

## What's Going On?

**Checking In**

Solutions from Last Time

**Minds on**

Applying the Laws

**Action!**

Exploring Rational Exponents

**Consolidation**

We are all the same

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

## | Checking In

## Solutions from Last Time

$$\text{a. } (6^8 \div 6^4)^3$$

subtract exponents  
(dividing)

$$= (6^4)^3$$

$$= 6^{12}$$

multiply exponents  
(power of a power)

$$\text{b. } (8^2 \times 8^3)^4 \times (8^6 \div 8^5)^2$$

add exponents  
(multiplying)

$$= (8^5)^4 \times (8^1)^2$$

$$= 8^{20} \times 8^2$$

$$= 8^{22}$$

## | Checking In

## Solutions from Last Time

$$\begin{aligned} \text{c. } & (5^9 \div 5^4)^3 \times (5^5 \div 5^8)^2 \\ & = (5^5)^3 \times (5^{-3})^2 \\ & = 5^{15} \times 5^{-6} \\ & = 5^9 \end{aligned}$$

$$\begin{aligned} \text{d. } & (4^7 \div 4^3)^6 \div (4^3 \times 4^4)^2 \\ & = (4^4)^6 \div (4^7)^2 \\ & = 4^{24} \div 4^{14} \\ & = 4^{10} \end{aligned}$$

## Checking In

### Solutions from Last Time

$$e. (3^6 \times 3^{-3}) \div (3^3)^3$$

$$= (3^3) \div 3^9$$

subtract

$$= 3^{-6}$$

$$= \frac{1}{3^6}$$

negative exponent...  
put in denominator and  
change the sign

$$f. (7^9 \div 7^{10}) \div (7^{13} \div 7^{-5})^{-2}$$

$$= (7^{-1}) \div (7^{18})^{-2}$$

$$= 7^{-1} \div 7^{-36}$$

$$= 7^{35}$$

## Minds on

## Applying the Laws

$$\overset{2}{4^{\frac{1}{2}}} \times \overset{2}{4^{\frac{1}{2}}} = 4^{\boxed{1}} = 4$$

$$\overset{3}{9^{\frac{1}{3}}} \times \overset{3}{9^{\frac{1}{3}}} = 9^{\boxed{1}} = 9$$

**Action!**

## Exploring Rational Exponents

$$16^{\frac{1}{2}} = 4$$

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

$$36^{\frac{1}{2}} = 6$$

$$49^{\frac{1}{2}} = 7$$

$$144^{\frac{1}{2}} = 12$$

$$100^{\frac{1}{2}} = 10$$

**Action!**


## Exploring Rational Exponents

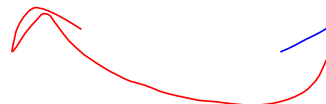
*What's another way of writing  $x^{\frac{1}{2}}$  ?*

$$x^{\frac{1}{2}} = \sqrt{x}$$


**Action!**

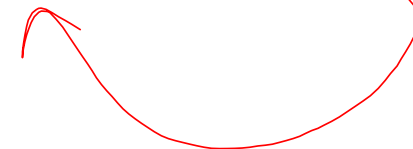
## Exploring Rational Exponents

$$8^{\frac{1}{3}} = 2$$


$$27^{\frac{1}{3}} = 3$$


$$(-125)^{\frac{1}{3}} = -5$$

$$64^{\frac{1}{3}} = 4$$


$$1000^{\frac{1}{3}} = 10$$




**Action!**

## Exploring Rational Exponents

*What's another way of writing  $x^{\frac{1}{3}}$  ?*

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

*What number to the power of 3 equals  $x$*

**Action!**

## Exploring Rational Exponents

*What's another way of writing  $x^{\frac{1}{n}}$  ?*

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

$$\sqrt[5]{1024} = 4$$

$$\sqrt[7]{-2187} = -3$$

$$\sqrt[4]{-16} = \text{error}$$

There is no number, that when multiplied by itself 4 times gives a negative.

**Action!**

## Exploring Rational Exponents

$$4^{\frac{3}{2}} = 8$$

$$(\sqrt{4})^3$$

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

$$(\sqrt[4]{16})^3$$

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

$$= (\sqrt[3]{27})^2$$

$$(-8)^{\frac{5}{3}} = -32$$

$$= (\sqrt[3]{-8})^5$$

**Action!**

## Exploring Rational Exponents

*What's another way of writing  $x^{\frac{m}{n}}$  ?*

$$x^{\frac{m}{n}} = \sqrt[n]{x^m}$$

$$(-64)^{\frac{7}{3}}$$

$$= \sqrt[3]{-64}^7$$

$$= (-4)^7$$

$$= -16384$$

## Consolidation

We are all the same!

$$4^{\frac{3}{2}} = (\sqrt{4})^3$$
$$= (2)^3$$
$$= 8$$

a. Come up with four **other** rational powers that are equal to 8.

b. Come up with four rational powers that are equal to -27.

Power Form      Radical Form      Eval.

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

$$27^{\frac{5}{3}} = \sqrt[3]{27^5} = 243$$

$$(-8)^{\frac{8}{3}} = \sqrt[3]{-8^8} = 256$$

$$(-32)^{\frac{4}{5}} = \sqrt[5]{-32^4} = 16$$

$$(-1024)^{\frac{3}{5}} = \sqrt[5]{-1024^3} = -64$$