Advanced Algebra 3/4 Name:___________

Solving Quadratics by Undoing

Many quadratic equations can be solved by undoing operations on both sides of the equation. These quadratics are in what is called **vertex form** (more on that in Unit 2). Remember that these equations often have **2 solutions** (but can also have 1 or no solutions).

SADMEP

Example: Compare these two equations. Notice how similar the steps for solving are.

Algebra	Words	Algebra	Words
$3(x+5)-2=25$ $+2\ +2$	Undo Subtraction	$3(x+5)^2-2=25$ $+2\ +2$	Undo subt.
$\frac{3(x+5)}{3}=\frac{27}{3}$	Undo Mult.	$\frac{3(x+5)^2}{3}=\frac{27}{3}$	Undo Mult.
		$\sqrt{(x+5)^2}=\sqrt{9}$	Undo Square
$x+5=9$ $-5\ -5$ $x=4$	Undo add.	$x+5=3$ or $x+5=-3$ $-5\ -5 \quad -5\ -5$ $x=-2 \quad x=-8$	Undo Add.
Check your solution(s) $3(4+5)-2\stackrel{?}{=}25$ $3(9)-2$ $27-2=25$		Check your solution(s) $3(-2+5)^2-2\stackrel{?}{=}25$ $3(3)^2-2$ $3(9)-2$ $27-2=25$	$3(-8+5)^2-2\stackrel{?}{=}25$ $3(-3)^2-2$ $3(9)-2$ $27-2=25$

Remember that solving an equation means finding a number (or numbers) that make the equation true. You can feel confident in your solution(s) by plugging in the value(s).

Solve the following equations and check your answers.

- $x+5=30$
  $-5\ -5$
  $x=25$
- $x^2+5=30$
  $-5\ -5$
  $\sqrt{x^2}=\sqrt{25}$
  $x=5 \quad x=-5$
- $2(x+5)=32$
  $\frac{2(x+5)}{2}=\frac{32}{2}$
  $x+5=16$
  $-5\ -5$
  $x=11$
- $2(x+5)^2=32$
  $\frac{2(x+5)^2}{2}=\frac{32}{2}$
  $(x+5)^2=16$
  $x=-1 \leftarrow x+5=4 \quad x+5=-4 \rightarrow x=-9$
- $-3(x+5)+1=-26$
  $-1\ -1$
  $\frac{-3(x+5)}{-3}=\frac{-27}{-3}$
  $x+5=9$
  $-5\ -5 \rightarrow x=4$
- $-3(x+5)^2+1=-26$
  $-1\ -1$
  $\frac{-3(x+5)^2}{-3}=\frac{-27}{-3}$
  $(x+5)^2=9$
  $x=-2 \leftarrow x+5=3 \quad x+5=-3 \rightarrow x=-8$

Not all quadratic equations are written in **vertex form.** When they are in **standard form** or in **factored form,** we use different techniques to solve them. Below are examples of each form:

Vertex Form	**Standard Form**	**Factored Form**
$-5(x-3)^2-3=-122$ $(x+1)^2-5=31$ You can solve by undoing because "x" is isolated	$x^2-4x-5=0$ $x^2+7x+12=0$ You **cannot** solve by undoing because "x" is in two locations	$-3(x-5)(3x-2)=0$ $(x+5)(x+2)=0$ You **cannot** solve by undoing because "x" is in two locations

The following quadratic equations are mixed up. Your task is to **identify** what form the equation is in, and then **solve** the equations in **vertex form.** If you finish early, try to reach back in your memory bank and remember how to solve equations in **standard form** or **factored form.**

$(x-3)^2+2=11$ VF $-2\ \ -2$ $(x-3)^2=9$ $x-3=3$ $x-3=-3$ $x=6$ $x=0$	$x^2-7x-8=0$ SF $(x-8)(x+1)$ $x=8$ $x=-1$	$3(x+5)^2=48$ VF $\div 3$ $\div 3$ $(x+5)^2=16$ $x+5=4$ $x+5=-4$ $x=-1$ $x=-9$
$(x-3)(x+5)=0$ FF $x=3,\ x=-5$	$x^2-9=0$ VF $+9\ +9$ $x^2=9$ $x=3$ $x=-3$	$x^2-9x-22=0$ SF $(x-11)(x+2)$ $x=11,$ $x=-2$
$-5(x-7)^2+5=0$ VF $-5\ \ -5$ $\frac{-5(x-7)^2}{-5}=\frac{-5}{-5}$ $(x-7)^2=1$ $x-7=1$ $x-7=-1$ $x=8$ $x=6$	$2(x+5)(x-3)=0$ FF $x=-5,$ $x=3$	$-2(x+3)^2+7=-1$ VF $-7\ \ -7$ $\frac{-2(x+3)^2}{-2}=\frac{-8}{-2}$ $(x+3)^2=4$ $x+3=2$ $x+3=-2$ $x=-1$ $x=-5$

Write yourself a summary of what you have learned about solving quadratic equations:

Undo operations using SADMEP order
Square root undoes squared & has
2 solutions. Rewrite Standard form to solve