Math 2200 **Date:**______________

4.4A Preparation for The Quadratic Formula - Reducing Square Roots

We looked at two methods for reducing radicals in Math 1201. The prime factorization method will be reviewed in Chapter 5 so we will review the **biggest perfect square** method. It is much quicker, so the one we want to use when simplifiying the quadratic formula.

To reduce a radical, where the radicand is not a perfect square, we must find the biggest perfect square that divides evenly into the radicand.

Example 1:

$$\sqrt{12}$$

$\sqrt{12}$

$4 \cdot 3$

$2 \cdot 2 \cdot 3$

$\sqrt{\cancel{2 \cdot 2} \cdot 3}$

$2\sqrt{3}$

$= \sqrt{4}\sqrt{3}$

$= 2\sqrt{3}$

Example 2:

$$\sqrt{24}$$

$= \sqrt{4}\sqrt{6}$

$= 2\sqrt{6}$

Example 3:

$$\sqrt{32}$$

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

$= 4\sqrt{2}$

Your turn:

(A) $\sqrt{48}$

$= \sqrt{16}\sqrt{3}$

$= 4\sqrt{3}$

(B) $\sqrt{56}$

$= \sqrt{4}\sqrt{14}$

$= 2\sqrt{14}$

(B) $\sqrt{108}$

$= \sqrt{36}\sqrt{3}$

$= 6\sqrt{3}$

(C) $\sqrt{196}$

$= 14$

(C) $\sqrt{180}$

$= \sqrt{36}\sqrt{5}$

$= 6\sqrt{5}$

(E) $\sqrt{432}$

$= \sqrt{144}\sqrt{3}$

$= 12\sqrt{3}$

(F) $\sqrt{363}$

$= \sqrt{121}\sqrt{3}$

$= 11\sqrt{3}$

(C) $\sqrt{486}$

$= \sqrt{81}\sqrt{6}$

$= 9\sqrt{6}$

(G) $\sqrt{275}$

$= \sqrt{25}\sqrt{11}$

$= 5\sqrt{11}$

(E) $\sqrt{1176}$

$= \sqrt{196}\sqrt{6}$

$= 14\sqrt{6}$

Complex Numbers

While you need to be aware that there are no real solutions to the square root of a negative number, here we will introduce to complex numbers. While there are many aspects to the complex number system, here we are only concerned with i. The following is true of i:

$$i = \sqrt{-1}$$
$$i^2 = -1$$

The imaginary unit is define by the square root of a negative number. For example:

$$\sqrt{-9}$$
$$= \sqrt{9}\sqrt{-1}$$
$$= 3i$$

Example 4:

Write in simplest form:

(A) $\sqrt{-16}$

$= \sqrt{16}\sqrt{-1}$

$= 4i$

(B) $\sqrt{-32}$

$= \sqrt{16}\sqrt{2}\sqrt{-1}$

$= 4\sqrt{2}i$

(C) $\sqrt{-\cancel{32}}$
48

$= \sqrt{16}\sqrt{3}\sqrt{-1}$

$= 4\sqrt{3}i$

(D) $\sqrt{-248}$

$= \sqrt{4}\sqrt{62}\sqrt{-1}$

$= 2\sqrt{62}i$