What's Going On?

Checking In

Minds on Calculate

Action! Rational Exponents

Consolidation Big Question

Learning Goal - I will be able to simplify rational exponents.

Checking In

Big Questions from Last Time

Simplify, using the exponent laws, then evaluate the expression below.

$$\left(\frac{(2^{-14})(2^{-5})^4}{(2^3)(2^{-5}\times 2^{-4})^4}\right)^{-3}$$

(It's 8, but that's not the point!)

$$\left(\frac{(2^{-14})(2^{-5})^4}{(2^3)(2^{-5}\times 2^{-4})^4}\right)^{-3}$$

$$=\left(\frac{(2^{-14})(2^{-20})}{(2^3)(2^{-9})^4}\right)^{-3}$$

$$=\left(\frac{2^{-34}}{(2)^3\,2^{-36}}\right)^{-3}$$

$$=\left(\frac{2^{-34}}{2^{-33}}\right)^{-3}$$

$$=\left(\frac{2^{33}}{2^{34}}\right)^{-3}$$

$$=\left(\frac{2^{34}}{2^{33}}\right)^{3}$$

$$=(2^1)^3$$

$$=2^3$$

$$=8$$

Checking In

Evaluate the expression below for
$x=-1, y=2, n=-2.$

$$\left(\frac{x^n y^3}{(xy)^{-2n}}\right)^n$$

$$=\left(\frac{(-1)^{(-2)}(2)^3}{((-1)(2))^{-2(-2)}}\right)^{-2}$$

$$=\left(\frac{(-1)^{-2}\cdot 8}{(-2)^4}\right)^{-2}$$

$$=\left(\frac{8}{(-1)^2\cdot 16}\right)^{-2}$$

$$=\left(\frac{8}{16}\right)^{-2}$$

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

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

$$=\frac{2^2}{1^2}=\frac{4}{1}=4$$

Minds on

Calculate

$9^{\frac{1}{2}} = 3$	$100^{\frac{1}{2}} = 10$
$8^{\frac{1}{3}} = 2$	$27^{\frac{1}{3}} = 3$

Action!

Rational Exponents

Anything raised to a rational exponent is a radical.

The rational exponent $\frac{1}{n}$ indicates the *n*th root of the base.

$$x^{\frac{1}{n}} = \sqrt[n]{x}\ , n > 1, n \in R, x \neq 0$$

$$9^{\frac{1}{2}} = \sqrt[2]{9}$$

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

$$10\,000^{\frac{1}{4}} = \sqrt[4]{10{,}000} = 10$$

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

$$49^{-\frac{1}{2}} = \frac{1}{49^{1/2}} = \frac{1}{\sqrt{49}} = \frac{1}{7}$$

Action!

Rational Exponents

$$x^{\frac{m}{n}} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m \quad , m \in Z, m > 0, n \in Z, n > 0, x \neq 0$$

m is an integer

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

$$(-27)^{\frac{4}{3}}$$

$$(16)^{-0.75}$$

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

$\sqrt[3]{27^2}$ or $\left(\sqrt[3]{27}\right)^2$

$= \sqrt[3]{729}$ $= (3)^2$

$= 9$ $= 9$

$$(-27)^{\frac{4}{3}}$$

$= \sqrt[3]{(-27)^4}$ or $\left(\sqrt[3]{-27}\right)^4$

$= \sqrt[3]{531,441}$ $= (-3)^4$

$= 81$ $= 81$

$$(16)^{-0.75}$$

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

$$= \frac{1}{16^{3/4}}$$

$$= \frac{1}{\sqrt[4]{16^3}}$$

$$= \frac{1}{\sqrt[4]{4096}}$$

$$= \frac{1}{8}$$

$$= \left(\sqrt[4]{16}\right)^{-3}$$

$$= (2)^{-3}$$

$$= 2^{-3}$$

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

$$= \frac{1}{8}$$

$$= \frac{1}{\left(\sqrt[4]{16}\right)^3}$$

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

$$= \frac{1}{8}$$

Consolidation

Big Questions!

Evaluate.

$$81^{\frac{1}{2}} - 8^{\frac{1}{3}} - 32^{\frac{4}{5}} + 16^{\frac{3}{4}} + 1^{\frac{2}{9}}$$

Simplify, then evaluate.

$$\frac{\left(8^{\frac{4}{3}}\right)^{\frac{1}{2}}}{8^{\frac{7}{6}}\sqrt{8}}$$