PRINCIPLES - LESSON 14D
DIVIDING RADICALS

Simplify.

ex1) $\sqrt{\frac{9}{16}} = \frac{\sqrt{9}}{\sqrt{16}}$

$= \boxed{\frac{3}{4}}$

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ex2) $\sqrt{\frac{196}{25}} = \frac{\sqrt{196}}{\sqrt{25}}$

$= \boxed{\frac{13}{5}}$

THE GROUND RULES

Ground Rule #3:

How to Divide Radicals

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

(true for all real numbers)

THE THREE BASIC RULES FOR SIMPLIFYING RADICALS

THE 3 RULES FOR SIMPLIFYING RADICALS

1. There must be no perfect factors under the radical.
2. There must be no fractions under the radical. 
3. There must be no radicals in a denominator. 

A radical is simplified only when all 3 of these rules are satisfied.

Simplify.

ex3) $\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}}$

$= \boxed{\frac{\sqrt{3}}{2}}$

ex4) $\sqrt{\frac{5}{36}} = \frac{\sqrt{5}}{\sqrt{36}}$

$= \boxed{\frac{\sqrt{5}}{6}}$

THE THREE BASIC RULES FOR SIMPLIFYING RADICALS

THE 3 RULES FOR SIMPLIFYING RADICALS

1. There must be no perfect factors under the radical.
2. There must be no fractions under the radical. $\sqrt{\frac{1}{2}}$
3. There must be no radicals in a denominator. $\frac{2}{\sqrt{3}}$

A radical is simplified only when all 3 of these rules are satisfied.

Simplify.

ex5) $\sqrt{\frac{5}{3}} = \frac{\sqrt{5}}{\sqrt{3}} = \frac{\sqrt{5}\cdot\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \frac{\sqrt{15}}{\sqrt{9}} = \boxed{\frac{\sqrt{15}}{3}}$

We need to multiply by something that will make the denominator a perfect square.

SIMPLIFYING RADICALS

Simplify.

ex6) $\sqrt{\frac{n}{7}} = \frac{\sqrt{n}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$

We need to multiply by something that will make the denominator a perfect square.

$= \frac{\sqrt{7n}}{\sqrt{49}}$

$= \boxed{\frac{\sqrt{7n}}{7}}$

SIMPLIFYING RADICALS

Simplify.

ex7) $\sqrt{\frac{n}{8}} = \frac{\sqrt{n}}{\sqrt{8}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2n}}{\sqrt{16}}$

We need to multiply by something that will make the denominator a perfect square.

$= \boxed{\frac{\sqrt{2n}}{4}}$

SIMPLIFYING RADICALS

Simplify.

ex8) $\sqrt{\frac{81}{x}} = \frac{\sqrt{81}}{\sqrt{x}} = \frac{9}{\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}}$

We need to multiply by something that will make the denominator a perfect square.

$= \frac{9\sqrt{x}}{\sqrt{x^2}}$

$= \boxed{\frac{9\sqrt{x}}{x}}$

SIMPLIFYING RADICALS

Simplify.

ex9) $\dfrac{1}{\sqrt[3]{2r}} \cdot \dfrac{\sqrt[3]{2^2 r^2}}{\sqrt[3]{2^2 r^2}} = \dfrac{\sqrt[3]{4r^2}}{\sqrt[3]{2^3 r^3}}$

We need to multiply by something that will make the denominator a perfect cube.

$= \boxed{\dfrac{\sqrt[3]{4r^2}}{2r}}$

SIMPLIFYING RADICALS

Simplify.

ex10) $\dfrac{8}{\sqrt[6]{x^2y^{10}z^{20}}} \cdot \dfrac{\sqrt[6]{x^4y^2z^4}}{\sqrt[6]{x^4y^2z^4}} = \dfrac{8\sqrt[6]{x^4y^2z^4}}{\sqrt[6]{x^6y^{12}z^{24}}}$

We need to multiply by something that will make the denominator a perfect sixth.

$= \dfrac{8\sqrt[6]{x^4y^2z^4}}{xy^2z^4}$

TWO WAYS TO DO THE SAME PROBLEM

Simplify.

ex11) $\dfrac{\sqrt{50}}{5\sqrt{2}}$ $\cdot\sqrt{2}$ $\cdot\sqrt{2}$

$= \dfrac{\sqrt{100}}{5\sqrt{4}}$

$= \dfrac{10}{10} = \boxed{1}$

Since there is no + or - in the fraction, we can reduce these radicals first.

ex12) $\dfrac{\sqrt{50}\ 25}{5\sqrt{2}\ 1} = \dfrac{\sqrt{25}}{5\sqrt{1}}$

$= \dfrac{5}{5}$

$= \boxed{1}$

SIMPLIFYING RADICALS

Simplify.

ex13) $\sqrt{\dfrac{5m^4n^9}{10m^7n^5}} = \sqrt{\dfrac{1n^4}{2m^3}}$

Reduce the fraction first if possible!

$= \dfrac{\sqrt{1n^4}}{\sqrt{2m^3}} = \dfrac{n^2}{\sqrt{2m^3}} \cdot \dfrac{\sqrt{2m}}{\sqrt{2m}} = \dfrac{n^2\sqrt{2m}}{\sqrt{4m^4}}$

$= \boxed{\dfrac{n\sqrt{2m}}{2m^2}}$

SIMPLIFYING RADICALS

Simplify.

ex15) $\dfrac{3-\sqrt{5}}{\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}}$

Distribute!

$= \dfrac{3\sqrt{5}-\sqrt{25}}{\sqrt{25}}$

We cannot reduce these radicals because of the minus in the numerator.

$= \boxed{\dfrac{3\sqrt{5}-5}{5}}$