Working With Radicals Feb 1/2011

Recall: The simplest quadratic relation is $y = x^2$

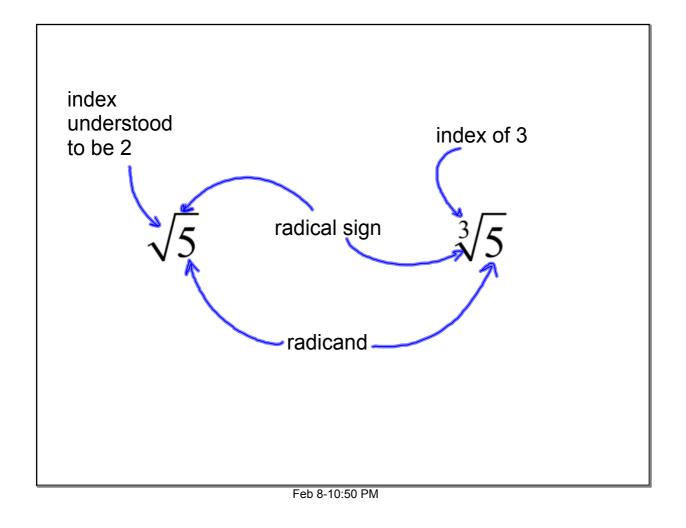
On rearranging, it is possible to get answers in the form $x = \pm \sqrt{y}$

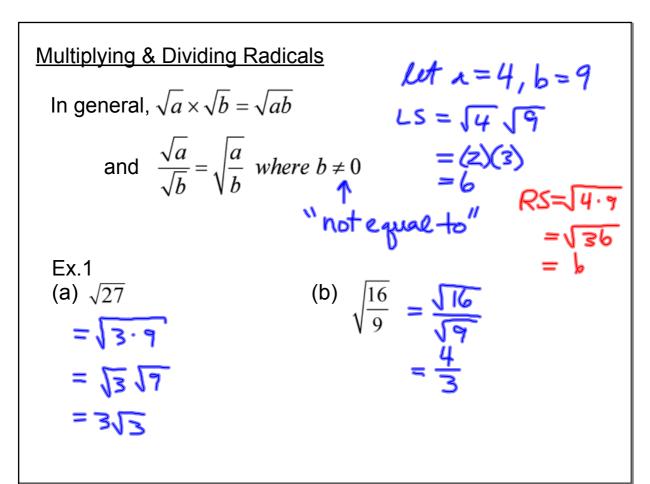
With actual values, we might see results such as

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

It is often required to keep answers in this exact form.

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Simplifying Radicals

A radical is in its simplest form when:

 the radicand has no perfect square factors (other than 1)

$$\sqrt{8}=\sqrt{4}\sqrt{2}=2\sqrt{2}$$

- the radicand contains no fractions

$$\sqrt{\frac{1}{4}} = \frac{1}{2}$$

- no radical appears in the denominator

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

Ex.2 Simplify

(a)
$$\sqrt{32}$$

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

$$= 4\sqrt{2}$$

$$= 2\sqrt{3} \cdot 5 \cdot 5$$

$$= 2\sqrt{3} \cdot 5 \cdot 5$$

$$= 2 \cdot 5\sqrt{3}$$

$$= 10\sqrt{3}$$
(c) $-3\sqrt{8}$

$$= -3\sqrt{2 \cdot 2 \cdot 2}$$

$$= -6\sqrt{2}$$
(d) $\frac{1}{2}\sqrt{\frac{72}{25}} = \frac{1}{2} \cdot \frac{8 \cdot 9}{5}$

$$= \frac{3\sqrt{8}}{10}$$

$$= \frac{3\sqrt{2} \cdot 2 \cdot 2}{10}$$

$$= \frac{3\sqrt{2}}{10}$$

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Homework:

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$$\frac{2(c)}{\sqrt{60}} = \sqrt{\frac{3}{3}} \times \sqrt{\frac{3}{3}}$$

$$= \sqrt{20}$$

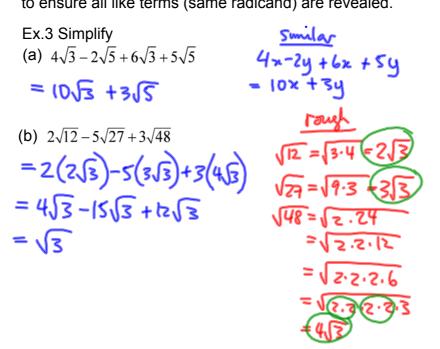
$$=$$

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Adding & Subtracting Radicals

Feb 10/2011

To add or subtract radicals, they must have the same <u>radicand</u>. It is advisable to simplify radicals to ensure all like terms (same radicand) are revealed.



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Binomial Multiplication of Radicals

Recall:
$$(a+b)(c+d) = 3b+ad+bc+bd$$

Ex.4 Expand & Simplify

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

$$= 6\sqrt{25} - 9\sqrt{5} + 4\sqrt{5} - 6 \implies (3x+2)(2x-3)$$

$$= 6\sqrt{25} - 9\sqrt{5} + 4\sqrt{5} - 6 \implies (6x^2 - 9x + 4x - 6)$$

$$= 30 - 5\sqrt{5} - 6$$

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

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Rationalizing the Denominator

A radical is not permitted in the denominator. If the denominator is a binomial, multiply by the conjugate of the denominator.

Given $a\sqrt{b} + c\sqrt{d}$, the conjugate would be $a\sqrt{b} - c\sqrt{d}$ Given $a\sqrt{b} - c\sqrt{d}$ the conjugate would be $a\sqrt{b} + c\sqrt{d}$

Ex.5 Find the conjugate of each radical

(a)
$$\sqrt{5} - \sqrt{2}$$
 (b) $3\sqrt{5} + 2\sqrt{10}$ conjugate is $3\sqrt{5} - 2\sqrt{10}$

Ex.6 Rationalize the denominator

$$\frac{4\sqrt{3}-2\sqrt{2}}{\sqrt{3}-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = 1$$

$$= \frac{(4\sqrt{3}-2\sqrt{2})(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = 2^{2}-y^{2}$$

$$= \frac{4\sqrt{9}+4\sqrt{6}-2\sqrt{6}-2\sqrt{4}}{\sqrt{9}+\sqrt{6}-\sqrt{6}-\sqrt{4}} = \frac{12+2\sqrt{6}-4}{3-2}$$

$$= \frac{8+2\sqrt{6}}{3}$$

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Homework: $\begin{array}{l} p.106 \# (1-4)(\text{odd}) \\ p.139 \# (1-7)(\text{odd}) \end{array}$ $\begin{array}{l} 6(c) \frac{2}{\sqrt{7}} \times \sqrt{7} \\ = \frac{2\sqrt{7}}{\sqrt{49}} \\ = \frac{2\sqrt{7}}{7} \end{array}$

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$$5(e) \sqrt{2} (\sqrt{3} + 4) \qquad \text{what if?}$$

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

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

$$=$$

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$$5(n) (2\sqrt{7} + 3\sqrt{5})(2\sqrt{7} - 3\sqrt{5})$$

$$= 4\sqrt{49} - 6\sqrt{35} + 6\sqrt{35} - 9\sqrt{25}$$

$$= 28 - 45$$

$$= -17$$

$$= -17$$

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

$$= 4(7) - 9(5)$$

$$= -17$$

$$= 7$$
Eat 11.10.30 AM

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