

Important Rules to Remember !!

Exponent Laws

Product of powers:	$a^m \cdot a^n = a^{m+n}$
Quotient of powers:	$a^m \div a^n = a^{m-n}, a \neq 0$
Power of a power:	$(a^m)^n = a^{mn}$
Power of a product:	$(ab)^m = a^m b^m$
Power of a quotient:	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Warm Up Questions

Simplify by writing as a single power.

$$1. \frac{(b^9 \cdot b^{-7} \cdot b^3)^2 \times (b^4 \cdot b^{-3})^2}{b^{-14}}$$

$$2. \frac{(a^3)^2 \cdot (a^{1/2})^3}{(a^{3/2})^4}$$

$$3. \frac{(-3/5)^{-3/4} \cdot (-3/5)^{1/2}}{(-3/5)^{5/4}}$$

$$\frac{(b^9 \cdot b^{-7} \cdot b^3)^2 \times (b^4 \cdot b^{-3})^2}{b^{-14}}$$

$$= \frac{(b^{9+(-7)+3})^2 \times (b^{4+(-3)})^2}{b^{-14}}$$

$$= \frac{(b^5)^2 \times (b^1)^2}{b^{-14}} \quad \checkmark$$

$$= \frac{b^{5 \cdot 2} \times b^{1 \cdot 2}}{b^{-14}}$$

$$= \frac{b^{10} \times b^2}{b^{-14}} \quad \checkmark$$

$$= \frac{b^{10+2}}{b^{-14}}$$

$$= \frac{b^{12}}{b^{-14}} \quad \checkmark$$

$$= b^{12 - (-14)}$$

$$= b^{26} \quad \checkmark$$

$$\frac{(a^3)^2 \cdot (a^{1/2})^3}{(a^{3/2})^4}$$

Multiply straight across

$$= \frac{a^{3 \cdot 2} \cdot a^{\frac{1}{2} \cdot 3}}{a^{\frac{3}{2} \cdot 4}}$$

$$\rightarrow \frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$$

$$\rightarrow \frac{3}{2} \times \frac{4}{1} = \frac{12}{2} = 6$$

$$= \frac{\cancel{a^6} \cdot a^{\frac{3}{2}}}{\cancel{a^6}}$$

Add/Subtract fractions get a common denominator

$$= \frac{a^{6 + \frac{3}{2}}}{a^6}$$

$$\frac{6}{1} + \frac{3}{2}$$

$$\frac{12}{2} + \frac{3}{2} = \frac{15}{2}$$

$$= \frac{a^{\frac{15}{2}}}{a^6}$$

$$= a^{\frac{15}{2} - \frac{6}{1}}$$

$$\frac{15}{2} - \frac{6}{1}$$

$$\frac{15}{2} - \frac{12}{2} = \frac{3}{2}$$

$$= a^{\frac{3}{2}}$$

$$\frac{(-3/5)^{-3/4} \cdot (-3/5)^{1/2}}{(-3/5)^{5/4}}$$

$$= \frac{\left(\frac{-3}{5}\right)^{-\frac{3}{4} + \frac{1}{2}}}{\left(\frac{-3}{5}\right)^{5/4}}$$

$$\rightarrow -\frac{3}{4} + \frac{1}{2} = \frac{-6}{8} + \frac{4}{8} = \frac{-2}{8} = -\frac{1}{4}$$

$$= \frac{\left(\frac{-3}{5}\right)^{-1/4}}{\left(\frac{-3}{5}\right)^{5/4}}$$

$$= \left(\frac{-3}{5}\right)^{-\frac{1}{4} - \frac{5}{4}}$$

$$= \left(\frac{-3}{5}\right)^{-\frac{6}{4}}$$

$$= \left(\frac{-3}{5}\right)^{-\frac{3}{2}}$$

$$= \left(\frac{5}{-3}\right)^{\frac{3}{2}}$$

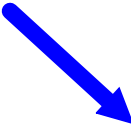
$$= \left(\frac{-5}{3}\right)^{\frac{3}{2}}$$

exp \swarrow
index \swarrow

$$\begin{aligned} & \frac{(b^9 \cdot b^{-7} \cdot b^3)^2 \times (b^4 \cdot b^{-3})^2}{b^{-14}} \\ &= \frac{(b^5)^2 \times (b^1)^2}{b^{-14}} \\ &= \frac{b^{10} \times b^2}{b^{-14}} \\ &= \frac{b^{12}}{b^{-14}} \\ &= b^{26} \end{aligned}$$


$$\frac{(a^3)^2 \cdot (a^{1/2})^3}{(a^{3/2})^4}$$
$$= \frac{a^6 \cdot a^{3/2}}{a^{12/2}} \rightarrow \begin{array}{l} 6/1 + 3/2 \\ 12/2 + 3/2 \\ = 15/2 \end{array}$$
$$= \frac{a^{15/2}}{a^{12/2}} \rightarrow \begin{array}{l} 15/2 - 12/2 \\ = 3/2 \end{array}$$
$$= a^{3/2}$$

$$\frac{(-3/5)^{-3/4} \cdot (-3/5)^{1/2}}{(-3/5)^{5/4}}$$



-3/4	+	1/2
-3/4	+	2/4
		-1/4

$$= \frac{(-3/5)^{-1/4}}{(-3/5)^{5/4}}$$



-1/4	-	5/4
		-6/4
		Reduce !!
		-3/2

$$= (-3/5)^{-3/2}$$
$$= (-5/3)^{3/2}$$

What happens when there's more than one base?

$$\begin{aligned} 1. \quad & a^4 \times a^{-4} \times b^3 \times a^2 \times b^{-4} \\ & = \underline{a^4} \times \underline{a^{-4}} \times \underline{b^3} \times \underline{a^2} \times \underline{b^{-4}} \\ & = a^2 \times b^{-1} \\ & = a^2 \times \left(\frac{1}{b}\right)^1 \\ & = \frac{a^2}{b} \end{aligned}$$

$$2. \quad (a^3b^2)^3 \\ = a^9b^6$$

$$\begin{aligned} 3. \quad & \frac{(a^5b^3)^2}{a^3b^{-2}} \\ &= \frac{a^{10}b^6}{a^3b^{-2}} \\ &= a^{10-3} b^{6-(-2)} \\ &= a^7b^8 \end{aligned}$$

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

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

$$= \frac{a^{10} b^6}{a^3 b^{-2}}$$

$$= \frac{a^{10-3} b^{6-(-2)}}{1}$$

$$= \frac{a^7 b^8}{1}$$

$$\begin{aligned} 4. \quad & \frac{10c^8d^{-2}}{2c^4d^5} = 5c^4d^{-7} = \frac{5c^4}{d^7} \\ & = 5c^4d^{-7} \\ & = \frac{5c^4}{d^7} \end{aligned}$$

$$\begin{aligned} 5. \quad & \frac{(4d^3c^{-3})(3d^6c^7)}{(2d^3c)^2} \\ & = \frac{12d^9c^4}{4d^6c^2} \\ & = 3d^3c^2 \end{aligned}$$

$$\begin{aligned} 6. & \left(\frac{(-10a^2b)^2}{10a^5b^{11}} \right)^{-1} \\ &= \left(\frac{100a^4b^2}{10a^5b^{11}} \right)^{-1} \\ &= \left(10a^{-1}b^{-9} \right)^{-1} \\ &= 10^{-1}ab^9 \\ &= \frac{ab^9}{10} \end{aligned}$$

Homework

$$\textcircled{1} \quad \frac{a^4 b^3 \times 12 a b^{-3}}{(2a^{-2} b^3)^2}$$

$$= \frac{12 a^{4+1} b^{3+(-3)}}{2^2 a^{-2 \cdot 2} b^{3 \cdot 2}}$$

$$= \frac{12 a^5 b^0}{2^2 a^{-4} b^6}$$

$$= \frac{12 a^5 b^0}{4 a^{-4} b^6}$$

$$= 3 a^{5-(-4)} b^{0-6}$$

$$= 3 a^9 b^{-6}$$

$$= \frac{3 a^9}{b^6}$$