2.2 - Operations with Radicals

What is a "***like radical***"?

Ex. Like or unlike?

a) $\sqrt{3}$, $\sqrt{3}$

like

b) $2\sqrt{7}$, $\sqrt{7}$

like

c) $2\sqrt{5}$, $5\sqrt{2}$

NOT LIKE

*simplify all radicals
*combine like radicals

Adding and Subtracting Like Radicals

a) $\sqrt{27}+\sqrt{20}-\sqrt{12}+\sqrt{45}$

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

$= \underbrace{3\sqrt{3} - 2\sqrt{3}} + \underbrace{2\sqrt{5} + 3\sqrt{5}}$

$= \sqrt{3} + 5\sqrt{5}$

b) $7\sqrt{2}-6\sqrt{63}-\sqrt{28}+5\sqrt{18}$

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

$= 7\sqrt{2} - 18\sqrt{7} - 2\sqrt{7} + 15\sqrt{2}$

$= 22\sqrt{2} - 20\sqrt{7}$

Multiplying Radicals *multiply first, then simplify

a) $\sqrt{3}\left(\sqrt{6}+5\right)$

$=\sqrt{3}\sqrt{6}+\sqrt{3}\cdot 5$

$=\sqrt{18}+5\sqrt{3}$

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

b) $4\sqrt{5}\left(2\sqrt{8}-3\sqrt{5}\right)$

$=8\sqrt{40}-12\sqrt{5}\sqrt{5}$

$=8\sqrt{40}-12(5)$

$=8\cdot 2\sqrt{10}-60$

$=16\sqrt{10}-60$

$12\sqrt{25}$

$12(5)$

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

$=8(3)+4\sqrt{15}-4\sqrt{15}-2(5)$

$=24-10$

$=14$

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

d) $\left(2\sqrt{5}-\sqrt{3}\right)^2$

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

$=20-4\sqrt{15}+3$

$=23-4\sqrt{15}$

Oct 2-11:05 AM

More Rationalizing Denominators...

a) $\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

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

b) $\frac{3\sqrt{5}}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{3\sqrt{10}}{4 \cdot 2}$

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

c) $\frac{5\sqrt{10}}{15\sqrt{20}}$

$= \frac{\cancel{5}\sqrt{\cancel{10}}}{\overset{3}{\cancel{15}}\sqrt{\cancel{10}}\sqrt{2}}$

$= \frac{1}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

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

$\frac{\sqrt{10}}{\sqrt{20}}$

$= \sqrt{\frac{10}{20}}$

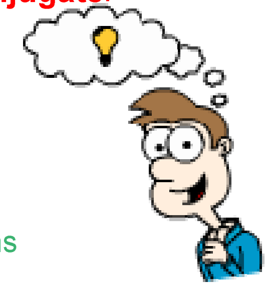
$= \sqrt{\frac{1}{2}}$

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

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

What if the denominator is more complicated and it needs rationalization?

You must multiply by the **conjugate**.



The conjugate of
a+b is a-b.

ie. Change the sign
between the two terms

Note: See a pattern?

Differenca of
Squares !!!

e) $$\frac{5}{2\sqrt{6}-\sqrt{3}} \cdot \frac{2\sqrt{6}+\sqrt{3}}{2\sqrt{6}+\sqrt{3}}$$

$$= \frac{5(2\sqrt{6}+\sqrt{3})}{(2\sqrt{6})^2-(\sqrt{3})^2}$$

$$= \frac{10\sqrt{6}+5\sqrt{3}}{4(6)-3}$$

$$= \frac{10\sqrt{6}+5\sqrt{3}}{21}$$

f) $$\frac{\sqrt{2}+\sqrt{5}}{\sqrt{6}-\sqrt{10}} \cdot \frac{\sqrt{6}+\sqrt{10}}{\sqrt{6}+\sqrt{10}}$$

$$= \frac{\sqrt{2}\sqrt{6}+\sqrt{2}\sqrt{10}+\sqrt{5}\sqrt{6}+\sqrt{5}\sqrt{10}}{6-10}$$

$$= \frac{\sqrt{12}+\sqrt{20}+\sqrt{30}+\sqrt{50}}{-4}$$

$$= -\frac{2\sqrt{3}+2\sqrt{5}+\sqrt{30}+5\sqrt{2}}{4}$$

Practice

p. 139
#1ac,2ce,3acg,5cgi,
6ag,7aegj,13,17ace, 19a

The teacher to a student: Conjugate the verb “to walk” in simple present.
The student: I walk… um… You walk …. um…
The teacher interrupts him: Quicker please.
The student: I run… You run…