6-6 Rational Exponents

- *write expressions with rational exponents or radical form*
- *simplify expressions involving rational exponents.*

$$b^{\frac{m}{n}} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$$

quick exponent rule review:

$x^3 \cdot x^5 = x^8$ $(x^3)^5 = x^{15}$

$\frac{x^5}{x^3} = x^2$ $\frac{x^3}{x^5} = x^{-2} = \frac{1}{x^2}$

$x^0 = 1$

Rewrite the following radicals using rational exponents. $b^{\frac{m}{n}} = \sqrt[n]{b^m}$

1. $\sqrt[2]{6^1}$ $6^{\frac{1}{2}}$
2. $\sqrt[4]{30^1}$ $30^{\frac{1}{4}}$
3. $\sqrt[3]{x^2}$ $x^{2/3}$

Rewrite the following rational exponents using radicals.

4. $27^{\frac{5}{3}}$ $\sqrt[3]{27^5}$ $\left(\sqrt[3]{27}\right)^5$
5. $3^{\frac{1}{2}}$ $\sqrt[2]{3^1}$
6. $x^{\frac{3}{4}}$ $\sqrt[4]{x^3}$ or $\left(\sqrt[4]{x}\right)^3$

Evaluate: means, figure out the actual value.

- you must show progression of work to receive credit!

.49 $\quad x^2 \cdot x^3 = x^5 \quad$ 243

Evaluate.

7. $8^{\frac{2}{3}}$

$\sqrt[3]{8^2}$ $\quad (\sqrt[3]{8})^2$

$\sqrt[3]{64}$ $\quad (2)^2$

4 $\quad$ 4

8. $64^{\frac{1}{3}}$

$\sqrt[3]{64}$

4

9. $27^{\frac{1}{3}} \bullet 27^{\frac{4}{3}} = 27^{5/3}$

$\sqrt[3]{27} \cdot (\sqrt[3]{27})^4$ $\quad (\sqrt[3]{27})^5$

$3 \cdot 3^4$ $\quad \sqrt[3]{3^5}$ $\quad \sqrt[3]{243}$

$3 \cdot 81$ $\quad 3 \cdot \sqrt[3]{531441}$

243 $\quad 3 \cdot 81$

$\quad 243$

$\sqrt[3]{3^5}$ $\quad$ 243

Simplify: make the problem "simpler" looking.

- cannot solve, there isn't an equation or an equals sign.
- for most cases, simplify means to:
  1. eliminate grouping symbols
  2. combine like terms

Simplifying Radicals

- ~~no "perfects" in the radicand.~~
- ~~no fractions in the radicand.~~
- ~~no radicals in the denominator.~~
- the index is as small as possible.

6-5

Simplifying Rational Exponents

- NO negative exponents.
- NO fraction exponents in denominator.
- NO complex fractions.

$$\frac{\frac{a}{b}}{\frac{c}{d}} \quad \div$$

Simplify.

1. $\frac{1}{a^{2/3}} \cdot \frac{a^{1/3}}{a^{1/3}} = \boxed{\frac{a^{\frac{1}{3}}}{a}}$

2. $x^{-1/4}$

$\frac{1}{x^{1/4}} \cdot \frac{x^{3/4}}{x^{3/4}} = \boxed{\frac{x^{3/4}}{x}}$

3. $\dfrac{2}{3^{1/2}} \cdot \dfrac{3^{1/2}}{3^{1/2}} = \boxed{\dfrac{2 \cdot 3^{1/2}}{3}}$

4. $\dfrac{5n^{5/5} \cdot n^{4/5}}{n^{1/5} \cdot n^{4/5}} = \dfrac{5n^{9/5}}{n^{5/5}} = \boxed{5n^{4/5}}$

$\boxed{5n^{4/5}}$

Write as a radical in simplest form.

5. $$\frac{x^{2/3}}{\sqrt[3]{x}} = \frac{x^{2/3}}{x^{1/3}} = x^{\frac{1}{3}}$$

$$\frac{\sqrt[3]{x^2}}{\sqrt[3]{x}} \cdot \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} = \frac{\sqrt[3]{x^4}}{\cancel{\sqrt[3]{x^3}}} = \frac{\sqrt[3]{x^4}}{x} \quad \frac{\cancel{x}\sqrt[3]{x}}{\cancel{x}}$$

6. $$\frac{1}{(m^{5/2}+n^{3/2})} \cdot \frac{(m^{5/2}-n^{3/2})}{(m^{5/2}-n^{3/2})}$$

$$\frac{(m^{\frac{5}{2}}-n^{\frac{3}{2}})}{(m^5-n^3)}$$

$$x^{\frac{2}{3}} \cdot x^{\frac{1}{4}}$$

$$\frac{(x^2-9)}{} \quad \frac{(x+3)}{(x^2+5x+6)}$$

7. $\sqrt[6]{36}$

$36^{\frac{1}{6}}$

$(6^{2})^{1/6}$ $\rightarrow$ $\frac{\cancel{2}^{1}}{1}\cdot\frac{1}{\cancel{6}_{3}} = \frac{1}{3}$

$6^{1/3}$

$\sqrt[3]{6}$

late

$\boxed{\frac{3000}{6000}}$ pts.

$\boxed{\frac{250}{500}}$ pts

$\sqrt[10]{16}$

$16^{\frac{1}{10}}$

$(4^{2})^{1/10}$

$4^{1/5}$

$\sqrt[5]{4}$