PC11 Lesson 5.2

Monday, April 17, 2017 8:53 PM

5.2 Multiplying and Dividing Radical Expressions

Warm Up:

Multiply.

a) $(2s^2t)(3s^2t)$ **b)** $(-3x)(2xp)$ **c)** $-2b(3b-1)$ **d)** $(3x-4y)(x-2y)$

$= 2\times 3\ s^4t^2$

$= 6s^4t^2$

$= -6x^2p$

$= -6b^2 + 2b$

$= 3x^2 - 6xy - 4xy + 8y^2$

$= 3x^2 - 10xy + 8y^2$

Divide:

a) $\frac{-6x^2y}{3x}$ **b)** $\frac{(4x^2y)^3}{4}$ **c)** $\frac{5(ab^3)^2}{20a^3}$

$= -2xy$

$= \frac{4^3x^6y^3}{4}$

$= 4^2x^6y^3$

$= 16x^6y^3$

$= \frac{5a^2b^6}{20a^3} = \frac{b^6}{4a}$

When multiplying radicals:

1. multiply the coefficients together.
2. multiply the radicands together
3. Simplify

*If you can simplify, do it. *

Only radicals with the same index can be multiplied together.

Example 1: Multiply and simplify:

a. $3\sqrt{2}\times\sqrt{5}$

$= 3\sqrt{2}\times 1\sqrt{5}$

$= 3\sqrt{10}$

b. $4\sqrt{3}\times\sqrt{12}$

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

$= 8\sqrt{9}$

$= 8\cdot 3 = 24$

OR

$4\sqrt{3}\times\sqrt{12}$

$= 4\sqrt{36}$

$= 4\cdot 6$

$= 24$

g. $-4\sqrt{a}\left(\sqrt{a}-9\sqrt{b}\right)$

$= -4\sqrt{a^2} + 36\sqrt{ab}$

$= -4a + 36\sqrt{ab}$

h. $\left(\sqrt{6}-2\sqrt{3}\right)\left(\sqrt{6}+2\sqrt{3}\right)-4$

$= 6 + \cancel{2\sqrt{18}} - \cancel{2\sqrt{18}} - 4\sqrt{9} - 4$

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

$= 6 - 4\cdot 3 - 4$

$= 6 - 12 - 4$

$= -10$

Similarly to multiplying radicals, when dividing radicals we divide the coefficients by coefficients and radicands by radicands, then simplify.

Example 1: Simplify:

a. $\frac{2\sqrt{15}}{\sqrt{3}}$

$= 2\sqrt{15 \div 3}$

$= 2\sqrt{5}$

b. $\frac{\sqrt{36}}{\sqrt{2}}$

$= \sqrt{36 \div 2}$

$= \sqrt{18}$

$= 3\sqrt{2}$

e. $\frac{\cancel{10}^{1}\sqrt[3]{162}}{\cancel{20}_{2}\sqrt[3]{128}}$

$= \frac{1}{2}\sqrt[3]{162 \div 128}$

$= \frac{1}{2}\sqrt[3]{\frac{81}{64}}$

$= \frac{1}{2}\sqrt[3]{\frac{27 \times 3}{64}} = \frac{1}{2}\frac{\sqrt[3]{27 \times 3}}{\sqrt[3]{64}}$

$= \frac{1}{2}\frac{3\sqrt[3]{3}}{4}$

$= \frac{3\sqrt[3]{3}}{8}$

f. $\frac{\sqrt{24}+\sqrt{48}-\sqrt{108}}{\sqrt{6}}$ $= \frac{\sqrt{24}}{\sqrt{6}} + \frac{\sqrt{48}}{\sqrt{6}} - \frac{\sqrt{108}}{\sqrt{6}}$

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

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

$= 2 - \sqrt{2}$

If the denominator of the answer is irrational, it must be changed. This is called **rationalizing the denominator** and is done in two ways.

(Your numbers will be smaller if you simplify your Radicals first)

1. For a **monomial denominator**, multiply the numerator and denominator by the radical term from the denominator.

Eg. $\frac{3}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{2 \times 6} = \frac{3\sqrt{6}}{12} = \frac{\sqrt{6}}{4}$

2. For a **binomial denominator**, multiply the numerator and deonominator by the **conjugate** of the denominator.

Eg. $\frac{5\sqrt{3}}{4-\sqrt{6}} \times \frac{(4+\sqrt{6})}{(4+\sqrt{6})} = \frac{20\sqrt{3}+5\sqrt{18}}{16+\cancel{4\sqrt{6}}-\cancel{4\sqrt{6}}-6}$

$= \frac{20\sqrt{3}+5\sqrt{18}}{16-6}$

$\sqrt{18} = 3\sqrt{2}$

$5 \times 3\sqrt{2}$

$= \frac{20\sqrt{3}+15\sqrt{2}}{10} = \frac{4\sqrt{3}+3\sqrt{2}}{2}$

Homework: p. ~~289 # 1 – 6 (a, c), 7a, 8-11 (a, c), 13, 17, 19, 21, 23, 26~~

$= 2 - \sqrt{2}$

$\boxed{\text{Rationalize}}$

- convert a rational number w/ost changing the value of expression

$\boxed{\text{Conjugate}}$

- two binomial factors whose product is the difference of two squares.

$(a+b)$ and $(a-b)$ product $a^2 - b^2$