Name: _____

Isolating *x* in Vertex Form

Remember: when your goal is to isolate a variable (like when you're asked to solve for *x*), however, you have to do the **opposite** of each operation, which means you also have to follow the order of operations backwards.

Subtraction/Addition Division / Multiplication Exponents Parenthesis

When a problem in sin Vertex form, $y = a(x-h)^2 + k$, the backwards order of operations looks like this:

Inverse Order of Operations	**Example 1**	**Example 2**
Subtraction/Addition *(Add or subtract the end number)*	$0 = -3(x-4)^2 + 75$ $-75 \qquad -75$ $\boxed{-75 = -3(x-4)^2}$	$0 = 7(x+5)^2 - 28$ $+28 \qquad +28$ $\boxed{28 = 7(x+5)^2}$
Division / Multiplication *(Divide by the first number)*	$\frac{-75}{-3} = \frac{-3(x-4)^2}{-3}$ $\boxed{25 = (x-4)^2}$	$\frac{28}{7} = \frac{7(x+5)^2}{7}$ $\boxed{4 = (x+5)^2}$
Exponents *(Square root both sides using ±!)*	$\pm\sqrt{25} = \pm\sqrt{(x-4)^2}$ $\boxed{\pm 5 = (x-4)}$	$\pm\sqrt{4} = \pm\sqrt{(x+5)^2}$ $\boxed{\pm 2 = (x+5)}$
Parenthesis *(Add or subtract the number inside)*	$\pm 5 = (x-4)$ $+4 \; (in\ front) \quad +4$ $\boxed{4 \pm 5 = x}$	$\pm 2 = (x+5)$ $-5 \; (in\ front) \quad -5$ $\boxed{-5 \pm 2 = x}$
(Switch the sides & split the ± into 2 problems: + and −)	$4 \pm 5 = x$ $x = 4 \pm 5$ $\boxed{x = 4+5 \;\; x = 9}$ or $\boxed{x = 4-5 \;\; x = -1}$	$-5 \pm 2 = x$ $x = -5 \pm 2$ $\boxed{x = -5+2 \;\; x = -3}$ or $\boxed{x = -5-2 \;\; x = -7}$
Notice that there are two answers for each problem!		

For each problem below, do the opposite operation in order to isolate the *x*-value.

1. $0 = -8(x+12)^2 + 72$	2. $0 = -10(x+9)^2 + 40$	3. $0 = 7(x+3)^2 - 175$
4. $0 = 3(x-1)^2 - 27$	5. $0 = -(x-7)^2 + 100$	6. $0 = 6(x+7)^2 - 6$

7. $0 = (x-8)^2 - 121$	8. $0 = 5(x-2)^2 - 405$	9. $0 = 2(x+7)^2 - 128$
10. $0 = 10(x-11)^2 - 360$	11. $0 = 9(x+8)^2 - 36$	12. $0 = 8(x-4)^2$

When square rooting isn't possible, just leave the number in the square root. Your answer will look like this:

$$x = \boxed{number_1 + \sqrt{number_2}} \; or \; \boxed{number_1 - \sqrt{number_2}}$$

Example $0 = -6(x+1)^2 + 12$ $-12 \quad\quad -12$ $-12 = -6(x+1)^2$ $\frac{-12}{-6} = \frac{-6(x+1)^2}{-6}$ $2 = (x+1)^2$ $\pm\sqrt{2} = \pm\sqrt{(x+1)^2}$ $\pm\sqrt{2} = (x+1)$ $-1 \quad\quad -1$ $-1 \pm \sqrt{2} = x$ so, $x = \boxed{-1+\sqrt{2} \; or \; -1-\sqrt{2}}$	13. $0 = -2(x-4)^2 + 12$	14. $0 = 11(x+7)^2 - 33$
Example $0 = -7(x-8)^2 - 14$ $+14 \quad\quad +14$ $14 = -7(x-8)^2$ $\frac{14}{-7} = \frac{-7(x-8)^2}{-7}$ $-2 = (x-8)^2$ $\pm\sqrt{-2} = \pm\sqrt{(x-8)^2}$ $\pm\sqrt{-2} = (x-8)$ $+8 \quad\quad +8$ $8 \pm \sqrt{-2} = x$ so, $x = \boxed{8+\sqrt{-2} \; or \; 8-\sqrt{-2}}$	15. $0 = 2(x-8)^2 + 10$	16. $0 = -5(x-3)^2 - 35$