

6-Exponent Laws

Wednesday, October 9, 2019 12:33 PM

BEDMAS

Ma11

1.6 EXPONENT LAWS AND ORDER OF OPERATIONS

Name: _____ Blk: _____

Review: Evaluate each expression.

1. $8 + 5 \cdot 4 = 28$

2. $\frac{3+2}{6} = \frac{5}{6}$

3. $12 + (2 + 4) \cdot 2 \div 6 = 14$

4. $3(5 - 3^2)^2 \div 4 = 12$

***Make sure you remember your exponent rules!* see page 36 for a reminder**

SIMPLIFYING NUMERICAL EXPRESSIONS WITH RATIONAL BASES

Example 1: Write each expression as a single power, then evaluate. Write each answer as a fraction in lowest terms.

a) $2.5^3 \cdot 2.5^{-5}$ same base
 $= 2.5^{3+(-5)}$ product of powers.
 $= 2.5^{-2}$ write as a fraction!
 $= \left(\frac{25}{10}\right)^{-2}$
 $= \left(\frac{5}{2}\right)^{-2}$
 $= \left(\frac{2}{5}\right)^2$
 $= \frac{4}{25}$

b) $\left[\left(\frac{5}{6}\right)^{27}\right] \cdot \left[\left(\frac{5}{6}\right)^{-4}\right]$ same base
 $= \left(\frac{5}{6}\right)^{14} \cdot \left(\frac{5}{6}\right)^{-12}$
 $= \left(\frac{5}{6}\right)^2$
 $= \frac{25}{36}$

c) $4\left(\frac{3}{5}\right)^{-3}$
 $= 4\left(\frac{5}{3}\right)^3$
 $= 4\left(\frac{125}{27}\right)$
 $= \frac{500}{27}$

SIMPLIFYING NUMERICAL EXPRESSIONS WITH RATIONAL EXPONENTS

Example 2: Write each expression as a single power, then evaluate. Write each answer as a fraction or a whole number.

a) $\left(\frac{36^{\frac{7}{8}}}{36^{\frac{1}{8}} \cdot 36^{\frac{11}{24}}}\right)^2$ *• same base
• product and quotient of powers*

$$= \left(36^{\frac{7}{8} - (\frac{1}{8} + \frac{11}{24})}\right)^2$$

$$= \left(36^{\frac{21}{24} - (\frac{3}{24} + \frac{11}{24})}\right)^2$$

$$= \left(36^{\frac{21}{24} - (\frac{14}{24})}\right)^2$$

$$= \left(36^{\frac{7}{24}}\right)^2$$

$$= 36^{\frac{14}{24}}$$

$$= 36^{\frac{7}{12}} = \sqrt[12]{36^7} = \boxed{6}$$

b) $\left(8^{\frac{2}{3}} - 9^{-\frac{1}{2}}\right)^2$ *• Don't have the same base!
• write as a radical*

$$= \left(\sqrt[3]{8} - \frac{1}{\sqrt{9}}\right)^2$$

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

$$= \left(\frac{12}{3} - \frac{1}{3}\right)^2$$

$$= \left(\frac{11}{3}\right)^2$$

$$= \frac{121}{9}$$

c) $\left(5^{\frac{1}{3}} \cdot 3^{-\frac{1}{2}}\right)^6$ *power of a power rule*

$$= 5^2 \cdot 3^{-3} \rightarrow \frac{1}{3^3}$$

$$= 25 \cdot \frac{1}{27}$$

$$= \boxed{\frac{25}{27}}$$

d) $2^{\frac{2}{5}} \cdot 64^{\frac{1}{5}}$ *Diff. base!
make them the same!*

$$64 = 2^6$$

$$= 2^{\frac{2}{5}} \cdot (2^6)^{\frac{1}{5}}$$

$$= 2^{\frac{2}{5}} \cdot 2^{\frac{6}{5}}$$

$$= 2^{\frac{8}{5}} = 2^{\frac{16}{10}} = 2^{\frac{8}{5}}$$

$$= 2^3$$

$$= \boxed{8}$$

SIMPLIFYING ALGEBRAIC EXPRESSIONS WITH RATIONAL EXPONENTS

Example 3: Simplify each expression and write with **positive exponents**

a) $2(6x^{-4}y^3)(5x^3y^5)$ *• Rearrange, apply laws.*

$$= 2 \cdot 5 \cdot 6 \cdot x^{-4} \cdot x^3 \cdot y^3 \cdot y^5$$

$$= 60x^{-1}y^8$$

$$= \boxed{\frac{60y^8}{x}}$$

b) $(6x + 5y^2)(3x - 2y^2)$ *Expand then simplify*

$$= 18x^2 - 12xy^2 + 15xy^2 - 10y^4$$

$$= \boxed{18x^2 + 3xy^2 - 10y^4}$$

apply power laws first.

$$c) \frac{(3x^3y^{-5})^2}{18x^6y^{-7}}$$

$$= \frac{9x^6y^{-10}}{18x^6y^{-7}}$$

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

$$= \left| \frac{1}{2y^3} \right|$$

APPLYING RATIONAL EXPONENTS

Example 4: Using the formula $h = 35d^{\frac{2}{3}}$, you can estimate the height of a certain species of fir tree.

- a) The base of a fir tree has diameter 4.5 m. Determine the approximate height of the tree. Give the answer to the nearest metre.

$$d = 4.5$$

$$h = 35d^{\frac{2}{3}}$$

$$h = 35(4.5)^{\frac{2}{3}}$$

$$= 95.39 \dots$$

$$= \boxed{95 \text{ m}}$$

- b) A fir tree is estimated to be 87.5 m high. Determine the diameter of the tree at its base. Give the answer to 1 decimal place

$$h = 87.5 \text{ m} \quad d = ?$$

$$\frac{87.5}{35} = \frac{35d^{\frac{2}{3}}}{35}$$

$$(2.5)^{\frac{3}{2}} = (d^{\frac{2}{3}})^{\frac{3}{2}}$$

$$2.5^{\frac{3}{2}} = d$$

$$d = 3.95 \approx \boxed{4.0 \text{ m}}$$

Assignment: 3-6(a,c), 7, 9, 11, 12ab, 13ef, 20, 19
p.69

Before you leave you must show me 2 questions

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