$(x)(x) = x^2$
$(x^2)(x^2) = x^4$
$(x^3)(x^3) = x^6$

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

$2 \times 2 = 4 \rightarrow \sqrt{4} = 2$
$3 \times 3 = 9 \rightarrow$
$4 \times 4 = 16$
$5 \times 5 = 25 \quad \sqrt{25} = 5$
$= 36$

$2 \times 2 \times 2 = 8$
$3 \times 3 \times 3 = 27$
$4 \times 4 \times 4 = 64$
$5 \times 5 \times 5 = 125$

Math 20-2: Radical Tutorial

1. Convert to a mixed radical in simplest form.

a) $\sqrt{50x^5}$

$\sqrt{25x^4}\sqrt{2x}$

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

b) $\sqrt[3]{40}$

$\sqrt[3]{8}\sqrt[3]{5}$

$2\sqrt[3]{5}$

2. Convert to an entire radical.

a) $3\sqrt{5} = \sqrt{3 \times 3}\sqrt{5}$

$= \sqrt{9}\sqrt{5}$

$= \sqrt{45}$

b) $5\sqrt[3]{3} = \sqrt[3]{5 \times 5 \times 5}\sqrt[3]{3}$

$= \sqrt[3]{125}\sqrt[3]{3}$

$= \sqrt[3]{375}$

3. Add, subtract, multiply and simplify radical expressions.

a) $\sqrt{54} + \sqrt{24} - \sqrt{96}$

$= \sqrt{9}\sqrt{6} + \sqrt{4}\sqrt{6} - \sqrt{16}\sqrt{6}$

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

$= \sqrt{6}$

b) $3\sqrt{12} + 2\sqrt{45} - 5\sqrt{20}$

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

$= 3(2)\sqrt{3} + 2(3)\sqrt{5} - 5(2)\sqrt{5}$

$= 6\sqrt{3} + 6\sqrt{5} - 10\sqrt{5}$

$= 6\sqrt{3} - 4\sqrt{5}$

(#)(#) (rad)(rad)

c) $2\sqrt{3}(2\sqrt{6}-4\sqrt{15})$

$= 4\sqrt{18} - 8\sqrt{45}$

$= 4\sqrt{9}\sqrt{2} - 8\sqrt{9}\sqrt{5}$

$= 4(3)\sqrt{2} - 8(3)\sqrt{5}$

$= 12\sqrt{2} - 24\sqrt{5}$

d) $(5\sqrt{6}+\sqrt{3})^2$

$(5\sqrt{6}+\sqrt{3})(5\sqrt{6}+\sqrt{3})$

$= 25\sqrt{36} + 5\sqrt{18} + 5\sqrt{18} + \sqrt{9}$

$= 25(6) + 10\sqrt{18} + 3$

$= 150 + 10\sqrt{9}\sqrt{2} + 3$

$= 153 + 10(3)\sqrt{2}$

$= 153 + 30\sqrt{2}$

mult by both radical

Num ÷ Num
Rad ÷ Rad

4. Rationalize the denominator.

a) $\frac{8\sqrt{x^5}}{2\sqrt{x}}$

$= 4\sqrt{x^4}$

$= 4x^2$

b) $\frac{\sqrt{72}}{4\sqrt{8}}$

$= \frac{\sqrt{9}}{4}$

$= \frac{3}{4}$

c) $\frac{3\sqrt{5}-7\sqrt{2}}{\sqrt{10}}\left(\frac{\sqrt{10}}{\sqrt{10}}\right)$

$= \frac{3\sqrt{50}-7\sqrt{20}}{\sqrt{100}}$

$= \frac{3\sqrt{25}\sqrt{2} - 7\sqrt{4}}{10}$

$= \frac{3(5)\sqrt{2} - 7(2)\sqrt{5}}{10}$

$= \frac{15\sqrt{2} - 14\sqrt{5}}{10}$

15, 14, 10 ÷ ?? nothing

d) $\frac{4\sqrt{8}}{\sqrt{48}} \begin{matrix} \div 8 \\ \div 8 \end{matrix} = \frac{4}{\sqrt{6}}\left(\frac{\sqrt{6}}{\sqrt{6}}\right)$

$= \frac{4\sqrt{6}}{\sqrt{36}} = \frac{4\sqrt{6}}{6}$ ÷2

$= \frac{2\sqrt{6}}{3}$

I. isolate √
II. square.
III. solve

5. Solve radical equations.

a) $\sqrt{x+2} = 5$ square

$x+2 = 25$ opp steps
-2

$x = 23$

b) $4(\sqrt{5x-2}) = 104$ ÷4 Isolate

$\sqrt{5x-2} = 26$ square II

$5x-2 = 676$ add 2 III. solve

$5x = 678$ ÷5

$x = 135.6$