Name: _____ Hour: _____ Date: _____

# Simplifying Complex Radicals Notes

***Recall:*** Sometimes we need to break down numbers that aren't perfect squares.

Perfect Squares: 4, 9, 16, 25, 36, 49, 64, 81, 100

**Simplifying Radicals Review Examples:**

1) $\sqrt{20}$

$\sqrt{4}\sqrt{5}$

$= \pm 2\sqrt{5}$

2) $\sqrt{32}$

$\sqrt{16}\sqrt{2}$

$= \pm 4\sqrt{2}$

3) $\sqrt{45}$

$\sqrt{9}\sqrt{5}$

$= \pm 3\sqrt{5}$

**Imaginary Numbers:**

$* \boxed{i = \sqrt{-1}} *$

**Simplifying Square Roots of Negative Numbers:**

$\sqrt{-30}$

$\sqrt{30}\sqrt{-1}$

$= \pm i\sqrt{30}$

1) $\sqrt{-4}$

$\sqrt{4 \cdot -1}$

$\sqrt{4}\sqrt{-1}$

$\pm 2i$

2) $\sqrt{-16}$

$\sqrt{16 \cdot -1}$

$\pm 4i$

3) $\sqrt{-18}$

$\sqrt{18}\sqrt{-1}$

$\sqrt{9}\sqrt{2}\sqrt{-1}$

$\pm 3i\sqrt{2}$

4) $\sqrt{-72}$

$\sqrt{36}\sqrt{2}\sqrt{-1}$

$= \pm 6i\sqrt{2}$

5) $\sqrt{-24}$

$\sqrt{4}\sqrt{6}\sqrt{-1}$

$= \pm 2i\sqrt{6}$

**Solving Quadratics with Complex Numbers:**

***Recall the Quadratic Formula:***

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Find the roots of the following quadratic. Your answer should be exact and completely simplified.

$2x^2 - 6x + 5 = 0$

$a=2$, $b=-6$, $c=5$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(2)(5)}}{2(2)}$$

$$= \frac{6 \pm \sqrt{36-40}}{4} = \frac{6 \pm \sqrt{-4}}{4} = \frac{6 \pm \sqrt{4}\sqrt{-1}}{4}$$

$$\frac{6 \pm 2i}{4} = \frac{6}{4} \pm \frac{2i}{4} = \boxed{\frac{3}{2} \pm \frac{i}{2}}$$

Find the zeros of the following quadratic. Make sure your answer is exact and fully simplified.

$2x^2 - 6x + 7 = 0$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(2)(7)}}{2(2)} = \frac{6 \pm \sqrt{36-56}}{4}$$

$$\frac{6 \pm \sqrt{-20}}{4} = \frac{6 \pm \sqrt{4}\sqrt{5}\sqrt{-1}}{4}$$

$$= \frac{6 \pm 2i\sqrt{5}}{4} = \frac{6}{4} \pm \frac{2i\sqrt{5}}{4} = \boxed{\frac{3}{2} \pm \frac{i\sqrt{5}}{2}}$$