6-Exponent Laws

Wednesday, October 9, 2019 12:33 PM

Ch.1 Unit Test Thursday Oct.17

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

$= 2.5^{3+(-5)}$

$= 2.5^{-2}$ write as a fraction

$= \left(\frac{5}{2}\right)^{-2}$

$= \left(\frac{2}{5}\right)^{2}$ write with a pos. exponent.

$= \frac{4}{25}$

b) $\left[\left(\frac{5}{6}\right)^{2}\right]^{7} \cdot \left[\left(\frac{5}{6}\right)^{3}\right]^{-4}$ • same base • multiply exponents

$= \left(\frac{5}{6}\right)^{14} \cdot \left(\frac{5}{6}\right)^{-12}$

$= \left(\frac{5}{6}\right)^{2}$

$= \frac{25}{36}$

c) $4\left(\frac{3}{5}\right)^{-3}$

$= 4\left(\frac{5}{3}\right)^{3}$

$= 4\left(\frac{125}{27}\right)$

$= \frac{500}{27}$

$= \boxed{\frac{4}{25}}$

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) $\left(\frac{36^{\frac{7}{8}}}{36^{\frac{1}{6}} \cdot 36^{\frac{11}{24}}}\right)^2$ • same base

$= \left(36^{\frac{7}{8} - \left(\frac{1}{6} + \frac{11}{24}\right)}\right)^2$

$= \left(36^{\frac{21}{24} - \left(\frac{4}{24} + \frac{11}{24}\right)}\right)^2$

$= \left(36^{\frac{6}{24}}\right)^2$

$= 36^{\frac{12}{24}}$

$= 36^{1/2}$

$= \sqrt{36} = \boxed{6}$

b) $\left(8^{\frac{2}{3}} - 9^{-\frac{1}{2}}\right)^2$ • write as radicals, • evaluate.

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

$= \left(4 - \frac{1}{3}\right)^2$

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

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

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

c) $\left(5^{\frac{1}{3}} \cdot 3^{-\frac{1}{2}}\right)^6$ apply exponent!

$= 5^{6/3} \cdot 3^{-6/2}$

$= 5^2 \cdot 3^{-3}$

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

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

d) $2^{\frac{9}{5}} \cdot 64^{\frac{1}{5}}$ $64 = 2^6$

$= 2^{9/5} \cdot \left(2^6\right)^{1/5}$

$= 2^{9/5} \cdot 2^{6/5}$

$= 2^{15/5}$

$= 2^3$

$= \boxed{8}$

SIMPLIFYING ALGEBRAIC EXPRESSIONS WITH RATIONAL EXPONENTS

Example 3: Simplify each expression and write with positive exponents. Expand / FOIL

a) $2(6x^{-4}y^3)(5x^3y^5)$ Rearrange

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

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

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

b) $(6x + 5y^2)(3x - 2y^2)$

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

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

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

$= \frac{9x^6y^{-10}}{18x^6y^{-7}}$ $y^{-10-(-7)}$ y^{-3}

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

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

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.

$d = 4.5$ $\quad h = 35(4.5)^{2/3}$

$= 35\,(2.725\ldots)$

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

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

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

$(2.5)^{3/2} = \left(d^{2/3}\right)^{3/2}$

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

In your group answer Qs # 20b and 22a,b
Show your work and hand in. p.75, 76

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