MCR 3U

# Rational Exponents

Minds On!

Consider this...

How can we write 41 as a product of two powers with base 4?

$$4^{1} = 4^{2} 4^{2}$$
 ... What is?.  $0 = 0$ 

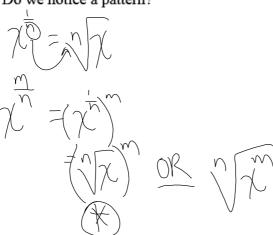
Therefore, the rational exponent  $\frac{1}{2}$  is the same as a  $\frac{1}{2}$  is the same as a  $\frac{1}{2}$ .

$$8^{1} = 8^{?}8^{?}8^{?}$$

Therefore, the rational exponent  $\frac{1}{3}$  is the same as a  $\frac{1}{3}$  is t

Therefore, the rational exponent  $\frac{1}{4}$  is the same as a  $\frac{1}{4}$ .

Do we notice a pattern?



In general, when working with rational exponents:

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

$$x^{\frac{m}{n}} = (\sqrt[n]{x})^m \text{ OR } x^{\frac{m}{n}} = \sqrt[n]{x^m}$$

### Action!

#### Example 1:

Write the following in radical form.

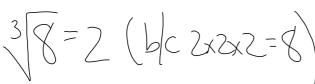
a) 
$$x^{\frac{3}{5}} = (5)$$
 b)  $-a^{\frac{1}{2}} = (5)$ 

## Example 2:

Write the following in exponential form.

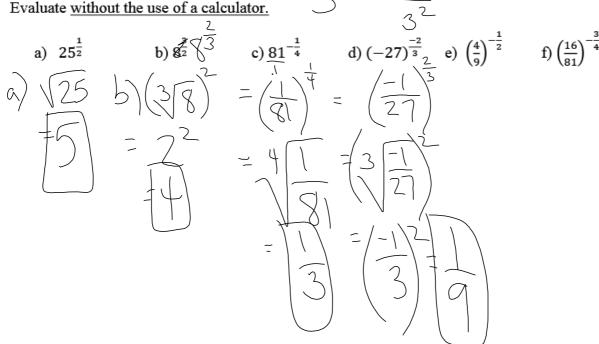
a) 
$$\sqrt{z} = 2^{\frac{1}{2}}$$
 b)  $(\sqrt[4]{a})^5 = 2^{\frac{5}{4}}$ 

In English, if we have  $\sqrt{81}$ , this means "what are two of the same numbers that multiply that given the same numbers are two of the same numbers."



## Example 3:

Evaluate without the use of a calculator.



Remember! Exponent laws still apply. Also, it would be helpful to memorize square/cube root Homework: Section 3.3, Page 175-176, #1-6

