5.2 Multiplying and Dividing Radical Expressions (Day 1)

OBJ: To multiply and divide radical expressions with the same index

* bases must match

Power of a Product	Product of Powers	Monomial Divide Monomial	Zero Exponent	Negative Exponents
$(x^{2/3})^{3/2} = x$	$y^{2/3} \bullet y^{1/5} = y^{13/15}$	$\frac{x^8}{x^2} = x^6$		
If you have a product to a power, then you multiply multiply.	Take a product times a product, side-by-side, then add them, then add them	Product divide product, then the exponents subtract		

Properties of Radicals

- Let a and b be real numbers and let n be an integer greater than 1.

Property Name	Definition	Example
Product Property * index must match	$\sqrt[n]{a} \bullet \sqrt[n]{b} = \sqrt[n]{ab}$	Ex. $\sqrt[3]{2} \cdot \sqrt[3]{3} = \sqrt[3]{6}$
Quotient Property	$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$	Ex. $\sqrt[3]{\frac{8}{27}} = \frac{\sqrt[3]{8}}{\sqrt[3]{27}} = \frac{2}{3}$

1. Multiply $\sqrt{3}(\sqrt{12} - \sqrt{21})$

$= \sqrt{3 \cdot 12} - \sqrt{3 \cdot 21}$

$= \sqrt{36} - \sqrt{63}$

$= 6 - \sqrt{7} \cdot \sqrt{9}$

$\boxed{= 6 - 3\sqrt{7}}$

2. Multiply or divide and simplify:

a. $\sqrt[3]{4} \cdot \sqrt[3]{6}$

$2 \cdot 2 \quad 3 \cdot 2$

$= \sqrt[3]{\cancel{2 \cdot 2 \cdot 2} \cdot 3}$

$\boxed{= 2\sqrt[3]{3}}$

b. $\sqrt[3]{49xy^3} \cdot \sqrt[3]{21xy^2}$

$7 \cdot 7 \quad 7 \cdot 3$

$= \sqrt[3]{\cancel{7 \cdot 7 \cdot 7}\, 3x^2y^5}$

$\cancel{y \cdot y \cdot y} \cdot y \cdot y$

$\boxed{= 7y\sqrt[3]{3x^2y^2}}$

c. $5\sqrt{7x^3y} \cdot 2\sqrt{28y^2}$

$7 \quad 4 \quad 2 \cdot 2$

$= 10\sqrt{\cancel{7 \cdot 7}\,\cancel{2 \cdot 2}\, x^3 y^3}$

$\cancel{x \cdot x} \cdot x \quad \cancel{y \cdot y} \cdot y$

$= 10 \cdot 7 \cdot 2 \cdot x \cdot y\sqrt{xy}$

$\boxed{= 140xy\sqrt{xy}}$

d. $2\sqrt[3]{6x^4y} \cdot 3\sqrt[3]{9x^5y^2}$

$3 \cdot 2 \quad 3 \cdot 3$

$= 6\sqrt[3]{\cancel{3 \cdot 3 \cdot 3} \cdot 2\, \cancel{x^9}\, \cancel{y^3}}$

$\cancel{x^3}\,\cancel{x^3}\,\cancel{x^3}$

$= 6 \cdot 3x^3y\sqrt[3]{2}$

$\boxed{= 18x^3y\sqrt[3]{2}}$

e. $\frac{\sqrt[3]{15x^4y}}{\sqrt[3]{5x^2y}} = \sqrt[3]{\frac{15x^4\cancel{y}}{5x^2\cancel{y}}}$

$\boxed{= \sqrt[3]{3x^2}}$

f. $\frac{\sqrt[3]{75x^7y^2}}{\sqrt[3]{25x^4}} = \sqrt[3]{\frac{75x^7y^2}{25x^4}}$

$= \sqrt[3]{3x^3y^2}$

$\boxed{= x\sqrt[3]{3y^2}}$

3. Rationalize the denominator. (No √ in the denominator.)

a. $\frac{\sqrt[3]{x}}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2 \cdot 2}}{\sqrt[3]{2 \cdot 2}} = \frac{\sqrt[3]{2 \cdot 2x}}{\sqrt[3]{2 \cdot 2 \cdot 2}} = \boxed{\frac{\sqrt[3]{4x}}{2}}$

b. $\frac{\sqrt{7x^4y}}{\sqrt{5xy}} \cdot \frac{\sqrt{5xy}}{\sqrt{5xy}} = \frac{\sqrt{7 \cdot 5\, x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y}}{\sqrt{5 \cdot 5 \cdot x \cdot x \cdot y \cdot y}} = \frac{x^2 \cancel{y}\sqrt{35x}}{5\cancel{x}\cancel{y}}$

$\boxed{= \frac{x\sqrt{35x}}{5}}$

5.2 Multiply & Divide Radicals (Day 1) HW Name___________________________

Multiply or divide, if possible. Then simplify. Assume all variables are positive. Circle your answers

1. $\sqrt[3]{16}\cdot\sqrt[3]{4}$

2. $\sqrt{x^2y}\cdot\sqrt{4xy}$

3. $\sqrt{5x^3}\cdot\sqrt{10x}$

4. $\sqrt[4]{162x^{15}y^{12}}$

5. $\sqrt{7x^3y}\cdot\sqrt{28y^5}$

6. $\sqrt[3]{50x^2z^5}\cdot\sqrt[3]{15y^3z}$

7. $\dfrac{\sqrt{54x^5y^3}}{\sqrt{2x^2y}}$

8. $\sqrt[4]{\dfrac{243k^7}{3k^3}}$

9. $\dfrac{\sqrt{63xy^3}}{\sqrt{7y}}$

10. $4\sqrt{2x}\cdot 3\sqrt{8x}$

11. $\dfrac{\sqrt{6x}}{\sqrt{3x}}$

12. $\dfrac{\sqrt[3]{4x^2}}{\sqrt[3]{x}}$

14. $\sqrt{2}(\sqrt{32}-\sqrt{14})$

15. $\sqrt{2}(\sqrt{8}-\sqrt{6})$

Warm-Up

Simplify #1-5 below (put just the answers at the top of your notes.

$5^3 = 5 \cdot 5 \cdot 5$

$x^4 \cdot x^4 \cdot x^4$

1. $(x^4)^3$ $\boxed{x^{12}}$

2. $y^3 y^4$ $\boxed{y^7}$

3. $\frac{x^7}{x^4}$ $\boxed{x^3}$

4. y^0 $\boxed{1}$

5. $\frac{x^{-1}}{1} = \boxed{\frac{1}{x}}$

$\frac{1}{x^{-1}} = x$