



Warm Up

Test Sept
27 or 28

Warm Up quiz tomorrow

Sept 27 or 28
Test

Express each as a radical then evaluate:

$$\begin{aligned} \text{a) } (1728)^{\frac{2}{3}} &= (\sqrt[3]{1728})^2 \\ &= (12)^2 \\ &= 144 \end{aligned}$$

Express each as a power:

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

Express each in simplest radical form: (Entire \rightarrow Mix)

$$\begin{aligned} \text{a) } \sqrt{180} &= \sqrt{36 \times 5} \\ &= \sqrt{36} \sqrt{5} \\ &= 6\sqrt{5} \end{aligned}$$

$$\begin{aligned} \text{b) } \sqrt[3]{1024} &\Rightarrow \sqrt[3]{512 \times 2} \\ &= \sqrt[3]{512} \sqrt[3]{2} \\ &= 8\sqrt[3]{2} \\ &= \sqrt[3]{64 \times 16} \\ &= \sqrt[3]{64} \sqrt[3]{16} \\ &= 4\sqrt[3]{16} \\ &= 4 \times \sqrt[3]{8} \sqrt[3]{2} \\ &= 4 \times 2 \sqrt[3]{2} \\ &= 8\sqrt[3]{2} \end{aligned}$$

Write the reciprocal for each:

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

$$\begin{aligned} \text{b) } 242 &= 242^1 \\ &= \frac{1}{242} \text{ or } 242^{-1} \end{aligned}$$

$$\text{c) } \frac{1}{6} = 6^{-1} \quad \downarrow \text{Recip} \quad 6^1$$

$$\text{d) } 8^2 = \text{Recip} \quad \frac{1}{8^2} \text{ or } 8^{-2}$$

Write all the following with a ^{positive} power

$$\frac{1}{6^{-2}} \quad , \quad \frac{2^{-3}}{1}$$
$$= 6^2 \quad \frac{1}{2^3}$$

Homework Questions

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

c) $\frac{1}{3^3} = 3^2$ 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) $(-7)^{-2} = \frac{1}{7^2}$

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

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

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

9) a) $4^{\frac{1}{2}} = \frac{1}{4^{\frac{1}{2}}} = \frac{1}{\sqrt{4}} = \frac{1}{2}$

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

9e) $(-0.027)^{\frac{2}{3}}$ or use calculator $(\frac{1}{-0.027})^{\frac{2}{3}}$
 $\frac{(-27)^{\frac{2}{3}}}{(1000)^{\frac{2}{3}}} = \frac{(-1000)^{\frac{2}{3}}}{(27)^{\frac{2}{3}}} = \frac{(\sqrt[3]{-1000})^2}{(\sqrt[3]{27})^2} = \frac{(-10)^2}{(3)^2} = \frac{100}{9} = 11.11$
 $\frac{(\frac{1}{\sqrt[3]{-0.027}})^2}{(\frac{1}{\sqrt[3]{1000}})^2} = \frac{(\frac{1}{-0.3})^2}{(\frac{1}{10})^2} = \frac{(1)^2}{(0.3)^2} = \frac{1}{0.09}$

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

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

Didn't flip fraction when you got rid of exp

12) $(\frac{-64}{125})^{\frac{2}{3}}$ $= \frac{(-125)^{\frac{2}{3}}}{(64)^{\frac{2}{3}}} = \frac{(\sqrt[3]{-125})^2}{(\sqrt[3]{64})^2} = \frac{(5)^2}{(4)^2} = \frac{3125}{1624}$

13a) $27^{\frac{4}{3}} = \frac{1}{27^{\frac{4}{3}}} = \frac{1}{(\sqrt[3]{27})^4} = \frac{1}{3^4} = \frac{1}{81}$
 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) $30^{-2.5} = \frac{1}{30^{2.5}} = \frac{1}{30^{\frac{5}{2}}} = \frac{1}{(\sqrt{30})^5} = \frac{1}{(\frac{1}{2})^5} = \frac{1}{\frac{1}{32}} = 32$

13b) $(\frac{-6}{27})^{\frac{2}{3}} = \frac{(-27)^{\frac{2}{3}}}{(8)^{\frac{2}{3}}} = \frac{(\sqrt[3]{-27})^2}{(\sqrt[3]{8})^2} = \frac{(3)^2}{(2)^2} = \frac{9}{4}$
 c) $(\frac{81}{16})^{\frac{3}{4}} = \frac{(16)^{\frac{3}{4}}}{(81)^{\frac{3}{4}}} = \frac{(\sqrt[4]{16})^3}{(\sqrt[4]{81})^3} = \frac{(2)^3}{(3)^3} = \frac{8}{27}$

Use laws of exponent notes

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

$$\text{a) } (3xy^{-2})^4$$

$$= 3^{1 \times 4} x^{1 \times 4} y^{(-2 \times 4)}$$

$$= 3^4 x^4 y^{-8}$$

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

$$\text{b) } \frac{(12r^6t^3)}{(3r^{10}t^2)}$$

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

$$= 4 r^{6-10} t^{3-2}$$

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

$$= \frac{4 t^1}{r^4}$$

Example 2**Simplifying Algebraic Expressions with Integer Exponents**

Simplify. Explain the reasoning.

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

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

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

$$= x^{3+2} \cdot y^{2+(-4)}$$

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

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

product law so add exponent of similar variables



CHECK YOUR UNDERSTANDING

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

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

quotient Law

$$= 5 a^{5-2} b^{3-(-2)}$$

$$= 5 a^3 b^5$$

Simplify by rewriting the following using a single power *multipl*

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

Step 1: Power of a power law

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

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

Step 2: Product of a power law

add exponent
on the same
base

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

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

Step 3: Rewrite with positive exponent

(flip the fraction)

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

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

$$= \left(\frac{a^6}{a^5} \frac{b^9}{b^8}\right)^{-2}$$

$$= (a^{6-5} b^{9-8})^{-2}$$

$$= (a^1 b^1)^{-2}$$

$$= a^{1 \times -2} b^{1 \times -2}$$

$$= a^{-2} b^{-2}$$

$$a = -3 \quad b = 2$$

$$= (-3)^{-2} \cdot (2)^{-2}$$

Fraction

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

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

$$= \frac{1}{9} \cdot \frac{1}{4}$$

$$= \frac{1}{36}$$

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3ac

8aceg

4ac

9aceg

5ac

Homework

6ac

7ac