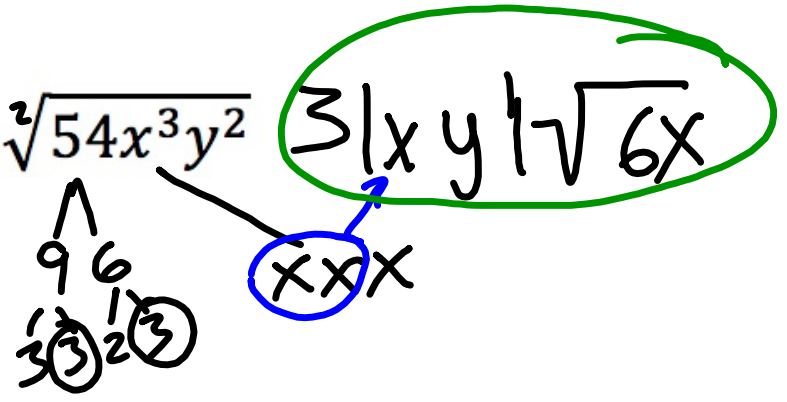
Warm Up

1. $\sqrt[3]{54x^3y^2}$



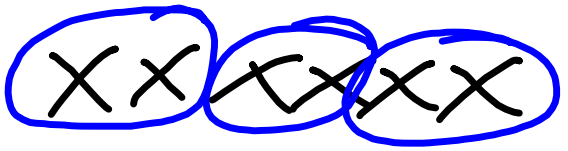
2. $\dfrac{-4x^5y^{-3}}{4x^8y^2}$

1-4 Rational Exponents

Reduce Assuming all variables are greater then or equal to zero.

(You can either do these using rational exponents or not.)

$\sqrt[2]{x^6} = x^{6/2}$



$\sqrt[3]{x^{12}} = x^{\frac{12}{3}}$

Rational exponent Calc task

1, 4, 9, 16, 25, 36

$a^{\left(\frac{1}{2}\right)} =$ _____

$1^{1/2} = \sqrt{1} = 1$

$4^{1/2} = \sqrt{4} = 2$

$9^{1/2} = \sqrt{9} = 3$

$16^{1/2} = \sqrt{16} = 4$

$25^{1/2} = \sqrt{25} = 5$

1, 8, 27, 64, 125, 216

$a^{\left(\frac{1}{3}\right)} = \_\_\_\_\_$

$1^{\frac{1}{3}} = \sqrt[3]{1} = 1$

$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$

$27^{\frac{1}{3}} = \sqrt[3]{27} = 3$

$64^{\frac{1}{3}} = \sqrt[3]{64} = 4$

1, 8, 27, 64, 125, 216

$$a^{\left(\frac{2}{3}\right)} = \sqrt[3]{a^2}$$

$1^{2/3} = \sqrt[3]{1^2} = 1$

$8^{2/3} = \sqrt[3]{8^2} = 2^2 = 4$

$27^{2/3} = \sqrt[3]{27^2} = 3^2 = 9$

1, 16, 81, 256, 625, 1296

$$a^{\left(\frac{3}{4}\right)} = \sqrt[4]{a^3}$$

$16^{3/4} = \sqrt[4]{16^3} = 2^3 = 8$

$81^{3/4} = \sqrt[4]{81^3} = 3^3 = 27$

$81 = 9 \times 9$

$9 = 3 \times 3$

$81 = 3 \times 3 \times 3 \times 3$

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

Fractional exponent

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

n is an integer bigger then or equal to 2

$a^{\frac{1}{1}} = a$

$a^{\frac{1}{0}}$ Can't do!

Write each of the following as a radical and simplify, if possible.

$9^{\frac{1}{2}} = \sqrt{9} = 3$

$(-64)^{\frac{1}{3}}$

$\sqrt[3]{-64}$

-4

$100^{\frac{1}{2}}$

$\sqrt{100} = 10$

$-100^{\frac{1}{2}}$

$-\sqrt{100} = -10$

$z^{\frac{1}{2}}$

$\sqrt{z}$

You try

$25^{\frac{1}{2}}$ $\sqrt{25}=5$

$(-27)^{\frac{1}{3}}$ $\sqrt[3]{-27}=-3$

$-64^{\frac{1}{2}}=-\sqrt{64}=-8$

$b^{\frac{1}{2}}$ $\sqrt{b}$

Rewrite in exponent form

$\sqrt[7]{x^1}$

$x^{\frac{1}{7}}$

$\sqrt[4]{b}$

$b^{\frac{1}{4}}$

You try

$\sqrt[12]{r}$

$r^{\frac{1}{12}}$

$\sqrt[5]{5d}$

$(5d)^{\frac{1}{5}}$

$5^{\frac{1}{5}} d^{\frac{1}{5}}$

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

a is real, m/n is a rational number in lowest terms with n bigger or equal to 2

Write each of the following as a radical and simplify, if possible.

$25^{\frac{3}{2}}$

$(\sqrt{25})^3 = 5^3$

$= 125$

$64^{\frac{2}{3}}$

$\sqrt[3]{64^2}$

4^2

16

$-9^{\frac{5}{2}}$

$-(\sqrt{9})^5$

-3^5

-243

$(-8)^{\frac{4}{3}}$

$\sqrt[3]{(-8)^4}$

$(-2)^4$

16

$-81^{\frac{7}{2}}$

$-(\sqrt{81})^7$

-9^7

You try

$27^{\frac{2}{3}} = 9$

$16^{\frac{3}{2}} = 64$

$-25^{\frac{5}{2}} = -5^5$

$-16^{\frac{3}{4}} = -8$

Rewrite in exponent form

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

$(2x^2)^{\frac{1}{3}}$

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

$\left(\sqrt[4]{5r}\right)^2$

$(5r)^{\frac{2}{4}}$

You try

$\sqrt[8]{a^3}$

$a^{3/8}$

$\left(\sqrt[3]{h}\right)^9$

$h^{9/3}$

Write each of the following as a radical and simplify, if possible.

$$x^{-\frac{1}{3}} = \frac{1}{x^{1/3}} = \frac{1}{\sqrt[3]{x}}$$

$$36^{-\frac{1}{2}} = \frac{1}{36^{1/2}} = \frac{1}{\sqrt{36}}$$

Just a reminder.

Exponent Rules

$$a^0 = 1 \qquad \text{if } a \neq 0$$

$$a^{-n} = \frac{1}{a^n} \quad \text{or} \quad \frac{1}{a^{-n}} = a^n \qquad \text{if } a \neq 0$$

$$a^m \cdot a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n} \quad \text{if } a \neq 0$$

$$(a^m)^n = a^{m \cdot n}$$

$$(a \cdot b)^n = a^n \cdot b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \quad \text{if } b \neq 0$$

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n \quad \text{if } a \neq 0,\ b \neq 0$$

After you simplify you should have:

- Only positive exponents.
- Each base only occurring once.
- Have no parentheses in the expression.
- No powers written to powers.