Name:_________________________________ Date:__________

Notes

Algebra Section 11.2

Pages 719-726

Goal: "Simplify radicals using the product property"
"Multiply radicals"
"Simplify radicals using the quotient property"
"Rationalize the denominator"
"Add and Subtract Radicals"

Radicals are simplest form when:

1. The number under the ________________ has no ______________ ______________ ______________.

2. No ____________________ have an _____________________ greater than 1.

3. There are no _____________________ under the radical sign.

4. There are no _____________________ in the ______________________.

Properties of Radicals

Product Property: $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$ or $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$ so….

$\sqrt{4 \cdot 9} = \sqrt{4} \cdot \sqrt{9} = 2 \cdot 3 = 6$

Quotient Property: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ or $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ so….

$\sqrt{\frac{9}{16}} = \frac{\sqrt{9}}{\sqrt{16}} = \frac{3}{4}$

Examples (Multiplication):

$\sqrt{9x^2} = \sqrt{9} \cdot \sqrt{x^2} = \mathbf{3x}$ $\sqrt{16x^3} = \sqrt{16} \cdot \sqrt{x^2} \cdot \sqrt{x} = \mathbf{3x\sqrt{x}}$ $\sqrt{32} = \sqrt{16} \cdot \sqrt{2} = \mathbf{4\sqrt{2}}$

Try These:

$\sqrt{16x^2}$ $\sqrt{4x^4}$ $\sqrt{49x^3}$ $\sqrt{27}$ $\sqrt{20}$

$\sqrt{64x^2}$ $\sqrt{8x^2}$ $\sqrt{81x^3}$ $\sqrt{45x^5}$ $\sqrt{12x^3y^6}$

Examples (Multiplication):

$\sqrt{6} \cdot \sqrt{6} = \sqrt{36} = \mathbf{6}$

$\sqrt{3x} \cdot 4\sqrt{x} = 4\sqrt{3x \cdot x} = 4 \cdot \sqrt{3} \cdot \sqrt{x^2} = \boldsymbol{4x\sqrt{3}}$

$\sqrt{7xy^2} \cdot 3\sqrt{x} = 3\sqrt{7 \cdot x^2 \cdot y^2} = 3 \cdot \sqrt{7} \cdot \sqrt{x^2} \cdot \sqrt{y^2} = \boldsymbol{3xy\sqrt{7}}$

Try These:

$\sqrt{2} \cdot \sqrt{8}$ $\qquad$ $\sqrt{20} \cdot \sqrt{5}$ $\qquad$ $\sqrt{5x} \cdot 3\sqrt{x}$ $\qquad$ $\sqrt{8x^2y} \cdot 4\sqrt{2y}$ $\qquad$ $2\sqrt{3a^2b^3} \cdot 5\sqrt{3ab}$

Examples (Division):

$\sqrt{\frac{13}{100}} = \frac{\sqrt{13}}{\sqrt{100}} = \frac{\sqrt{13}}{10}$

$\sqrt{\frac{7}{x^2}} = \frac{\sqrt{7}}{\sqrt{x^2}} = \frac{\sqrt{7}}{x}$

Try These:

$\sqrt{\frac{3}{9}}$ $\qquad$ $\sqrt{\frac{5}{n^2}}$ $\qquad$ $\sqrt{\frac{a^3}{b^2}}$ $\qquad$ $\sqrt{\frac{w^3}{144}}$ $\qquad$ $\sqrt{\frac{16}{4x^4}}$

Rationalize the Denominator:
Radicals in the denominator (not perfect square).

Examples:

$\frac{3}{\sqrt{7}}$ Multiply by $\frac{\sqrt{7}}{\sqrt{7}}$ $\qquad$ $\frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{3\sqrt{7}}{\sqrt{49}} = \frac{3\sqrt{7}}{7}$

$\frac{\sqrt{5}}{\sqrt{2m}}$ Multiply by $\frac{\sqrt{2m}}{\sqrt{2m}}$ $\qquad$ $\frac{\sqrt{5}}{\sqrt{2m}} \cdot \frac{\sqrt{2m}}{\sqrt{2m}} = \frac{\sqrt{10m}}{\sqrt{4m^2}} = \frac{\sqrt{10m}}{2m}$

Try These:

$\frac{1}{\sqrt{5}}$ $\qquad$ $\frac{1}{\sqrt{x}}$ $\qquad$ $\frac{2}{\sqrt{3x}}$ $\qquad$ $\frac{5}{\sqrt{7n}}$ $\qquad$ $\frac{\sqrt{2a}}{\sqrt{6a}}$

Add and Subtract Radicals:
Radicals are like terms when: when the number under the radical sign (The radicand) is exactly the same.
Combine like radical terms by adding or subtracting the coefficient.

Examples:

$4\sqrt{10} + \sqrt{13} - 9\sqrt{10}$
$4\sqrt{10} - 9\sqrt{10} + \sqrt{13}$
$-5\sqrt{10} + \sqrt{13}$

$5\sqrt{3} + \sqrt{48}$
$5\sqrt{3} + \sqrt{16 \cdot 3}$
$5\sqrt{3} + 4\sqrt{3}$
$9\sqrt{3}$

Try These:

$7\sqrt{14} + \sqrt{21} - 4\sqrt{14}$

$2\sqrt{7} + 3\sqrt{63}$

$2\sqrt{7} + \sqrt{28}$

Distribute: (combine like terms if possible)
F.O.I.L = first, outer, inner, last
Example:

$\sqrt{5}(4 - \sqrt{20})$
$4\sqrt{5} - \sqrt{100}$
$4\sqrt{5} - 10$

$(\sqrt{7} + \sqrt{2})(\sqrt{7} - 3\sqrt{2})$ F.O.I.L
$(\sqrt{7} \cdot \sqrt{7}) + (\sqrt{7} \cdot -3\sqrt{2}) + (\sqrt{2} \cdot \sqrt{7}) + (\sqrt{2} \cdot 3\sqrt{2})$
$7 + -3\sqrt{14} + \sqrt{14} + 3\sqrt{4}$
$7 - 2\sqrt{14} + 3 \cdot 2$
$1 - 2\sqrt{14}$

Try These:

$\sqrt{3}(2 + \sqrt{12})$

$(\sqrt{2} + \sqrt{5})(\sqrt{2} - 3\sqrt{5})$

$\sqrt{2}(3 + \sqrt{2})$

$(4 - \sqrt{3})(6 + \sqrt{3})$

$\sqrt{6}(7\sqrt{3} + 6)$

$(3\sqrt{5} + 7)^2$