Radical Lesson

$\sqrt{n}$ - Radical $\sqrt{\ }$ - Radical Symbol n - Radicand

Simplifying Radicals (Square Roots):

1) Find the largest perfect square factor of the radicand.
2) Factor the radicand using the perfect square factor.
3) $\sqrt{\text{Perfect Square}}$ comes outside the radical, the other factor (non-perfect square stays inside the radical.

Ex: Simplify. (Exact Roots – no decimal approximations)

1) $\sqrt{18}$ 2) $\sqrt{24}$ 3) $\sqrt{147}$ 4) $\sqrt{605}$

5) $\sqrt{72}$ 6) $\sqrt{84}$ 7) $\sqrt{128}$ 8) $\sqrt{49x^2}$

9) $\sqrt{64x^2y^3}$ 10) $\sqrt{125a^2b}$ 11) $\sqrt{98c^3d^4}$

Multiplying Radicals: $a\sqrt{b}\cdot c\sqrt{d} = ac\sqrt{bd}$

Ex: Simplify.

1) $3\sqrt{5}\cdot\sqrt{2}$ 2) $2\sqrt{14}\cdot\sqrt{21}$ 3) $2\sqrt{10}\cdot 5\sqrt{5}$

A Radical Expression is simplified when:

1) The radicand does not contain any perfect square factors.
2) The radicand is not a fraction.
3) No radicals in the denominator. (Rationalize the Denominator)

Dividing Radicals: $\frac{a\sqrt{b}}{c\sqrt{d}} = \frac{a}{c}\sqrt{\frac{b}{d}}$

Ex: Simplify. $\frac{6\sqrt{15}}{2\sqrt{5}}$

Rationalize the Denominator: Multiply the numerator and denominator by a quantity so the denominator is an exact root.

$$\frac{\sqrt{a}}{\sqrt{b}} \cdot 1 = \frac{\sqrt{a}}{\sqrt{b}} \cdot \frac{\sqrt{b}}{\sqrt{b}} = \frac{\sqrt{ab}}{\sqrt{b^2}} = \frac{\sqrt{ab}}{b}$$

Ex: Simplify.

1) $\frac{\sqrt{11}}{\sqrt{6}}$

2) $\frac{2\sqrt{7}}{\sqrt{5}}$

3) $\frac{3\sqrt{5}}{\sqrt{8}}$

Operations with Radical Expressions: Radical expressions in which the radicands are alike can be added or subtracted in the same way that monomials are added or subtracted.

Monomials

$4x + 5x =$

Radical Expressions

$4\sqrt{5} + 5\sqrt{5} =$

Ex: Simplify each expression.

1) $6\sqrt{7}+5\sqrt{7}-3\sqrt{7}$

2) $5\sqrt{6}+3\sqrt{7}+4\sqrt{7}-2\sqrt{6}$

If the radicals in a radical expression are not in simplest form, simplify each radical first. Then look to see if there are like radicals.

3) $4\sqrt{27}+5\sqrt{12}+8\sqrt{75}$

4) $3\sqrt{45}+4\sqrt{80}-2\sqrt{125}$

Radical Practice

Directions: Simplify. (Exact Roots – no decimal approximations)

1) $\sqrt{45}$ 2) $\sqrt{48}$ 3) $\sqrt{216}$ 4) $\sqrt{12}$

5) $8\sqrt{27}$ 6) $10\sqrt{96}$ 7) $2\sqrt{200}$ 8) $\sqrt{50x^2}$

9) $\sqrt{144x^3y}$ 10) $3\sqrt{12}\cdot\sqrt{6}$ 11) $2\sqrt{5}\cdot 3\sqrt{15}$ 12) $\frac{\sqrt{4}}{5\sqrt{3}}$

13) $\frac{\sqrt{8}}{\sqrt{100}}$ 14) $\frac{\sqrt{15}}{2\sqrt{20}}$ 15) $\frac{\sqrt{5}}{\sqrt{3}}$ 16) $\frac{2\sqrt{2}}{\sqrt{7}}$

17) $-2\sqrt{3}+3\sqrt{27}$ 18) $-\sqrt{27}-3\sqrt{45}-\sqrt{20}+2\sqrt{75}$

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Simplifying Radical Expressions

Date__________________ Period____

Simplify.

1) $\sqrt{125n}$

2) $\sqrt{216v}$

3) $\sqrt{512k^2}$

4) $\sqrt{512m^3}$

5) $\sqrt{216k^4}$

6) $\sqrt{100v^3}$

7) $\sqrt{80p^3}$

8) $\sqrt{45p^2}$

9) $\sqrt{147m^3n^3}$

10) $\sqrt{200m^4n}$

11) $\sqrt{75x^2y}$

12) $\sqrt{64m^3n^3}$

13) $\sqrt{16u^4v^3}$

14) $\sqrt{28x^3y^3}$

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Adding and Subtracting Radical Expressions

Date________________ Period____

Simplify.

1) $3\sqrt{6} - 4\sqrt{6}$

2) $-3\sqrt{7} + 4\sqrt{7}$

3) $-11\sqrt{21} - 11\sqrt{21}$

4) $-9\sqrt{15} + 10\sqrt{15}$

5) $-10\sqrt{7} + 12\sqrt{7}$

6) $-3\sqrt{17} - 4\sqrt{17}$

7) $-10\sqrt{11} - 11\sqrt{11}$

8) $-2\sqrt{3} + 3\sqrt{27}$

9) $2\sqrt{6} - 2\sqrt{24}$

10) $2\sqrt{6} + 3\sqrt{54}$

11) $-\sqrt{12} + 3\sqrt{3}$

12) $3\sqrt{3} - \sqrt{27}$

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Multiplying Radical Expressions

Date________________ Period____

Simplify.

1) $3\sqrt{12} \cdot \sqrt{6}$

2) $\sqrt{5} \cdot \sqrt{10}$

3) $\sqrt{6} \cdot \sqrt{6}$

4) $\sqrt{5} \cdot -4\sqrt{20}$

5) $-4\sqrt{15} \cdot -\sqrt{3}$

6) $\sqrt{20x^2} \cdot \sqrt{20x}$

7) $\sqrt{15n^2} \cdot \sqrt{10n^3}$

8) $\sqrt{18a^2} \cdot 4\sqrt{3a^2}$

9) $-3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$

10) $-4\sqrt{28x} \cdot \sqrt{7x^3}$

11) $\sqrt{3}(5 + \sqrt{3})$

12) $2\sqrt{5}(\sqrt{6} + 2)$

13) $-3\sqrt{3}(2 + \sqrt{6})$

14) $\sqrt{3}(-5\sqrt{10} + \sqrt{6})$

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