

## 4.0 Dividing Radicals.Sept2020

Math 20-2

Radicals

**Skill Review: divide fractions (polynomials)**

$$\frac{12}{18} = \frac{6}{9} = \frac{2}{3}$$

$$\frac{12}{18} = \frac{4}{6} = \frac{2}{3}$$

$\div 8$

$$\frac{24x^3}{16x} = \frac{3x^2}{2}$$

$$\frac{\cancel{2}x \cdot x}{\cancel{2}}$$

$$\frac{12x^2y}{16xy^3} = \frac{3x}{4y^2}$$

$$\frac{12}{16} \quad \frac{\cancel{x}x}{\cancel{y}y}$$

$$\frac{16x^2 + 24xy}{8x} = \frac{16x^2}{8x} + \frac{24xy}{8x} = \frac{2x}{1} + \frac{3y}{1} = 2x + 3y$$

**Outcome: Divide radicals; simplify where possible.**

1. Divide the following radicals. Simplify if possible.

a.  $\frac{\sqrt{18}}{\sqrt{6}} = \sqrt{\frac{18}{6}} = \sqrt{3}$

b.  $\frac{4\sqrt{80}}{8\sqrt{10}} = \frac{\sqrt{80}}{2\sqrt{10}} = \frac{\sqrt{4 \cdot 20}}{2\sqrt{10}} = \frac{2\sqrt{20}}{2\sqrt{10}} = \sqrt{\frac{20}{10}} = \sqrt{2}$

c.  $\frac{\sqrt{125}}{\sqrt{5}} = \sqrt{\frac{125}{5}} = \sqrt{25} = 5$

d.  $\frac{5\sqrt{96}}{1\sqrt{12}} = 5\sqrt{\frac{96}{12}} = 5\sqrt{8} = 5\sqrt{4 \cdot 2} = 5(2)\sqrt{2} = 10\sqrt{2}$

**Outcome: Rationalize denominators (do not leave a radical on the top and bottom of an expression).**

Math Problem: What kind of number do we get when we multiply a square root radical by itself?

$$\sqrt{5} \times \sqrt{5} = \sqrt{25} = 5$$

$$\sqrt{6} \sqrt{6} = \sqrt{36} = 6$$

$$\sqrt{10} \times \sqrt{10} = \sqrt{100} = 10$$

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$$\begin{aligned}
 \text{e. } \frac{3\sqrt{24}}{2\sqrt{5}} &= \frac{3\sqrt{4}\sqrt{6}}{2\sqrt{5}} = \frac{3(2)\sqrt{6}}{2\sqrt{5}} \\
 &= \frac{\cancel{6}\sqrt{6}}{\cancel{2}\sqrt{5}} = \frac{3\sqrt{6}\sqrt{5}}{2\sqrt{5}\sqrt{5}} \\
 &= \frac{3\sqrt{30}}{2(5)} = \frac{3\sqrt{30}}{10}
 \end{aligned}$$

$$\begin{aligned}
 \text{f. } \frac{2\sqrt{30}}{1\sqrt{8}} &= \frac{2\sqrt{15}}{1\sqrt{4}} = \frac{\cancel{2}\sqrt{15}}{\cancel{2}} \\
 &= \sqrt{15}
 \end{aligned}$$

2. Divide the following. Rationalize the denominator. Simplify wherever possible.

$$\begin{aligned}
 \text{a. } \frac{10\sqrt{12}}{2\sqrt{2}} \\
 = 5\sqrt{6}
 \end{aligned}$$

number ÷ number

radical ÷ radical

simplify

$$\begin{aligned}
 \text{b. } \frac{15\sqrt{24}}{5\sqrt{18}} & \quad \text{number } 15 \text{ and } 5 \div 5 \\
 & \quad \text{radical } 24, 18 \div 6 \\
 &= \frac{3\sqrt{4}}{\sqrt{3}} \\
 &= \frac{3(2)}{\sqrt{3}} = \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\cancel{6}\sqrt{3}}{\cancel{3}} = 2\sqrt{3}
 \end{aligned}$$

$$\text{c. } \frac{4\sqrt{6} + 8\sqrt{18}}{2\sqrt{6}}$$

$$\frac{4\sqrt{6}}{2\sqrt{6}} + \frac{8\sqrt{18}}{2\sqrt{6}}$$

$$2(1) + 4\sqrt{3}$$

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

BREAK APART WHEN  $\div$  BOTH TERMS

$$\begin{aligned}
 \text{d. } \frac{12\sqrt{60} - 15\sqrt{40}}{3\sqrt{5}} &= \frac{12\sqrt{60}}{3\sqrt{5}} - \frac{15\sqrt{40}}{3\sqrt{5}} \\
 &= 4\sqrt{12} - 5\sqrt{8} \\
 &= 4\sqrt{4\sqrt{3}} - 5\sqrt{4\sqrt{2}} \\
 &= 4(2)\sqrt{3} - 5(2)\sqrt{2} \\
 &= 8\sqrt{3} - 10\sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{e. } \frac{4\sqrt{2} - 10\sqrt{6}}{2\sqrt{3}} &= \frac{4\sqrt{6} - 10\sqrt{18}}{2(3)} \\
 &= \frac{4\sqrt{6} - 10\sqrt{9}\sqrt{2}}{6} \\
 &= \frac{4\sqrt{6} - 10(3)\sqrt{2}}{6} \\
 &= \frac{4\sqrt{6} - 30\sqrt{2}}{6} \\
 &\quad 4, 30, 6 \div 2 \\
 &= \frac{2\sqrt{6} - 15\sqrt{2}}{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{f. } \frac{5 + \sqrt{14}}{\sqrt{20}} &= \frac{5 + \sqrt{14}}{\sqrt{4}\sqrt{5}} \\
 &= \left( \frac{5 + \sqrt{14}}{2\sqrt{5}} \right) \left( \frac{\sqrt{5}}{\sqrt{5}} \right) = \frac{5\sqrt{5} + \sqrt{70}}{2(5)} \\
 &= \frac{5\sqrt{5} + \sqrt{70}}{10}
 \end{aligned}$$