

Radicals and Roots

$$\sqrt{9} = \sqrt{3 \cdot 3} = 3$$

$$\sqrt[3]{8} = \sqrt[3]{2 \cdot 2 \cdot 2} = 2$$

8
^
2 · 4
^
2 2

$$\sqrt{25} = \sqrt{5 \cdot 5} = 5$$

$$\sqrt{4} = \sqrt{2 \cdot 2} = 2$$

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

$$\sqrt{y^2} = y$$

$$\sqrt{x^4} = x^2$$

$$\sqrt{16} = \sqrt{\cancel{2 \cdot 2} \cdot \cancel{2 \cdot 2}}$$

$$2 \cdot 2$$

$$\boxed{4}$$

$$\begin{array}{c} 16 \\ \wedge \\ 8 \ 2 \\ \wedge \\ 2 \ 4 \\ \wedge \\ 2 \ 2 \end{array}$$

$$\begin{array}{c} 16 \\ \wedge \\ 4 \ 4 \\ \wedge \ \wedge \\ 2 \ 2 \ 2 \ 2 \end{array}$$

$$\sqrt{32} = \sqrt{\cancel{2 \cdot 2} \cdot \cancel{2 \cdot 2} \cdot 2}$$

$$2 \cdot 2 \sqrt{2}$$

$$4\sqrt{2}$$

$$\begin{array}{c} 32 \\ \wedge \\ 4 \ 8 \\ \wedge \ \wedge \\ 2 \ 2 \ 4 \ 2 \\ \wedge \\ 2 \ 2 \end{array}$$

$$\sqrt{20} = 2\sqrt{5}$$

~~$$\sqrt{2 \cdot 2 \cdot 5}$$~~

$$2\sqrt{5}$$

$$\begin{array}{r} 20 \\ \wedge \\ 2 \ 10 \\ \wedge \\ 2 \ 5 \end{array}$$

$$\sqrt{369}$$

$$= 3\sqrt{41}$$

~~$$\sqrt{3 \cdot 3 \cdot 41}$$~~

$$3\sqrt{41}$$

$$\begin{array}{r} 369 \\ \wedge \\ 3 \ 123 \\ \wedge \\ 3 \ 41 \end{array}$$

$$\sqrt{123} = \sqrt{123}?$$

$$\begin{array}{r} 41 \cdot 3 \\ \hline \sqrt{123} \end{array}$$

$$\begin{array}{r} 123 \\ \wedge \\ 41 \cdot 3 \end{array}$$

$$\sqrt{8x^3}$$

~~$$\sqrt{2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x}$$~~

$$2x\sqrt{2x}$$

$$\begin{array}{r} 8 \\ \wedge \\ 2 \ 4 \\ \wedge \\ 2 \ 2 \\ \\ x^3 \\ \wedge \\ x \ x^2 \\ \wedge \\ x \ x \end{array}$$

$$\sqrt{81y^2} = 9y$$

~~$$\sqrt{3 \cdot 3 \cdot 3 \cdot 3 \cdot y \cdot y}$$~~

$$\begin{array}{r} 33y \\ \hline 9y \end{array}$$

$$\begin{array}{r} 81 \\ \wedge \\ 3 \ 27 \\ \wedge \\ 3 \ 9 \\ \wedge \\ 3 \ 3 \\ \\ y^2 \\ \wedge \\ y \ y \end{array}$$

$$\sqrt{20x^2y^5}$$

$$\sqrt{2 \cdot 2 \cdot 5 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y}$$

$$2xyy\sqrt{5y} = 2xy^2\sqrt{5y}$$

$$\begin{array}{r} 20 \\ \wedge \\ 2 \ 10 \\ \wedge \\ 2 \ 5 \end{array}$$

$$\begin{array}{r} x^2 \\ \wedge \\ x \cdot x \end{array}$$

$$\begin{array}{r} y^5 \\ \wedge \\ y \ y^4 \\ \wedge \\ y \ y^3 \\ \wedge \\ y \ y^2 \\ \wedge \\ y \ y \\ \wedge \\ y \end{array}$$

$$\sqrt[3]{48a^3b^4}$$

$$2 \cdot 2 \cdot a \cdot b \cdot b \cdot \sqrt[3]{3a}$$

$$\sqrt[3]{(4ab^2\sqrt{3a})}$$

$$\sqrt[3]{12ab^2\sqrt{3a}}$$

$$12ab^2\sqrt{3a}$$

$$\sqrt[3]{(4ab^2)\sqrt{3a}}$$

$$\begin{array}{r} 48 \\ \wedge \\ 2 \ 24 \\ \wedge \\ 2 \ 12 \\ \wedge \\ 2 \ 6 \\ \wedge \\ 2 \ 3 \end{array}$$

$$\begin{array}{r} a^3 \\ \wedge \\ 9 \cdot 8 \cdot 1 \\ \wedge \\ 6 \cdot 4 \\ \wedge \\ 6 \cdot 8 \cdot 1 \cdot 6 \end{array}$$

