Lesson Title **3.3 Completing the Square NOTES** **Algebra 2** **Date** ____________

OBJECTIVE 1: Finding the perfect "c"

Complete the square using $\square = \left(\frac{b}{2}\right)^2$

TASK 1: Use the formula for completing the square to fill the □'s below.

a) $x^2 + 6x + \square$

$\left(\frac{6}{2}\right)^2 = (3)^2 = \boxed{9}$

b) $x^2 - 5x + \square$

$\left(-\frac{5}{2}\right)^2 = \boxed{\frac{25}{4}}$

OBJECTIVE 2: Converting to Vertex Form

When converting from Standard Form to Vertex Form, you use completing the square.

STEPS:

1) If there is a "c" move it to the other side of the =.
2) Make sure "a" = 1, if not 1 then factor "a" out using GCF.
3) Divide the value of "b" by 2, square it, and add that value to both sides of the equation.
4) Write one side as a perfect square binomial and combine like terms on the other side, if necessary
5) Use inverse operations to move the constant to the side with the perfect square binomial.
6) Make sure your final answer is in vertex form.
   $y = a(x - h)^2 + k$.

TASK 2: Convert to vertex form. Then state your vertex and axis of symmetry Each person should have the marker once for these.

a) $x^2 + 14x = 15$

$x^2 + 14x + \boxed{49} = 15 + \boxed{49}$

$\square = \left(\frac{14}{2}\right)^2 = (7)^2 = 49$

$(x+7)^2 = 64$

$y = (x+7)^2 - 64$

$V: (-7, -64)$

$AofS: x = -7$

b) $x^2 + 11x = -10$

$x^2 + 11x + \boxed{\frac{121}{4}} = -10 + \boxed{\frac{121}{4}}$

$\square = \left(\frac{11}{2}\right)^2 = \frac{121}{4}$

$\left(x + \frac{11}{2}\right)^2 = \frac{121}{4} - \frac{40}{4}$

$\left(x + \frac{11}{2}\right)^2 = \frac{81}{4}$

$y = \left(x + \frac{11}{2}\right)^2 - \frac{81}{4}$

$V: \left(-\frac{11}{2}, -\frac{81}{4}\right)$

$AofS: x = -\frac{11}{2}$

c) $x^2 - 8x + 15 = 0$

$x^2 - 8x + \boxed{16} = -15 + \boxed{16}$

$\square = \left(-\frac{8}{2}\right)^2 = (-4)^2 = 16$

$(x-4)^2 = 1$

$y = (x-4)^2 - 1$

$V: (4, -1)$

$AofS: x = 4$

OBJECTIVE 3: Solving by Completing the Square

You use the same steps as earlier, but then at step 5 there is no need to bring the constant back over as k. Instead you move everything away from x to solve for it.

STEPS:

1) If there is a "c" move it to the other side of the =.
2) Make sure "a" = 1, if not 1 then factor "a" out using GCF
3) Divide the value of "b" by 2, square it, and add that value to both sides of the equation.
4) Write one side as a perfect square binomial and combine like terms on the other side, if necessary.
5) If "a" is not 1 then divide both sides by "a" to get the perfect square binomial alone.
6) Square root both sides of the equations, DO NOT FORGET the ± in front of the square root.
7) Now subtract by your "h" to get x alone.
8) Simplify if necessary.
9) Check if time allows.

Task 3: Solve using completing the square.
Each member of the group should have the marker once.

a) $x^2 + 6x - 16 = 0$

$x^2+6x+\boxed{9} = 16+\boxed{9}$

$\square = \left(\frac{6}{2}\right)^2 = (3)^2 = 9$

$\sqrt{(x+3)^2} = \sqrt{25}$

$(x+3) = \pm 5$ $\quad -3+5=2$

$x = -3 \pm 5$ $\quad -3-5=-8$

$\boxed{x = 2, -8}$

b) $2x^2 + 4x - 7 = 0$

$\square = \left(\frac{2}{2}\right)^2 = 1^2 = 1$

$2(x^2+2x+\boxed{1}) = 7 + 2\boxed{1}$

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

$\sqrt{(x+1)^2} = \sqrt{\frac{9}{2}}$

$x+1 = \pm\frac{3}{\sqrt{2}}$

$\boxed{x = -1 \pm \frac{3}{\sqrt{2}}}$

c) $x^2 + 4x - 21 = 0$

$\square = \left(\frac{4}{2}\right)^2 = (2)^2 = 4$

$x^2+4x+\boxed{4} = 21+\boxed{4}$

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

$x+2 = \pm 5$ $\quad -2+5=3$

$x = -2 \pm 5$ $\quad -2-5=-7$

$\boxed{x = 3, -7}$

Still need help with: