2.2 - Operations with Radicals

What is a like radical?

Ex. Like or unlike?
a) $3\sqrt{2}, 5\sqrt{2}, -3\sqrt{2}$ like
b) $\sqrt{8}, \sqrt{2}, \sqrt{32}$ like
c) $\sqrt{3}, 5\sqrt{5}$ unlike

*simplify all radicals
*combine like radicals

A. Adding and Subtracting Like Radicals

a) $\sqrt{27}+\sqrt{20}-\sqrt{12}+\sqrt{45}$
$=3\sqrt{3}+2\sqrt{5}-2\sqrt{3}+3\sqrt{5}$
$=\sqrt{3}+5\sqrt{5}$

b) $7\sqrt{2}-6\sqrt{63}-\sqrt{28}+5\sqrt{18}$
$=7\sqrt{2}-18\sqrt{7}-2\sqrt{7}+15\sqrt{2}$
$=22\sqrt{2}-20\sqrt{7}$

B. Multiplying Radicals *multiply first, then simplify

a) $\sqrt{3}(\sqrt{6}+5)$
$=\sqrt{3}\sqrt{6}+5\sqrt{3}$
$=\sqrt{18}+5\sqrt{3}$
$=3\sqrt{2}+5\sqrt{3}$

$4\sqrt{5}(2\sqrt{8}-3\sqrt{5})$
$=8\sqrt{5}\sqrt{8}-12\sqrt{5}\sqrt{5}$
$=8\sqrt{40}-12\sqrt{25}$
$=8\sqrt{4}\sqrt{10}-60$
$=16\sqrt{10}-60$

Feb 25-10:32 PM

FOIL!!!

c) $(2\sqrt{3}-\sqrt{5})(4\sqrt{3}+2\sqrt{5})$
$=8(3)+4\sqrt{15}-4\sqrt{15}-2(5)$
$=24-10$
$=14$

d) $(2\sqrt{5}-\sqrt{3})^2 = (2\sqrt{5}-\sqrt{3})(2\sqrt{5}-\sqrt{3})$
$=4(5)-2(2\sqrt{15})+3$
$=20-4\sqrt{15}+3$
$=23-4\sqrt{15}$

C. Rationalizing Denominators Ensure no radicals in denom.

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

b) $\frac{3\sqrt{5}}{4\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}$
$=\frac{3\sqrt{5}\sqrt{2}}{4(2)}$
$=\frac{3\sqrt{10}}{8}$

c) $\frac{5\sqrt{10}}{15\sqrt{20}}$
$=\frac{\sqrt{10}}{3\sqrt{10}\sqrt{2}}$
$=\frac{1}{3\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}$
$=\frac{\sqrt{2}}{6}$

Feb 25-10:48 PM

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

You must multiply by the **conjugate**.

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

$= \frac{10\sqrt{6}+5\sqrt{3}}{4(6)+2\sqrt{18}-2\sqrt{18}-3}$

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

The conjugate of a+b is a-b.

ie. Change the sign between the two terms

Note: See a pattern?

Manufacturing a Difference of Squares!

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

$= \frac{\sqrt{12}+\sqrt{20}+\sqrt{30}+\sqrt{50}}{6-10}$

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

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

Feb 25-10:53 PM

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

Feb 25-11:01 PM