

Welcome Back MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>2/5</u> Topic: <u>2D Rational Indices WS</u>	0 1 2	
Tuesday Date: <u>2/6</u> Topic: <u>Exponential Study Guide</u>	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Warm-up: Simplify the expression.

$$2m^{-\frac{2}{3}} \cdot 4m^{\frac{1}{4}}$$

$$\begin{aligned} \frac{8m}{1} &= \frac{8}{m^{\frac{2}{3}}} \left(\frac{m^{\frac{1}{4}}}{m^{\frac{3}{4}}} \right) \\ &= \frac{8m^{\frac{1}{4}}}{m^{\frac{5}{4}}} = \frac{8m^{\frac{1}{4}}}{m} \end{aligned}$$

$$-\frac{2}{3} + \frac{1}{4} = \frac{-8+3}{12} = -\frac{5}{12}$$

$$\begin{aligned} \frac{6^4}{12^4} &= \frac{6^4}{(2 \cdot 6)^4} \\ &= \frac{6^4}{2^4 \cdot 6^4} = \frac{1}{2^4} \\ &= \frac{1}{16} \end{aligned}$$

Class Plan:

✓ 1. Warm-up

~~2. Homework Questions?~~

3. Criterion C: Create a study guide to communicate Index Laws

4. Math Team Problems

*add them to your study guide! :)

2B Index Laws

(Properties of Exponents)

DO: Create your own study guide.

1. Explain properties (use words & symbols).
2. Show examples (expansion & rules)

Division →

Power →

Multiplication
 $b^m \cdot b^n = b^{\square}$

Zero
 $\frac{b^m}{b^n} = b^{\square}$ $b^0 = \square$

Negative
 $\frac{1}{b^m} = \square$

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

$(b^m)^n = b^{\square}$

***Use Investigations to help you!

Done? Math Team Problems

A. The expression $\frac{15^{30}}{45^{15}}$ simplifies to...?

$$\begin{aligned} \frac{(15)^{30}}{(3 \cdot 5)^{15}} &= \frac{15^{30}}{3^{15} 5^{15}} = \frac{15^{15}}{3^{15}} = \frac{(3 \cdot 5)^{15}}{3^{15}} \\ &= \frac{3^{15} 5^{15}}{3^{15}} = 5^{15} = 3.05 \times 10^{10} \\ &\approx 30,500,000,000 \end{aligned}$$

B. Suppose $x > y > 0$. Which of the following is the same as $\frac{x^y y^x}{y^y x^x}$?

- a) $(x - y)^{\frac{y}{x}}$ b) $\left(\frac{x}{y}\right)^{x-y}$ c) 1 d) $\left(\frac{x}{y}\right)^{y-x}$ e) $(x - y)^{\frac{x}{y}}$

C. Which of the following values satisfies the expression

$$25^{-2} = \frac{5\left(\frac{48}{x}\right)}{5\left(\frac{26}{x}\right) \bullet 25\left(\frac{17}{x}\right)} ?$$

a) 2

b) 3

c) 5

d) 6

e) 9

D.

Suppose that $a > 0$ and $b > 0$. Define r to be the number that results when both the base and the exponent of a^b are tripled. Suppose now that we write $r = a^b x^b$. Which of the following expressions represents x ?

- a) 3 b) $3a^2$ c) $27a^2$ d) $2a^{3b}$ e) $3a^{2b}$

$$\frac{a^{-\frac{1}{4}} b^{-\frac{5}{4}} c^{\frac{2}{3}} \cdot \left(a^{\frac{1}{2}} b^{-2} c^{\frac{1}{2}} \right)^{\frac{1}{2}}}{a^{-\frac{2}{3}} b^{\frac{3}{2}} c^{\frac{3}{2}}}$$

Solutions

$$\begin{aligned} \text{A. } \frac{15^{30}}{45^{15}} &= \frac{(3 \cdot 5)^{30}}{(9 \cdot 5)^{15}} = \frac{3^{30} \cdot 5^{30}}{9^{15} \cdot 5^{15}} = \frac{3^{30} \cdot 5^{30}}{(3^2)^{15} \cdot 5^{15}} \\ &= \frac{3^{30} \cdot 5^{30}}{3^{30} \cdot 5^{15}} = \frac{\cancel{3}^{30} \cdot 5^{30}}{\cancel{3}^{30} \cdot 5^{15}} = \frac{5^{30}}{5^{15}} = \boxed{5^{15}} \\ &\quad \uparrow \\ &\quad \text{This is far enough...} \\ &\quad \ddot{\smile} \end{aligned}$$

Solutions

$$\begin{aligned} B. \quad \frac{x^y y^x}{y^y x^x} &= x^y x^{-x} y^x y^{-y} = x^{y-x} y^{x-y} = \frac{x^{y-x}}{y^{-(x-y)}} \\ &= \frac{x^{y-x}}{y^{-x+y}} = \frac{x^{y-x}}{y^{y-x}} = \boxed{\left(\frac{x}{y}\right)^{y-x}} \end{aligned}$$

Solutions

$$D. \quad r = (3a)^{(3b)} \Rightarrow r = 3^{(3b)} a^{(3b)}$$

Told that $r = a^b \times$. So we want to factor out an a^b , and see what's left over.

$$\begin{aligned} r &= 3^{3b} a^{3b} = 3^{3b} a^{2b} a^b = a^b \cdot 3^{3b} \cdot a^{2b} \\ &= a^b \cdot (3^3 \cdot a^2)^b \\ &= a^b \cdot (27 \cdot a^2)^b \end{aligned}$$

Solutions

d) continued...

So, if $r = a^b x^b$ and $r = a^b (27a^2)^b$

$$a^b x^b = a^b (27a^2)^b$$

$$\Rightarrow \boxed{x = 27a^2}$$

Solutions

$$C. \quad 25^{-2} = \frac{5^{\left(\frac{48}{x}\right)}}{5^{\left(\frac{26}{x}\right)} \cdot 25^{\left(\frac{12}{x}\right)}} \Rightarrow (5^2)^{-2} = \frac{5^{\left(\frac{48}{x}\right)}}{5^{\left(\frac{26}{x}\right)} \cdot (5^2)^{\left(\frac{12}{x}\right)}}$$

$$\Rightarrow 5^{-4} = \frac{5^{\left(\frac{48}{x}\right)}}{5^{\left(\frac{26}{x}\right)} \cdot 5^{\left(\frac{24}{x}\right)}} \Rightarrow 5^{-4} = \frac{5^{\left(\frac{48}{x}\right)}}{5^{\left(\frac{60}{x}\right)}} \Rightarrow 5^{-4} = 5^{\left(\frac{-12}{x}\right)}$$

\Rightarrow Bases the same, so to be equal, exponents must be equal. $\Rightarrow -4 = \frac{-12}{x} \Rightarrow \boxed{x=3}$

Simplify the expression.

$$\frac{a^{-\frac{1}{4}} b^{-\frac{5}{4}} c^{\frac{2}{3}} \cdot (a^{\frac{1}{2}} b^{-2} c^{\frac{1}{2}})^2}{a^{-\frac{2}{3}} b^{\frac{3}{2}} c^{\frac{3}{2}}}$$

$$\frac{a^{-\frac{1}{4}} b^{-\frac{5}{4}} c^{\frac{2}{3}} \cdot a^{\frac{1}{2}} b^{-2} c^{\frac{1}{2}} \cdot a^{\frac{1}{2}} b^{-2} c^{\frac{1}{2}}}{a^{-\frac{2}{3}} b^{\frac{3}{2}} c^{\frac{3}{2}}}$$

$$= \frac{a^{\frac{2}{3}} b^{-\frac{9}{4}} c^{\frac{11}{12}}}{b^{\frac{3}{4}} c^{\frac{3}{2}}}$$

$$= a^{\frac{2}{3}} b^{-\frac{9}{4} - \frac{3}{4}} c^{\frac{11}{12} - \frac{18}{12}}$$

$$= a^{\frac{2}{3}} b^{-\frac{15}{4}} c^{-\frac{7}{12}}$$

$$= \frac{a^{\frac{2}{3}} b^{\frac{1}{4}} c^{\frac{5}{12}}}{b^{\frac{15}{4}} c^{\frac{7}{12}}}$$

← Rationalize!
☺

$$= \frac{a^{\frac{2}{3}} b^{\frac{1}{4}} c^{\frac{5}{12}}}{b^4 c}$$