$\sqrt{25}$ = radical expression

$\sqrt{}$ = radical sign

25 = radicand, the expression under the $\sqrt{}$.

$\sqrt{25} = 5^2$ or $(-5)^2$

The positive square root = the principal square root.

$-\sqrt{25} = -5$ This is the negative square root

$(-5)^2 = 25$

Perfect square a # whose square root is a whole #

1 4 9 16 25

Simplify radical expressions

$\sqrt{4x} \cdot \sqrt{6x} = \sqrt{24x^2}$ *Find the perfect squares

$2\sqrt{x} \cdot \sqrt{6x}$

$2\sqrt{6x^2}$

$2x\sqrt{6}$

or

$\sqrt{4} \cdot \sqrt{6} \cdot \sqrt{x^2}$

$2 \cdot \sqrt{6} \cdot x$

$2x\sqrt{6}$

$2x\sqrt{6}$

$$\sqrt{\frac{18x^4}{6x}}$$

* Always try to simplify first

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

$$x\sqrt{3x}$$

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

$\sqrt{5} \cdot \sqrt{5} = \sqrt{5^2} = \sqrt{25} = 5$

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

even # of x

$\sqrt{x^2} = x$

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

$\sqrt{x^7}$ $x^3\sqrt{x}$

$\sqrt{75}$

$\sqrt{25 \cdot 3}$

$5\sqrt{3}$

$\sqrt{5x} \cdot \sqrt{10x^4}$

$\sqrt{50x^5}$

$x^2\sqrt{\cancel{25}} \cdot \boxed{\sqrt{2} \cdot \sqrt{x}}$

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

Add/Subtract Radical Expressions

* Only add or subtract like radicals. Simplify first.

$$6\sqrt{24x^3} - \sqrt{6x}$$

$$6\cdot\overbrace{\sqrt{4}\cdot\sqrt{6}\cdot\sqrt{x^2}\cdot\sqrt{x}} \quad -6x$$

$$6\cdot 2\cdot\sqrt{6}\cdot x\cdot\sqrt{x} \quad -6x$$

$$12x\sqrt{6x} - 1\sqrt{6x} = (12x-1)\sqrt{6x}$$

Simplify

$$6\sqrt{24x^3} - \sqrt{6x}$$

$$6 \cdot 2x\sqrt{6x} \quad - \sqrt{6x}$$

$$12x\sqrt{6x} - 1\sqrt{6x}$$

$$(12x-1)\sqrt{6x}$$

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

$$7\sqrt{2} + 5\sqrt{2} = 12\sqrt{2}$$

$$7\sqrt{2} + 1\sqrt{2} = 8\sqrt{2}$$

$$7\sqrt{3} + \sqrt{12}$$

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

$$7\sqrt{3} + 2\sqrt{3} = 9\sqrt{3}$$

$$4\sqrt{50x} - 6\sqrt{32x}$$

$$4 \sqrt{25} \cdot \sqrt{2x} - 6 \cdot \sqrt{16} \cdot \sqrt{2x}$$

$$4 \cdot 5 \cdot \sqrt{2x} - 6 \cdot 4 \cdot \sqrt{2x}$$

$$20\sqrt{2x} - 24\sqrt{2x} = -4\sqrt{2x}$$

Rationalizing the denominator

You cannot have a radical in the denominator:

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

Both perfect squares

Square a $\sqrt{\ }$ and you get the #: $\sqrt{3} \cdot \sqrt{3} = \sqrt{9} = 3$

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

$$\frac{15}{\sqrt{6}}\cdot\frac{\sqrt{6}}{\sqrt{6}} = \frac{\cancel{15}\sqrt{6}}{\cancel{6}} = \frac{5\sqrt{6}}{2}$$

$$\frac{\sqrt{3x}}{\sqrt{9}} = \frac{\sqrt{3x}}{3}$$

$$\frac{\sqrt{4x^3}}{\sqrt{8x^5}}$$

$$\frac{2x\sqrt{x}\cdot\sqrt{2x}}{2x^2\sqrt{2x}\cdot\sqrt{2x}}$$

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

$$\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\cancel{3}\sqrt{3}}{\cancel{3}} = \sqrt{3}$$

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

$$\frac{\sqrt{4x^3}}{\sqrt{8x^5}}$$

Rationalize a denominator with 2 terms

Multiply by the conjugate (use opposite sign)

$$\frac{1}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

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

middle term drops out

$$4-3 = 1$$ denominator

$$\frac{1}{2-\sqrt{3}} \cdot \frac{(2+\sqrt{3})}{(2+\sqrt{3})} = \frac{2+\sqrt{3}}{1} = 2+\sqrt{3}$$

Solve

$$\frac{7}{5+\sqrt{3}} \cdot \frac{(5-\sqrt{3})}{(5-\sqrt{3})} = \frac{35-7\sqrt{3}}{25-3}$$

$$= \frac{35-7\sqrt{3}}{22}$$

$$\frac{8}{3\sqrt{2}-4}$$

$$\frac{h}{\sqrt{x+h}-\sqrt{x}}$$

$$\frac{7}{5+\sqrt{3}} \cdot \frac{5-\sqrt{3}}{5-\sqrt{3}}$$

$$\frac{7(5-\sqrt{3})}{(5+\sqrt{3})(5-\sqrt{3})} = \frac{35-7\sqrt{3}}{25-3}$$

$$= \frac{35-7\sqrt{3}}{22}$$

January 30, 2012

$$\frac{8}{4+\sqrt{5}}$$

The n^{th} root

$\sqrt[5]{32} = 2$ then $2^5 = 32$

$\sqrt[n]{a} = b$ then $b^n = a$

n is the index

If the index is even then the radicand is positive. If the index is odd then the radicand can be positive or negative.

$$2^3$$

$$\sqrt[3]{24}$$

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

$$2\sqrt[3]{3}$$

$$\sqrt{24}$$

$$\sqrt{4}\cdot\sqrt{6}$$

$$2\sqrt{6}$$

$$\sqrt[4]{8}\cdot\sqrt[4]{4}$$

$$\sqrt[4]{32}$$

$$\sqrt[4]{16}\cdot\sqrt[4]{2}$$

$$2\sqrt[4]{2}$$

Square root: $n=2$ (even #)

$\sqrt[2]{-16}$ does not exist

<u>Solve</u>

$\sqrt[3]{27}$ $\sqrt[3]{-27}$

$\sqrt{16}$ $\cancel{\sqrt{16}}$

$$\sqrt[5]{32x^6}$$

$$2^5 = 32$$

$$2x\sqrt[5]{x}$$

$$\sqrt{x^3} = \sqrt{x}\cdot\sqrt{x}\cdot\sqrt{x}$$

$$x\sqrt{x}$$

$$\sqrt[4]{\frac{162x^5}{2x}} = \sqrt[4]{81x^4}$$

3^4

$3x$

$$\sqrt[3]{12} \cdot \sqrt[3]{4}$$

$$\sqrt[3]{48}$$

$$\sqrt[3]{8} \cdot \sqrt[3]{6}$$

$$2\sqrt[3]{6}$$