

Warm Up Questions

$$\left(\frac{-27}{8}\right)^{-2/3}$$

$$(0.49)^{-3/2}$$

$\left(\frac{49}{100}\right)^{-3/2}$

$$(81)^{-5/2}$$

$$\left(\frac{81}{256}\right)^{-2/4}$$

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$$\left(\frac{-27}{8}\right)^{-2/3}$$

$\left(\frac{8}{-27}\right)^{2/3}$ *2/3 exp. root*

$$\frac{(\sqrt[3]{8})^2}{(\sqrt[3]{-27})^2}$$

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

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

$$(0.49)^{-3/2}$$

$\left(\frac{49}{100}\right)^{-3/2}$ *3/2 exp. root*

$$\frac{(\sqrt{100})^3}{(\sqrt{49})^3}$$

$$\frac{10^3}{7^3}$$

$$= \frac{1000}{343}$$

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$$\frac{(81)^{-5/2}}{1}$$

$$\frac{1}{81^{5/2}}$$

5/2 exp. root

$$\frac{1}{(\sqrt{81})^5}$$

$$\frac{1}{9^5}$$

$$= \frac{1}{59049}$$

$$\left(\frac{81}{256}\right)^{-2/4}$$

$$\frac{81^{-1/2}}{256}$$

$$\frac{256^{1/2}}{81}$$

$$\frac{\sqrt{256}}{\sqrt{81}}$$

$$\frac{16}{9}$$

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Write as a Power

$$\left(\sqrt[4]{25}\right)^3$$

$$25^{\frac{3}{4}}$$

exp root

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Solve

a) $(-64)^{4/3}$

4/3 exp. root

$$(\sqrt[3]{-64})^4$$

$$(-4)^4$$

$$+256$$

b) $-64^{4/3}$

4/3 exp. root

$$-(\sqrt[3]{64})^4$$

$$-(4)^4$$

$$= -256$$

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$$1) 7^3 \times 7^4 = 7^7$$

$$2) 5^2 \times 5^3 = 5^5$$

$$3) 4^7 \times 4^2 = 4^9$$

$$4) 5^1 \times 5^4 = 5^5$$

$$5) 7^3 \times 7^1 = 7^4$$

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$$6) 2n^4 \times 3n^5 = 6n^9$$

$$7) 4m^3 \times 2n = 8m^3n$$

$$8) 6x^4 \times 3x^3 = 18x^7$$

$$9) 5x^3 \times 5x^{-2} = 25x^1$$

$$10) 8p^4 \times 3p^4 \times 2p^5 = 48p^{10}$$

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$$11) (m^4)^3 = m^{12}$$

$$12) (x^3)^2 = x^6$$

$$13) (2m^4)^2 = 2^2 m^8$$

$$= 4m^8$$

$$14) (3p)^3 = 3^3 p^3$$

$$15) (7x^2)^2 = 7^2 x^4$$

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$$16) \frac{x^5}{x^2} = x^3$$

$$17) \frac{m^8}{m^1} = m^7$$

$$18) \frac{r^5}{r^3} = r^2$$

$$19) \frac{8m^4}{2m^2} = 4m^2$$

$$20) \frac{7n^3}{3h^2} = \frac{7n^3}{3}$$

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

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Simplify by Writing as a Single Power

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

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$$\begin{aligned} \text{b) } & \frac{b^3 \times b^{-5}}{b^7} \\ &= \frac{b^{-2}}{b^7} \\ &= b^{-2-7} \\ &= b^{-9} \\ & \text{Write with a positive exponent.} \\ &= \frac{1}{b^9} \end{aligned}$$

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

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$$\begin{aligned} \text{d) } & \frac{(1.4^3)(1.4^4)}{1.4^{-2}} \\ & \text{Use the product of powers law. (ADD)} \\ &= \frac{1.4^{3+4}}{1.4^{-2}} \\ &= \frac{1.4^7}{1.4^{-2}} \\ & \text{Use the quotient of powers law. (SUBTRACT)} \\ &= 1.4^{7 - (-2)} \\ &= 1.4^9 \end{aligned}$$

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

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.

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

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

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)

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

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

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.

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

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

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

$= 0.8^{-5}$

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

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

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

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