

Algebra RH

Essential Question: How do we divide radicals?

Do Now:

a. $\frac{\sqrt{16}}{\sqrt{4}}$

$\sqrt{4}$

2

b. $\frac{\sqrt{16}}{\sqrt{4}}$

$\frac{4}{2}$

2

c. $\frac{\sqrt{8}}{\sqrt{4}}$

$\sqrt{2}$

d. $\frac{\sqrt{8}}{\sqrt{4}}$

$\frac{\sqrt{4}\sqrt{2}}{2}$

$\frac{2\sqrt{2}}{2}$

$\sqrt{2}$



Dividing Square Root Radicals

To divide two monomial square roots:

- Divide the coefficients to find the coefficient of the quotient.
- Divide the radicands to find the radicand of the quotient.
- * • If possible, simplify.

A. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

B. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

C. $\frac{x\sqrt{a}}{y\sqrt{b}} = \frac{x}{y} \cdot \sqrt{\frac{a}{b}}$

Examples:
 $\frac{\sqrt{24}}{\sqrt{2}} = \frac{\sqrt{24}}{2}$
 $\frac{\sqrt{12}}{\sqrt{4}\sqrt{3}} = \frac{\sqrt{12}}{2\sqrt{3}}$

$\frac{\sqrt{4}}{\sqrt{9}} = \frac{\sqrt{4}}{\sqrt{9}}$
 $\frac{2}{3}$

$\frac{6\sqrt{10}}{3\sqrt{2}} = 2\sqrt{5}$

1. $\frac{\sqrt{72}}{\sqrt{2}}$

$\frac{\sqrt{72}}{2}$
 $\frac{\sqrt{36}}{6}$

2. $7\sqrt{3} \div 3\sqrt{3}$

$\frac{7\sqrt{3}}{3\sqrt{3}}$
 $\frac{7}{3}$

* 3. $\frac{3\sqrt{54}}{6\sqrt{3}}$

$\frac{\frac{1}{2}\sqrt{18}}{\frac{1}{2}\sqrt{4}\sqrt{2}}$

4. $\sqrt{50} \div \sqrt{2} = \frac{\sqrt{25}}{5}$

$\rightarrow \frac{1}{2}(3)\sqrt{2} \rightarrow \frac{3}{2}\sqrt{2}$

5. $\frac{\sqrt{36}}{\sqrt{49}}$

$\frac{\sqrt{36}}{\sqrt{49}}$
 $\frac{6}{7}$

6. $\sqrt{\frac{8}{49}}$

$\frac{\sqrt{8}}{\sqrt{49}}$
 $\frac{\sqrt{4}\sqrt{2}}{7}$
 $\frac{2\sqrt{2}}{7}$

7. $\frac{12\sqrt{20x^5}}{3\sqrt{5x}}$

$4\sqrt{4x^4}$
 $4(2x^2)$
 $8x^2$

A fraction is not in simplest form if a radical appears in the denominator.

you must rationalize the denominator

$$A. \frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$

$$B. \frac{3}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{2 \cdot 2} \rightarrow \frac{3\sqrt{2}}{4}$$

Examples:

$$1. \frac{5}{\sqrt{8}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{\sqrt{16}}$$

$$2. \frac{3}{\sqrt{24}} \cdot \frac{\sqrt{24}}{\sqrt{24}}$$

$$3. \frac{\sqrt{2}}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$4. \frac{5\sqrt{3a^3}}{4\sqrt{8a}} \cdot \frac{\sqrt{8a}}{\sqrt{8a}}$$

or

$$\frac{5\sqrt{8}}{\sqrt{8}\sqrt{8}} \rightarrow \frac{5\sqrt{4}\sqrt{2}}{8} \rightarrow \frac{10\sqrt{2}}{8} \rightarrow \frac{5\sqrt{2}}{4}$$

$$\frac{3\sqrt{4}\sqrt{6}}{24}$$

$$\frac{3 \cdot 2\sqrt{6}}{24} \rightarrow \frac{6\sqrt{6}}{24} \rightarrow \frac{\sqrt{6}}{4}$$

$$\frac{\sqrt{6}}{2 \cdot 3} = \frac{\sqrt{6}}{6}$$

$$\frac{5\sqrt{24a^4}}{4 \cdot 8a} \rightarrow \frac{5\sqrt{4a^4}\sqrt{6}}{32a}$$

$$\frac{5(2a^2)\sqrt{6}}{32a}$$

When simplifying fractions where a binomial radical appears in the denominator, multiply the numerator and denominator by the conjugate.

Examples of conjugates:

a) $4 + \sqrt{7}$ $4 - \sqrt{7}$

b) $\sqrt{3} - 6$ $\sqrt{3} + 6$

c) $5\sqrt{2} - 1$

$5\sqrt{2} + 1$

$$\frac{10a^2\sqrt{6}}{32a}$$

$$\frac{5a\sqrt{6}}{16}$$

Rule: $(p - \sqrt{q})(p + \sqrt{q}) = p^2 - q$ $(p^2 + p\sqrt{q} - p\sqrt{q} - (\sqrt{q})^2)$

Simplify:

$$1. \frac{6}{(4 - \sqrt{2})} \cdot \frac{(4 + \sqrt{2})}{(4 + \sqrt{2})}$$

$$2. \frac{2}{(5 + \sqrt{11})} \cdot \frac{(5 - \sqrt{11})}{(5 - \sqrt{11})}$$

$$\frac{24 + 6\sqrt{2}}{16 - 2} \rightarrow \frac{12 + 3\sqrt{2}}{14} \rightarrow \frac{12 + 3\sqrt{2}}{7}$$

$$\frac{10 - 2\sqrt{11}}{25 - 11} \rightarrow \frac{10 - 2\sqrt{11}}{14} \rightarrow \frac{5 - \sqrt{11}}{7}$$

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

$$4. \frac{(\sqrt{5} + 3)}{(4 - \sqrt{5})} \cdot \frac{(4 + \sqrt{5})}{(4 + \sqrt{5})}$$

$$\frac{10 + 10\sqrt{6}}{4 - 4 \cdot 6}$$

$$\frac{4\sqrt{5} + 5 + 12 + 3\sqrt{5}}{16 - 5}$$

$$\frac{10 + 10\sqrt{6}}{4 - 24} \rightarrow \frac{10 + 10\sqrt{6}}{-20} \rightarrow \frac{1 + \sqrt{6}}{-2}$$

$$\frac{7\sqrt{5} + 17}{11}$$