

② half of the middle (b term)

③ Need vertex template $(x \quad)^2$

④ Square Middle

⑤ Add it to other side

Day 7: Solving by Completing the Square

Solving by Completing the Square

Solve the following quadratic equation by completing the square.

$$x^2 + 8x - 20 = 0$$

Steps	Example
1) Gather x^2 and x term on the left side and all constants on the right side of the equals sign.	$x^2 + 8x = 20$
* 2) If a is not 1, divide all terms by a . (on both sides of the equals sign)	
3) Divide b by 2, and add that number to both the left and right sides of the equation.	$(x^2 + 8x) = 20 + 10$ $(x + 4)^2 = 30$
4) Rewrite the left side as a binomial squared. $(x + \frac{b}{2})^2$ and simplify the right side of the equation.	
5) Take the square root of each side of the equation.	$\sqrt{(x+4)^2} = \sqrt{30}$
6) Separate into two equations, one positive and one negative, and solve for x .	$x + 4 = 6$ $\quad -4 \quad -4$ $x = 2$ $x + 4 = -6$ $\quad -4 \quad -4$ $x = -10$

Practice: Solve by Completing the Square

1) $x^2 + 4x - 28 = -7$

$+28 \quad +28$

$$x^2 + 4x = 21 + 4$$

$$\sqrt{(x+2)^2} = \sqrt{25}$$

$x + 2 = 5$

$x = 3$

$x + 2 = -5$

$x = -7$

2) $3x^2 - 6x - 14 = -5$

$+14 \quad +14$

$$\frac{3x^2 - 6x = 9}{3}$$

$x = 3$

$x = -1$

$$x^2 - 2x = 3 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{4}$$

$x - 1 = 2$

$x = 1 \pm 2$

Completing the square classwork

Date _____ Period _____

Solve each equation by completing the square.

$$1) n^2 - 6n = 7 + 9$$

$$\sqrt{(n-3)^2} = \sqrt{16}$$

$$n-3 = 4 \quad \boxed{n=7}$$

$$n-3 = -4 \quad \boxed{n=-1}$$

$$2) x^2 - 10x - 21 = -10$$

$$3) 10r^2 + 20r - 27 = 3$$

$$+27 +27$$

$$\frac{10r^2 + 20r = 30}{10}$$

$$r^2 + 2r = 3 + 1$$

$$\sqrt{(r+1)^2} = \sqrt{4}$$

$$r+1 = 2$$

$$\boxed{r=1}$$

$$r+1 = -2$$

$$\boxed{r=-3}$$

$$4) 6n^2 + 12n - 39 = 9$$

$$5) n^2 + 8n + 4 = -3$$

$$-4 -4$$

$$n^2 + 8n = -7 + 16$$

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

$$n+4 = 3$$

$$n = -1$$

$$n+4 = -3$$

$$n = -7$$

$$6) 7n^2 + 14n - 54 = 2$$

$$+54 +54$$

$$\frac{7n^2 + 14n = 56}{7}$$

$$n^2 + 2n = 8 + 1$$

$$(n+1)^2 = 9$$

$$n+1 = 3$$

$$\boxed{n=2}$$

$$n+1 = -3$$

$$\boxed{n=-4}$$

$$7) k^2 - 16k - 11 = 6$$

$$8) n^2 - 6n - 48 = 7$$

$$9) r^2 - 10r - 53 = 3$$

$$10) 6x^2 - 12x - 25 = -7$$