Chapter 2 Radicals Name ______________________

Radicals are any expression involving the root sign: $\sqrt{}$

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coefficient → $5\sqrt[3]{2}$ ← radicand

- An ___entire___ radical has a coefficient of one or negative one.

  ex. $\sqrt{2}$, $-\sqrt[3]{7}$, ...

- A ___mixed___ radical has a coefficient other than one or negative one.

  ex. $2\sqrt{3}$, $5\sqrt[3]{11}$, ...

We can convert from **mixed** to **entire radicals** and **entire** to **mixed radicals.**

Ex. a) $\sqrt{98}$

$= \sqrt{49 \cdot 2}$

$= 7\sqrt{2}$

simplest form

b) $2\sqrt{7}$

$= \sqrt{4}\sqrt{7}$

$= \sqrt{28}$

c) $\sqrt[3]{24n^7}$

$= \sqrt[3]{8 \cdot 3 \cdot (n \cdot n \cdot n)(n \cdot n \cdot n) \cdot n}$

$= 2nn\sqrt[3]{3n}$

$= 2n^2\sqrt[3]{3n}$

We can **add or subtract like radicals** by adding or subtracting their coefficients.

Ex. a) $2\sqrt{5} - 3\sqrt{7} + 1\sqrt{5}$

$= 3\sqrt{5} - 3\sqrt{7}$

b) $2\sqrt{28} - 5\sqrt{7}$

$= 2\sqrt{4 \cdot 7} - 5\sqrt{7}$

$= 2(2)\sqrt{7} - 5\sqrt{7}$

$= 4\sqrt{7} - 5\sqrt{7}$

$= -\sqrt{7}$

We **multiply** radicals by multiplying coefficient by coefficient and radicand by radicand. We can **divide** radicals by dividing coefficient by coefficient and radicand by radicand. Answers must be in **simplest form**.

Ex. a) $4\sqrt{6} \cdot 3\sqrt{2}$

$= 12\sqrt{12}$

$= 12\sqrt{4 \cdot 3}$

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

$= 24\sqrt{3}$

b) $\dfrac{18\sqrt{2}}{3\sqrt{14}}$

$= 6\sqrt{\dfrac{2}{14}}$

$= 6\sqrt{\dfrac{1}{7}}$

$= \dfrac{6\sqrt{1}}{\sqrt{7}}$

$= \dfrac{6}{\sqrt{7}}$

Rationalize the denominator

$= \dfrac{6}{\sqrt{7}} \cdot \dfrac{\sqrt{7}}{\sqrt{7}}$

$= \dfrac{6\sqrt{7}}{\sqrt{49}}$

$= \dfrac{6\sqrt{7}}{7}$

Multiplying binomials: Use FOIL (First, Outside, Inside, Last)

Ex. $(8\sqrt{6}+2)(\sqrt{2}-3)$

$= 8\sqrt{12} - 24\sqrt{6} + 2\sqrt{2} - 6$

$= 8\sqrt{4\cdot 3} - 24\sqrt{6} + 2\sqrt{2} - 6$

$= 16\sqrt{3} - 24\sqrt{6} + 2\sqrt{2} - 6$

Rationalizing binomial denominators—we multiply by the **conjugate**.

- The conjugate of $a+b$ is: $a-b$ and vice versa

Ex. $\frac{5}{(2-\sqrt{3})} \cdot \frac{(2+\sqrt{3})}{(2+\sqrt{3})}$

$= \frac{10+5\sqrt{3}}{4+\cancel{2\sqrt{3}}-\cancel{2\sqrt{3}}-\sqrt{9}}$

$= \frac{10+5\sqrt{3}}{4-3}$

$= \frac{10+5\sqrt{3}}{1}$

$= 10+5\sqrt{3}$

Solving Radical Equations

1. Isolate the radical
2. Square both sides
3. Solve for ‘x’
4. Check for extraneous roots

Ex. $\sqrt{x+1}+3=5$

$-3 \quad -3$

$\sqrt{x+1}=2$

$(\sqrt{x+1})^2=(2)^2$

$x+1=4$

$-1 \quad -1$

$x=3$

Check:

$\sqrt{x+1}+3=5$

$\sqrt{3+1}+3=5$

$\sqrt{4}+3=5$

$2+3=5$

$5=5$ ✓