1.8 Radicals and Radical Operations

Numbers like $\sqrt{18}$, $\sqrt{28}$, and $\sqrt{48}$ are called radical numbers.

Definition: a radical is the positive square root of a number.

Most radicals are irrational numbers, meaning that if you calculate them they are decimal numbers that neither terminate nor repeat.

Ex. $\sqrt{7} \cong 2.645751311 \ldots$

Mixed Radicals: Have a coefficient outside of the radical. Ex: $2\sqrt{3}$

Adding and Subtracting Radicals

Like numbers and polynomials, radicals can be combined and simplified using algebra. Radicals follow similar rules as collecting "like terms".

$\sqrt{3} + \sqrt{3} =$ _____

$5\sqrt{5} - \sqrt{5} =$ _____

Only "like radicals" can be subtracted or added. (So $3\sqrt{5} + 2\sqrt{7}$ cannot be simplified)

Multiplying and Dividing Radicals

When *multiplying* 2 radicals together, multiply the values under the $\sqrt{\ }$ symbol.

Ex: $\sqrt{4}\sqrt{9} =$

Ex: $\sqrt{5}\sqrt{5} =$

Ex: $\sqrt{50}\sqrt{10} =$

Ex: $(\sqrt{-7})(\sqrt{-7}) =$

Division can also be done "inside" the radical.

Ex: $\frac{\sqrt{12}}{\sqrt{3}} =$

Ex: $\frac{\sqrt{180}}{\sqrt{10}} =$

Mixed Radicals can be multiplied and divided in the same way.

Ex. $3\sqrt{50} * 4\sqrt{10} =$

Ex: $(3\sqrt{7})(-\sqrt{5}) =$

Ex: $(2\sqrt{4})(5\sqrt{9}) =$

Ex: $(-\sqrt{5})(7\sqrt{6}) =$