Name: ______________________ Date: ______________

Solving Quadratics by Inverse Operations

1, 4, 9, 16, 25, 36, ...

Now that we have a good feeling for square roots, we can use them to help us solve special types of quadratic equations (those equations involving a squared quantity). Let's make sure we first understand a basic concept.

***Exercise* #1:** Solve each of the following equations for all values of x. Write your answers in simplest radical form.

(a) $\sqrt{x^2}=\sqrt{16}$

$x=\pm 4$

(b) $\sqrt{x^2}=\sqrt{100}$

$x=\pm 10$

(c) $\sqrt{x^2}=\sqrt{20}$

$x=\sqrt{20}=\sqrt{4}\sqrt{5}$

$\pm 2\sqrt{5}$

So, the key here is that the **inverse operation** to **squaring** is taking a **square root**. BUT, when you do this, you always introduce both a positive and negative answer. Squaring is a **non-reversible** process, meaning that you can't simply undo it.

Now, let's add some additional operations. Recall that we always solve equations by undoing operations in the opposite order in which they have been done. And in terms of order of operations, exponents essentially come first, so they will be "undone" last.

***Exercise* #2:** Solve each of the following equations for all values of x by using inverse operations. In each case your final answers will be rational numbers.

(a) $2x^2+10=28$

$-10 \quad -10$

$\frac{2x^2}{2}=\frac{18}{2}$

$\sqrt{x^2}=\sqrt{9}$

$x=\pm 3$

(b) $\frac{x^2}{2}-5=3$

$+5 \quad +5$

$\cancel{2}\cdot\frac{x^2}{\cancel{2}}=8\cdot 2$

$\sqrt{x^2}=\sqrt{16}$

$x=\pm 4$

$\frac{x^2}{2}=\frac{8}{1}$

$\sqrt{x^2}=\sqrt{16}$

$x=\pm 4$

(c) $(x-2)^2=25$

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

$x-2=\pm 5$

$+2 \quad +2$

$x=2\pm 5$

$2+5$ and $2-5$

7 $\quad$ -3

$\{-3, 7\}$

(d) $2(x+5)^2-50=150$

$+50 \quad +50$

$\frac{\cancel{2}(x+5)^2}{\cancel{2}}=\frac{200}{2}$

$\sqrt{(x+5)^2}=\sqrt{100}$

$x+5=\pm 10$

$-5 \quad -5$

$\boxed{x=-5\pm 10}$ ✓

-15 and 5

1, 4, 9, 16, 25

Of course, there is no reason our answers must come out as rational numbers as in Exercise #3. We can also have answers to these types of equations that involve **irrational numbers.** In these cases we are typically asked, for some unknown reason, to express our answers in **simplest radical form**.

***Exercise* #3:** Solve each of the following quadratic equations by using inverse operations. Express all of your answers in simplest radical form.

(a) $5x^2-2=38$

$+2 \quad +2$

$\frac{5x^2}{5}=\frac{40}{5}$

$x^2=8$

$\sqrt{x^2}=\sqrt{8}$

$x=\sqrt{4}\sqrt{2}$

$\boxed{x=\pm 2\sqrt{2}}$

(b) $(x-3)^2+10=38$

$-10 \quad -10$

$\sqrt{(x-3)^2}=\sqrt{28}$

$x-3=\sqrt{28}$

$x-3=\sqrt{4}\sqrt{7}$

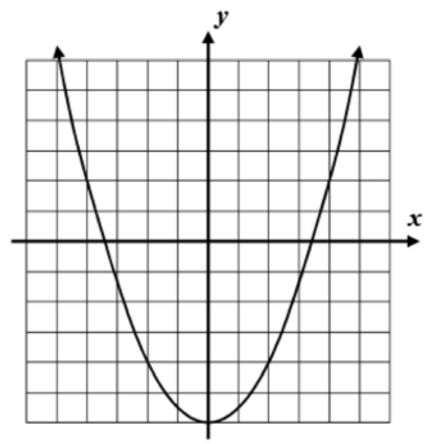
$x-3=\pm 2\sqrt{7}$

$+3 \quad +3$

$x=3\pm 2\sqrt{7}$

***Exercise* #4:** Francis graphs the parabola $y=\frac{1}{2}x^2-6$ on the grid below. He believes that the quadratic has zeroes of -3.5 and 3.5.

(a) Find the zeroes of this function in simplest radical form and explain why Francis must be incorrect.



***Exercise* #5:** Find the zeroes of the function $f(x)=(x+4)^2-20$ in simplest radical form. Then, express them in terms of a decimal rounded to the nearest *hundredth*.

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SOLVING QUADRATICS USING INVERSE OPERATIONS
HOMEWORK

1. Solve each of the following quadratics by applying inverse operations. In each case, your answers will be rational numbers. Always write them in simplest form.

(a) $2x^2 = 98$ (b) $(x+3)^2 = 25$ (c) $x^2 - 11 = 53$

(d) $\frac{(x-4)^2}{3} = 12$ (e) $20(x+1)^2 = 5$

(f) $-2(x-7)^2 + 5 = -195$ (g) $(2x+1)^2 - 6 = 19$

2. Which of the following is the solution set to the equation $\frac{(x-6)^2}{2}+4=36$?

(1) $\{0,12\}$ (3) $\{-2,16\}$

(2) $\{-4,8\}$ (4) $\{-2,14\}$

3. Solve each of the following quadratic equations by using inverse operations. Express each of your answers simplest radical form.

(a) $\frac{1}{2}x^2-4=0$ (b) $(x-5)^2=18$ (c) $2x^2+7=71$

(d) $5(x+2)^2+37=487$ (e) $\frac{(x-4)^2}{3}+8=17$