

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:	$(a^m)^n = a^{mn}$ (mult.)
Power of a product:	$(ab)^m = a^m b^m$
Power of a quotient:	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Simplify by Writing as a Single Power

$$\begin{aligned}\text{a) } & 0.3^{-3} \cdot 0.3^5 \\ &= 0.3^{(-3) + 5} \\ &= 0.3^2\end{aligned}$$

$$\mathbf{b)} \quad \frac{\mathbf{b^3 \times b^{-5}}}{\mathbf{b^7}}$$

$$= \frac{\mathbf{b^{-2}}}{\mathbf{b^7}}$$

$$= \mathbf{b^{-2-7}}$$

$$= \mathbf{b^{-9}}$$

Write with a positive exponent.

$$= \frac{\mathbf{1}}{\mathbf{b^9}}$$

$$\begin{aligned} \text{c) } & \frac{(a^5 \times a^{-3})^{-2}}{a^{-2}} \\ &= \frac{(a^2)^{-2}}{a^{-2}} \\ &= \frac{a^{-4}}{a^{-2}} \\ &= a^{-4 - (-2)} \\ &= a^{-4 + 2} \\ &= a^{-2} \\ &= 1/a^2 \end{aligned}$$

$$\mathbf{d)} \quad \frac{(1.4^3)(1.4^4)}{1.4^{-2}}$$

Use the product of powers law. (ADD)

$$= \frac{1.4^{3+4}}{1.4^{-2}}$$

$$= \frac{1.4^7}{1.4^{-2}}$$

Use the quotient of powers law. (SUBTRACT)

$$= 1.4^{7 - (-2)}$$

$$= 1.4^9$$

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

First use the power of a power law:

For each power multiply the exponents.

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

Then use the product of powers law. **(ADD)**

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

Write with a positive exponent.

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

$$\mathbf{f)} \quad \left(\frac{7^{\frac{2}{3}}}{7^{\frac{1}{3}} \cdot 7^{\frac{5}{3}}} \right)^6$$

Use the product of powers law. (ADD)

$$= \left(\frac{7^{\frac{2}{3}}}{7^{\frac{1}{3} + \frac{5}{3}}} \right)^6$$

$$= \left(\frac{7^{\frac{2}{3}}}{7^{\frac{6}{3}}} \right)^6$$

Use the quotient of powers law. (SUBTRACT)

$$= \left(7^{\frac{2}{3} - \frac{6}{3}} \right)^6$$

$$-\frac{4}{3} \times \frac{6}{1}$$

$$= \left(7^{-\frac{4}{3}}\right)^6$$

Use the power of a power law. (MULTIPLY)

$$= 7^{\left(-\frac{4}{3}\right)(6)}$$

$$= 7^{-\frac{24}{3}}$$

$$= 7^{-8}$$

Write with a positive exponent.

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

CHECK YOUR UNDERSTANDING

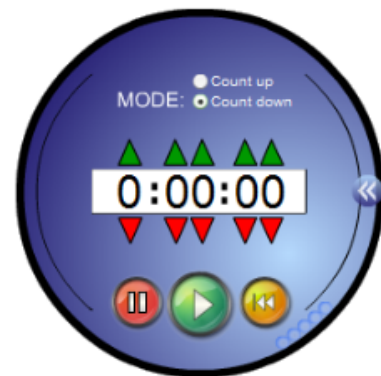
Simplify by writing as a single power. Explain your reasoning.

a) $0.8^2 \cdot 0.8^{-7}$

b) $\left[\left(-\frac{4}{5} \right)^2 \right]^{-3} \div \left[\left(-\frac{4}{5} \right)^4 \right]^{-5}$

c) $\frac{(1.5^{-3})^{-5}}{1.5^5}$

d) $\frac{9^{\frac{5}{4}} \cdot 9^{-\frac{1}{4}}}{9^{\frac{3}{4}}}$



$$\text{a) } 0.8^2 \cdot 0.8^{-7}$$

$$= \mathbf{0.8^{-5}}$$

$$= \frac{1}{0.8^5}$$

$$\begin{aligned}
 \text{b) } & \left[\left(-\frac{4}{5} \right)^2 \right]^{-3} \div \left[\left(-\frac{4}{5} \right)^4 \right]^{-5} \\
 & \left(-\frac{4}{5} \right)^{-6} \div \left(-\frac{4}{5} \right)^{-20} \\
 & \left(-\frac{4}{5} \right)^{-6 - (-20)} \\
 & \left(-\frac{4}{5} \right)^{-6 + 20} \\
 & \left(-\frac{4}{5} \right)^{14}
 \end{aligned}$$

$$\text{c) } \frac{(1.5^{-3})^{-5}}{1.5^5}$$

$$= \frac{1.5^{15}}{1.5^5}$$

$$= 1.5^{10}$$

$$\begin{aligned} \text{d) } & \frac{9^{\frac{5}{4}} \cdot 9^{-\frac{1}{4}}}{9^{\frac{3}{4}}} \\ &= \frac{9^{\frac{5}{4} + \frac{-1}{4}}}{9^{\frac{3}{4}}} \\ &= \frac{9^{\frac{4}{4}}}{9^{\frac{3}{4}}} \\ &= 9^{\frac{4}{4} - \frac{3}{4}} \\ &= 9^{\frac{1}{4}} \end{aligned}$$

