Algebra II **Name:** _____

#14: Solve equations by completing the square.
#15: Rewrite functions by completing the square.

Convert between standard and factored form by either multiplying or factoring. Leave the third column blank.

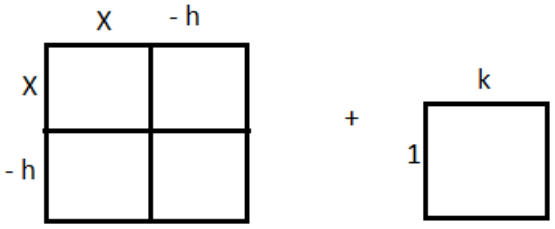
Standard Form	Factored Form	Vertex Form
$f(x) = x^2 - 2x - 35$		
	$g(x) = -4(x + 3)(x - 1)$	
$h(x) = -x^2 + 4x + 5$		

BIG IDEA: We want to be able to turn any function of the *standard form* $f(x) = ax^2 + bx + c$ into the *vertex form* $f(x) = a(x - h)^2 + k$.

This process is called "Complete the Square". To do this, we can visualize what we're trying to do.

Example1 Literally think of a square, like the Punnett square in biology.

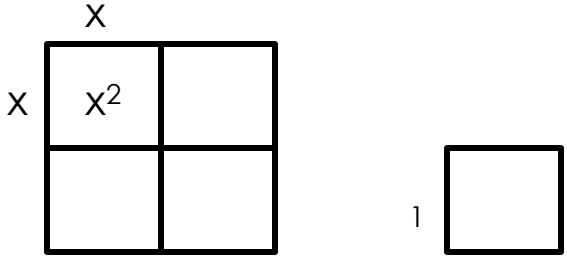
The $(x-h)^2$ is a perfect square so x and h go on both the top sides. Then we add a little square k at the end.



Fill in the insides of the square by multiplying.

Example 2 Turn $f(x) = x^2 + 6x + 11$ into the vertex form $f(x) = a(x - h)^2 + k$.

What two numbers are the same and add up to 6?



The equation in vertex form is: _____

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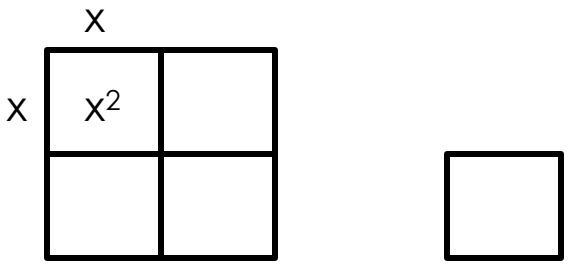
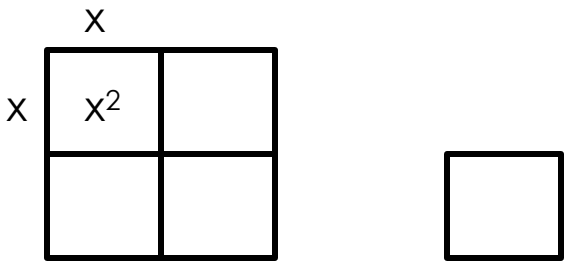
Practice

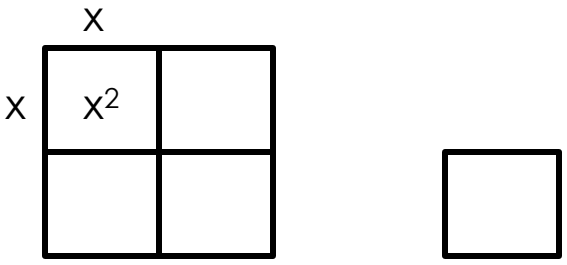
1. $x^2 + 10x + 27 = 0$



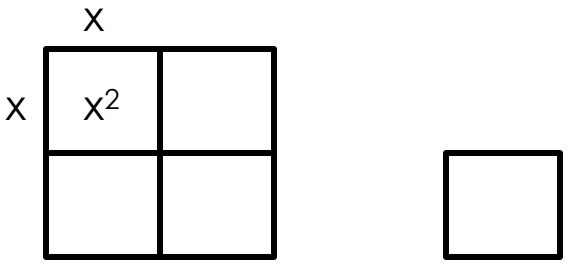
2. $y = x^2 + 4x + 9$



3. $h(x) = x^2 + -8x + 10$

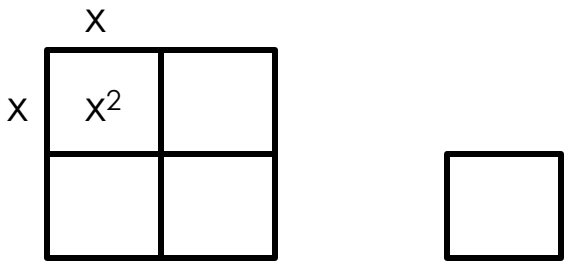


4. $x^2 - 6x + 15$

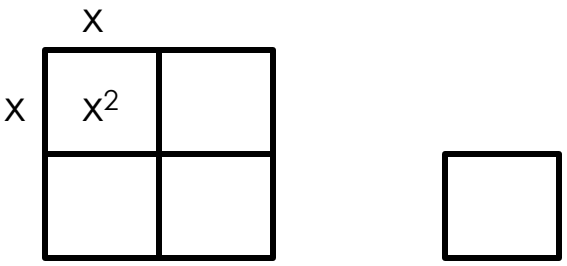


Note: If there is a number in front of the x^2, we have to factor or divide that out front.

5. $2x^2 + 16x + 100 = 0$



6. $y = -2x^2 + 20x + 190$



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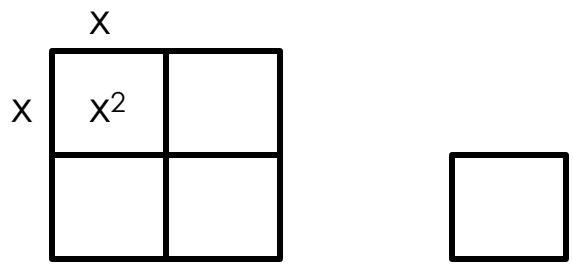
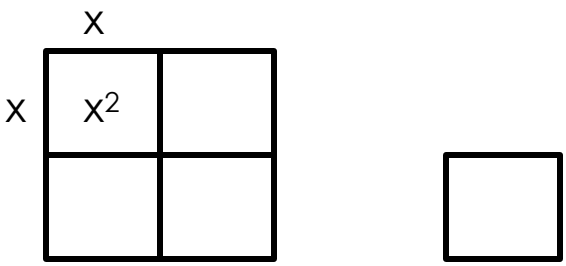
And sometimes that means we will work with fractions….nooooooook!

7. $f(x) = 3x^2 + 12x + 8$



8. $5x^2 + 20x - 21 = 0$



The last 8 problems have helped us to rewrite quadratic functions in vertex form. Now, as always, we will take it another step farther and solve the equation. Let's look at an example.

Answer $3(x+2)^2 - 20 = 0$
Add 20 to both sides $3(x+2)^2 = 20$
Divide by 3 on both sides $(x+2)^2 = \frac{20}{3}$

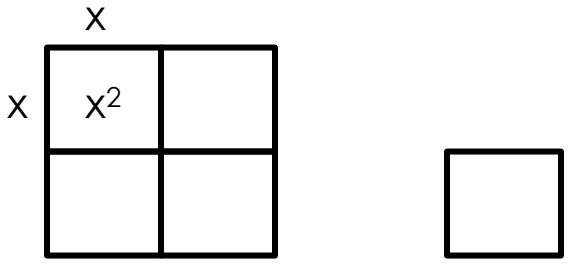
Square root both sides $x + 2 = \pm\sqrt{\frac{20}{3}}$

Subtract 2 from both sides $x = -2 \pm\sqrt{\frac{20}{3}}$

Type in on the calculator and round to the hundredths place. x = _____ and x = _____.

Now let's do the whole process. Use your answer from #8 and continue solving in #9. ☺

9. $5x^2 + 20x - 21 = 0$



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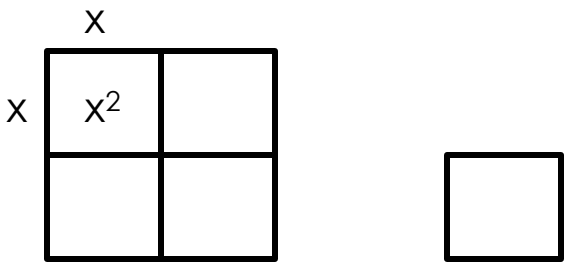
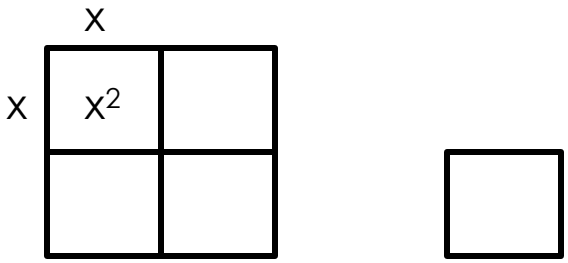
Remember, to solve quadratic equations they should always be set equal to 0. Pay attention to the problems below!!

Directions: Rewrite the functions below in vertex form and solve. Round to the nearest hundredth.

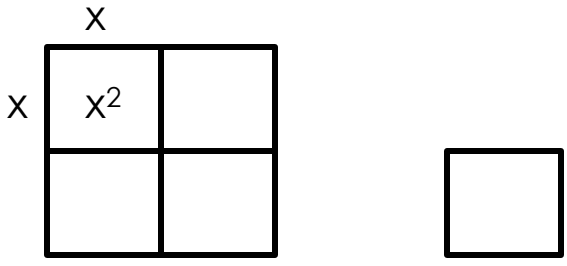
10. $x^2 - 20x - 105 = -5$



11. $4x^2 + 16x - 62 = 3$



12. $x^2 = 33 + 8x$



13. $7x^2 + 14x - 21 = 0$