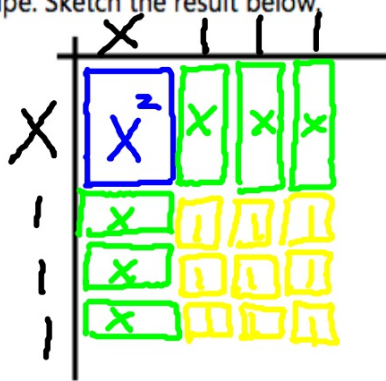


## Completing the Square

1) Consider the Quadratic Equation:  $y = x^2 + 6x + 9$ . It is in Standard form.

Use the digital tiles to represent this quadratic. Try to arrange them so they fit in a perfect square shape. Sketch the result below.



What is the length of your square?

$$x+3$$

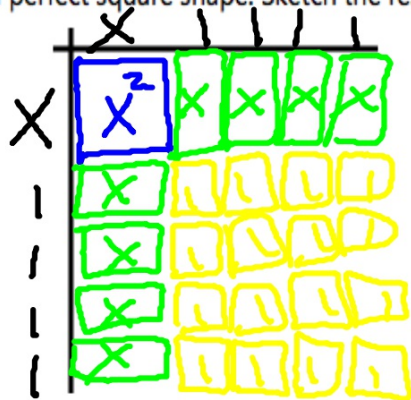
What is the width of your square?

$$x+3$$

Rewrite the quadratic equation as a product of the length and width.

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

2) Use the digital tiles to represent the quadratic  $y = x^2 + 8x + 16$ . Try to arrange them so they fit in a perfect square shape. Sketch the result below.



What is the length of your square?

$$x+4$$

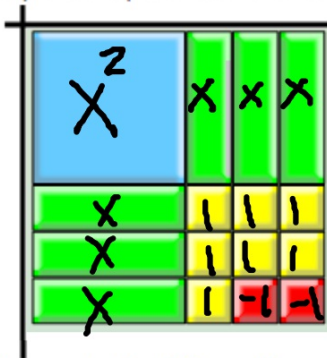
What is the width of your square?

$$x+4$$

Rewrite the quadratic equation as a product of the length and width.

$$(x+4)(x+4) = (x+4)^2$$

3) Use the digital tiles to represent the quadratic  $y = x^2 + 6x + 7$ . Try to arrange them so they fit in a perfect square shape. Sketch the result below.



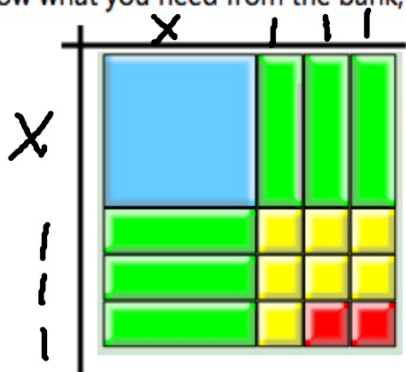
Why is this quadratic different from the previous two?

Didn't make a perfect square

What more would we need if we were going to make a perfect square shape?

borrow 2 more "1's"

Borrow what you need from the bank, and sketch the result below.



*\* borrowed  
2*

What is the length of your square?

$$(x+3)$$

What is the width of your square?

$$(x+3)$$

Rewrite the quadratic equation as a product of the length and width. Remember to note what you owe to the bank!

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

$$1) y = x^2 + 4x + 3$$

① b-term  $\div 2$

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

$$(x+2)^2 - 1$$

② How many 1's  
to make a square?

$$2^2 = 4 \quad 3 - 4 = -1$$

$$4) y = x^2 + 2x + 2$$

$$\frac{2}{2} = 1$$

$$(x+1)^2 + 1$$

$$1^2 = 1 \quad 2 - 1 = 1$$

Now let's apply that to the Circle Equations!

Example 1:  $x^2 + y^2 + 14x - 12y + 60 = 0$

① Get x's & y's together:  $x^2 + 14x + 49 + y^2 - 12y + 36 = -60$

② Complete the Square twice:  $(x+7)^2 + (y-6)^2 = \frac{-60 + 49 + 36}{1} = 25$

③ Simplify:  $(x+7)^2 + (y-6)^2 = 25$

Center:  $(-7, 6)$  radius: 5

Example 2:  $x^2 + y^2 - 4x - 8y - 55 = 0$

① Get x's & y's together:  $x^2 - 4x + 4 + y^2 - 8y + 16 = 55$   
+ 4  
+ 16

② Complete the square twice:  $(x-2)^2 + (y-4)^2 = 75$

③ Simplify:  $(x-2)^2 + (y-4)^2 = 75$

Center:  $(2, 4)$  radius:  $\sqrt{75}$   
 $5\sqrt{3}$

Homework is Page 6.4 in Packet