**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_Per:\_\_\_\_\_\_**

**Examples (Simplifying):**

$\sqrt{8}=\sqrt{4}∙\sqrt{2}$ $\sqrt{48}$=$\sqrt{16}∙\sqrt{3}$ $\sqrt{125}=\sqrt{25}∙\sqrt{5}$

 $2\sqrt{2}$ $4\sqrt{3}$ $5\sqrt{5}$

**Try These:**

 $\sqrt{50}$ $\sqrt{12}$ $\sqrt{27}$ $\sqrt{32}$ $\sqrt{28}$

 $\sqrt{48}$ $\sqrt{72}$ $\sqrt{80}$ $\sqrt{162}$ $\sqrt{600}$

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

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

**Examples (Multiplication):**

$\sqrt{6}∙\sqrt{6}=\sqrt{36}=6$ $\sqrt{3x}∙4\sqrt{x}=4\sqrt{3x∙x}=4∙\sqrt{3}∙\sqrt{x^{2}}=4x\sqrt{3}$

**Try These:**

$\sqrt{2}∙\sqrt{8}$ $\sqrt{20}∙\sqrt{5}$ $3\sqrt{5x}∙\sqrt{x}$

**Challenge:**

$\sqrt{8x^{2}y}∙4\sqrt{2y}$ $2\sqrt{3ab}∙5\sqrt{3ab}$

**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:**

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

**Rationalize the Denominator:**

Cannot have Radicals in the denominator (not perfect square).

**Examples:**

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

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

**Try These:**

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

$\frac{3}{\sqrt{2}}$ $\frac{2}{\sqrt{3a}}$ $\frac{1}{\sqrt{x}}$ $\frac{4}{\sqrt{2n}}$ $\frac{\sqrt{a}}{\sqrt{2a}}$

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

**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:**

$3\sqrt{5}+7\sqrt{5}$ $4\sqrt{10}+\sqrt{13}-9\sqrt{10}$ $5\sqrt{3}+\sqrt{48}$

 $10\sqrt{5}$ $4\sqrt{10}-9\sqrt{10}+\sqrt{13}$ $5\sqrt{3}+\sqrt{16∙3}$

$-5\sqrt{10}+\sqrt{13}$ $5\sqrt{3}+4\sqrt{3}$

 $9\sqrt{3}$

**Try These:**

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

 $2\sqrt{5}-8\sqrt{5}$ $2\sqrt{2}+\sqrt{8}$ $4\sqrt{3}+2\sqrt{27}$

$7\sqrt{14}+\sqrt{21}-4\sqrt{14}$ $2\sqrt{7}+3\sqrt{63}$ $2\sqrt{7}+\sqrt{28}$

**Distribute:** (combine like terms if possible)

Example:

$\sqrt{5}\left(4-\sqrt{20}\right)$ $\left(3\sqrt{2}\right)^{2}=3\sqrt{2}∙3\sqrt{2}$

$4\sqrt{5}-\sqrt{100}$ $9\sqrt{4}$

$4\sqrt{5}-10$ $3∙2=6$

**Try These:**

$\sqrt{3}\left(2+\sqrt{12}\right)$ $3\left(\sqrt{2}-3\sqrt{5}\right)$ $\sqrt{2}\left(3+\sqrt{2}\right)$

**Mixed Practice:**

**Simplify:**

$\sqrt{98}$ $\sqrt{18x^{2}}$ $\sqrt{4a^{4}}$ $\sqrt{20b^{3}}$ $\sqrt{3}∙\sqrt{6}$

$\sqrt{5}∙\sqrt{20}$ $\sqrt{2}∙\sqrt{10}$ $3\sqrt{2}∙4\sqrt{8}$ $3\sqrt{8}∙\sqrt{3}$ $\sqrt{6}∙2\sqrt{8}$

$2\sqrt{2}∙3\sqrt{6}$ $6\sqrt{3}∙4\sqrt{5}$ $3\left(2\sqrt{2}-5\right)$ $\sqrt{2}\left(3\sqrt{6}+\sqrt{24}\right)$

$\sqrt{\frac{1}{4}}$ $\sqrt{\frac{2}{n^{2}}}$ $\sqrt{\frac{5}{x^{4}}}$ $\sqrt{\frac{w^{3}}{100}}$ $\sqrt{\frac{64}{9x^{4}}}$

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

$3\sqrt{5}+2\sqrt{5}$ $\sqrt{7}+4\sqrt{7}-3\sqrt{7}$ $2\sqrt{3}-8\sqrt{3}$

$2\sqrt{8}+\sqrt{32}-4\sqrt{12}$ $4\sqrt{6}+3\sqrt{24}$ $2\sqrt{5}+\sqrt{500}$