



Warm Up

Test Sept 26

Warm Up quiz tomorrow

Express each as a radical then evaluate:

$$a) (1728)^{\frac{2}{3}}$$

Handwritten notes: "2 ← exp", "3 ← index"

$$= \sqrt[3]{1728^2}$$

$$= \sqrt[3]{(12)^2}$$

$$= 144$$

Express each as a power:

$$a) (\sqrt[6]{128})^7 = 128^{\frac{7}{6}}$$

Express each in simplest radical form: (Entire to Mixed)

$$a) \sqrt{180}$$

$$= \sqrt{36 \times 5}$$

$$= \sqrt{36} \times \sqrt{5}$$

$$= 6\sqrt{5}$$

$$b) \sqrt[3]{1024}$$

$$= \sqrt[3]{512 \times 2}$$

$$= \sqrt[3]{512} \times \sqrt[3]{2}$$

$$= 8\sqrt[3]{2}$$

Write the reciprocal for each:

$$a) 7^{-3} \quad \frac{1}{7^3}$$

$$b) \frac{242}{1}$$

$$c) \frac{1}{6}$$

$$d) 8^2$$

$$242^{-1}$$

$$\text{Rec } 242^{-1}$$

$$\text{Rec } 6^{-1}$$

$$\text{Rec } \frac{1}{8^2}$$

Ex) Write Each Power with a positive Exponent

$$a) 6^{-2}$$

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

$$b) \frac{1}{3^3}$$

$$= 3^{-3}$$

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

$$\left(\frac{4}{3}\right)^2 = \frac{4^2}{3^2} = \frac{16}{9}$$

Homework Questions

Page 233-234

3a) $\frac{1}{3^3} = \frac{1}{27}$ b) $(\frac{1}{2})^{-3} = \frac{-2^3}{1} = -\frac{8}{1}$

c) $\frac{1}{3^3} = 3^3$ d) $\frac{1}{4^2} = 4^2$

4a) $4^2 = 16$ $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

c) $6^1 = 6$ $6^{-1} = \frac{1}{6}$

d) $2^{-3} = \frac{1}{2^3}$ b) $3^{-3} = \frac{1}{3^3}$ c) $(-1)^{-2} = \frac{1}{1^2}$

7) a) $(\frac{1}{2})^{-2} = (\frac{2}{1})^2 = 2^2 = 4$

b) $(\frac{2}{3})^{-3} = (\frac{3}{2})^3 = \frac{27}{8}$

c) $(\frac{4}{5})^{-4} = (\frac{5}{4})^4 = \frac{625}{256}$

9) a) $4^{\frac{1}{2}} = \frac{1}{4^{\frac{1}{2}}}$ ← sq. rt.
 $= \frac{1}{\sqrt{4}} = \frac{1}{2}$

9) c) $27^{\frac{1}{3}} = \frac{1}{27^{\frac{1}{3}}}$
 $= \frac{1}{\sqrt[3]{27}} = \frac{1}{3}$

9) c) $(-0.027)^{\frac{2}{3}}$ or use calculator $(\frac{1}{-0.027})^{\frac{2}{3}}$
 $= \frac{(-27)^{\frac{2}{3}}}{1000^{\frac{2}{3}}} = \frac{(-1000)^{\frac{2}{3}}}{27^{\frac{2}{3}}}$
 $= \frac{(\sqrt[3]{-1000})^2}{(\sqrt[3]{27})^2} = \frac{(-10)^2}{(3)^2} = \frac{100}{9} = 11.11$

10) a) $\frac{1}{9} = (3^{-1})^{-2} = 3^2$

d) $4 = 2^2$
 $4^{\frac{1}{2}} = \frac{1}{4^{\frac{1}{2}}} = \frac{1}{2}$

Didn't flip fraction when you got rid of exp.

12) $(\frac{-64}{125})^{\frac{2}{3}} = \frac{(-125)^{\frac{2}{3}}}{64^{\frac{2}{3}}}$
 $= \frac{(\sqrt[3]{-125})^2}{(\sqrt[3]{64})^2} = \frac{(-5)^2}{(4)^2} = \frac{25}{16}$

13) a) $(\frac{27}{1})^{\frac{4}{3}} = \frac{16^{\frac{1.5}}{16^{\frac{1.5}}}} = \frac{1}{30^{\frac{1.5}}}$
 $= \frac{1}{27^{\frac{4}{3}}} = \frac{1}{(\sqrt[3]{27})^4} = \frac{1}{3^4} = \frac{1}{81}$

b) $16^{-1.5} = \frac{1}{16^{1.5}} = \frac{1}{16^{\frac{3}{2}}} = \frac{1}{(\sqrt{16})^3} = \frac{1}{4^3} = \frac{1}{64}$

c) $30^{-1.5} = \frac{1}{30^{1.5}} = \frac{1}{(\sqrt{30})^3} = \frac{1}{(\frac{1}{4})^3} = \frac{1}{\frac{1}{64}} = 64$

13) a) $(\frac{-8}{27})^{\frac{2}{3}} = \frac{(-27)^{\frac{2}{3}}}{8^{\frac{2}{3}}} = \frac{(\sqrt[3]{-27})^2}{(\sqrt[3]{8})^2} = \frac{(3)^2}{(2)^2} = \frac{9}{4}$

b) $(\frac{81}{16})^{\frac{3}{4}} = \frac{16^{\frac{3}{4}}}{81^{\frac{3}{4}}} = \frac{(\sqrt[4]{16})^3}{(\sqrt[4]{81})^3} = \frac{2^3}{3^3} = \frac{8}{27}$

Use laws of exponent notes

Simplify the following (Leave your answer with positive exponents):

a) $(3xy^{-2})^4$ *power of product*

$= 3^4 x^4 y^{-8}$
evaluate *move to bottom*

$= \frac{81 x^4}{y^8}$

b) $\frac{(12r^6t^3)}{(3r^{10}t^2)}$ *quotient law → subtract exp*

$\frac{12}{3} \frac{r^6}{r^{10}} \frac{t^3}{t^2}$

$= 4 r^{-4} t^1$

$= \frac{4t}{r^4}$

Example 2

Simplifying Algebraic Expressions with Integer Exponents

Simplify. Explain the reasoning.

a) $(x^3y^2)(x^2y^{-4})$ *product law → add exp*

$$= x^5 y^{-2}$$

$$= \frac{x^5}{y^2}$$

b) $\frac{10a^5b^3}{2a^2b^{-2}}$
 $= 5a^3b^5$

quotient law → subtract exponent

b³⁺² = b⁵ (watch signs)



CHECK YOUR UNDERSTANDING

Simplify by rewriting the following using a single power

$$\left[\left(-\frac{3}{2} \right)^{-4} \right]^2 \cdot \left[\left(-\frac{3}{2} \right)^2 \right]^3$$

Step 1: Power of a power law

$$\left[\left(-\frac{3}{2} \right)^4 \right]^2 \cdot \left[\left(-\frac{3}{2} \right)^6 \right]^3$$

$$\left(-\frac{3}{2} \right)^8 \cdot \left(-\frac{3}{2} \right)^6$$

$$\left[\left(-\frac{2}{3} \right)^4 \right]^2 \cdot \left[\left(-\frac{3}{2} \right)^2 \right]^3$$

$$\left(-\frac{2}{3} \right)^8 \cdot \left(-\frac{3}{2} \right)^6$$

Step 2: Product of a power law

$$\left(-\frac{3}{2} \right)^8 \cdot \left(-\frac{3}{2} \right)^6$$

So add exp

$$\left(-\frac{3}{2} \right)^{14}$$

$$\frac{\left(-2 \right)^8 \cdot \left(+3 \right)^6}{\left(+3 \right)^8 \cdot \left(-2 \right)^6}$$

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

Step 3: Rewrite with positive exponent

flip fract

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

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

$$\frac{4}{9}$$

What is the value of $\left(\frac{a^6 b^9}{a^5 b^8}\right)^{-2}$ when $a = -3$ and $b = 2$?

$$\begin{aligned} & \left(\frac{a^6 b^9}{a^5 b^8}\right)^{-2} && \text{Simplify inside bracket first} \\ & = \left(\frac{a^1 b^1}{1}\right)^{-2} \Rightarrow a^{-2} b^{-2} \Rightarrow \frac{1}{a^2 b^2} \\ & = \left(\frac{1}{a b}\right)^2 \\ & = \frac{1^2}{a^2 b^2} \\ & = \frac{1}{a^2 b^2} && a = -3 \quad b = 2 \\ & && \text{Sub in values} \\ & = \frac{1}{(-3)^2 (2)^2} \\ & = \frac{1}{9 \cdot 4} \\ & = \frac{1}{36} \end{aligned}$$

you try

$$\begin{aligned}
 & \left(\frac{8 \cdot \frac{a^5}{a^9} \cdot 1}{b^{-1/3}} \right)^{\frac{1}{2}} \\
 & \left(4 \cdot a^{-4} \cdot b^{\frac{1}{3}} \right)^{\frac{1}{2}} \\
 & 4^{\frac{1}{2}} \cdot a^{-4 \cdot \frac{1}{2}} \cdot b^{\frac{1}{3} \cdot \frac{1}{2}} \\
 & = \sqrt{4} \cdot a^{-2} \cdot b^{\frac{1}{6}} \\
 & = 2 \cdot a^{-2} \cdot b^{\frac{1}{6}} \\
 & = \frac{2 b^{\frac{1}{6}}}{a^2}
 \end{aligned}$$

Simplify
Bracket
firstpower to product
(x exponents)

Homework

Page 241 - 242

3ac, 4ac, 5ac, 6ac,

8aceg, 9aceg, ~~10aceg~~, g

Quiz Tomorrow

Do Tomorrow
Sheet

Attachments

Laws of Exponents Day 2.pdf