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:	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Simplify by Writing as a Single Power

a) $0.3^{-3} \cdot 0.3^{5}$

$$= 0.3^{(-3)+5}$$

$$= 0.3^{2}$$

b) $\dfrac{b^3 \times b^{-5}}{b^7}$

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

$= b^{-2-7}$

$= b^{-9}$

Write with a positive exponent.

$= \dfrac{1}{b^9}$

c) $\dfrac{(a^5 \times a^{-3})^{-2}}{a^{-2}}$

$= \dfrac{(a^2)^{-2}}{a^{-2}}$

$= \dfrac{a^{-4}}{a^{-2}}$ $-4+2$

$= a^{-4-(-2)}$

$= a^{-4+2}$

$= a^{-2}$

$= 1/a^2$

d) $\dfrac{(1.4^3)(1.4^4)}{1.4^{-2}}$

Use the product of powers law. **(ADD)**

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

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

7+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.

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

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

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)**

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

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

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.

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

$$6^{\frac{1}{3}} \times 6^{\frac{2}{3}} = 6^{\frac{3}{3}}$$

$$= 6^{1}$$

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

$$6^{8/12} \times 6^{3/12} = 6^{\frac{11}{12}}$$

11 ← exp
12 ← root

$$\frac{6^{\frac{2}{3}\times 5} \times 6^{\frac{1}{5}\times 3}}{6^{\frac{1}{3}}}$$

$$= \frac{6^{\frac{10}{15}} \times 6^{\frac{3}{15}}}{6^{\frac{1}{3}}}$$

$$= \frac{6^{\frac{13}{15}}}{6^{\frac{1}{3}\times 5}}$$

$$\frac{6^{\frac{13}{15}}}{6^{\frac{5}{15}}}$$

$$= 6^{\frac{8}{15}}$$

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

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

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

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

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

$\left(-\frac{4}{5}\right)^{-6} \div \left(-\frac{4}{5}\right)^{-20}$ ~~$-64-20$~~

$\left(-\frac{4}{5}\right)^{14}$

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

$\dfrac{1.5^{15}}{1.5^{5}}$

$= 1.5^{10}$

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

$\frac{5}{4} + \frac{-1}{4}$

$= \frac{4}{4}$

$\frac{9^{\frac{4}{4}}}{9^{\frac{3}{4}}}$

$\frac{4}{4} - \frac{3}{4} = \frac{1}{4}$

perkan $= 9^{\frac{1}{4}}$