



Exponential Laws #1



1) Please write the following as a single power using the exponent laws.

$$\begin{aligned} \text{a) } 2^8 \times 2^2 \\ = 2^{8+2} \\ = 2^{10} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{(-1)^9}{(-1)^2} &= (-1)^{9-2} \\ &= (-1)^7 \end{aligned}$$

$$\begin{aligned} \text{c) } (8^2)^6 \\ = 8^{2 \cdot 6} \\ = 8^{12} \end{aligned}$$

$$\begin{aligned} \text{d) } 3^{10} \div 3^8 \\ = 3^{10-8} \\ = 3^2 \end{aligned}$$

$$\begin{aligned} \text{e) } 1^{10} \times 1^4 \\ = 1^{10+4} \\ = 1^{14} \end{aligned}$$

$$\begin{aligned} \text{f) } \left(\frac{5^5}{5^2}\right)^{10} &= (5^{5-2})^{10} \\ &= (5^3)^{10} \\ &= 5^{3 \cdot 10} \\ &= 5^{30} \end{aligned}$$

$$\begin{aligned} \text{g) } x^5 x^4 \\ = x^{5+4} \\ = x^9 \end{aligned}$$

$$\begin{aligned} \text{h) } \frac{a^8}{a^5} &= a^{8-5} \\ &= a^3 \end{aligned}$$

$$\begin{aligned} \text{i) } (y^3)^5 &= y^{3 \cdot 5} \\ &= y^{15} \end{aligned}$$

2) Write the following in expanded form and then evaluate.

$$\begin{aligned} \text{a) } 3^5 &= 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \\ &= 243 \end{aligned}$$

$$\begin{aligned} \text{b) } \left(\frac{1}{7}\right)^6 &= \left(\frac{1}{7}\right)\left(\frac{1}{7}\right)\left(\frac{1}{7}\right)\left(\frac{1}{7}\right)\left(\frac{1}{7}\right)\left(\frac{1}{7}\right) \\ &= \frac{1}{117649} \end{aligned}$$

$$\begin{aligned} \text{c) } (-3)^4 &= (-3)(-3)(-3)(-3) \\ &= 81 \end{aligned}$$

$$\begin{aligned} \text{d) } -3^4 &= -3 \cdot 3 \cdot 3 \cdot 3 \\ &= -81 \end{aligned}$$

$$\begin{aligned} \text{e) } \left(\frac{3}{5}\right)^4 &= \left(\frac{3}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{5}\right) \\ &= \frac{81}{125} \end{aligned}$$

$$\text{f) } (-5)^1 = -5$$

$$\begin{aligned} \text{g) } (2^2)^3 &= (2^2)(2^2)(2^2) \\ &= (4)(4)(4) \\ &= \underline{\underline{64}} \end{aligned}$$

$$\begin{aligned} \text{h) } \left(\frac{3}{4}\right)^2 &= \left(\frac{3}{4}\right)\left(\frac{3}{4}\right) \\ &= \frac{9}{16} \end{aligned}$$



Exponential Laws #2



1) Please write the following as a single power using the exponent laws, remember to NOT leave any negative exponents or decimals. Do **NOT** evaluate.

$$\begin{aligned} \text{a) } 7^{-2} \times 7^{-5} &= 7^{(-2)+(-5)} \\ &= 7^{-7} \\ &= \frac{1}{7^7} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{3^{-9}}{3^{-2}} &= 3^{-9-(-2)} \\ &= 3^{-9+2} \\ &= 3^{-7} \\ &= \frac{1}{3^7} \end{aligned}$$

$$\text{c) } (5^{-4})^{-2} = 5^{(-4) \cdot (-2)} = 5^8$$

$$\begin{aligned} \text{d) } 6^5 \div 6^8 &= 6^{5-8} \\ &= 6^{-3} \\ &= \frac{1}{6^3} \end{aligned}$$

$$\begin{aligned} \text{e) } 5^{10} \times 5^{10} &= 5^{10+10} \\ &= 5^{20} \end{aligned}$$

$$\begin{aligned} \text{f) } \left(\frac{10^{-2}}{10^{-4}}\right)^{-3} &= [10^{-2-(-4)}]^{-3} \\ &= (10^{-2+4})^{-3} \\ &= (10^2)^{-3} \\ &= 10^{-6} \end{aligned}$$

$$\begin{aligned} \text{g) } x^{-5} x^4 x^{-3} &= x^{-5+4+(-3)} \\ &= x^{-4} \\ &= \frac{1}{x^4} \end{aligned}$$

$$\begin{aligned} \text{h) } \frac{a^8}{a^{-5}} &= a^{8-(-5)} \\ &= a^{8+5} \\ &= a^{13} \end{aligned}$$

$$\begin{aligned} \text{i) } (y^{-3})^{15} &= y^{-3 \cdot 15} \\ &= y^{-45} \end{aligned}$$

2) Evaluate the following, do NOT leave decimals answers, leave them in fraction form.

$$\begin{aligned} \text{a) } 3^{-3} &= \frac{1}{3^3} \\ &= \frac{1}{27} \end{aligned}$$

$$\begin{aligned} \text{b) } \left(\frac{1}{7}\right)^{-6} &= (7)^6 \\ &= 117649 \end{aligned}$$

$$\text{c) } (-1)^{12} = 1$$

$$\text{d) } -1^{12} = -1$$

$$\begin{aligned} \text{e) } \left[\left(\frac{4}{3}\right)^{-2}\right]^3 &= \left[\left(\frac{3}{4}\right)^2\right]^3 \\ &= \left(\frac{3}{4}\right)^6 = \left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right) \\ &= \frac{729}{4096} \end{aligned}$$

$$\text{f) } 2000^0 = 1$$

$$\begin{aligned} \text{g) } -(2^{-2})^{-2} &= -(2^{-2 \cdot -2}) \\ &= -(2^4) \\ &= -(16) \\ &= -16 \end{aligned}$$

$$\begin{aligned} \text{h) } \left(\frac{3}{4}\right)^{-2} &= \left(\frac{4}{3}\right)^2 \\ &= \frac{4}{3} \cdot \frac{4}{3} \\ &= 16/9 \end{aligned}$$

Exponential Laws #3

1) Please write the following as a single power using the exponent laws, remember to NOT leave any negative exponents or decimals. Do **NOT** evaluate.

$$\begin{aligned} \text{a) } 7^{-2} \div 7^{-5} &= 7^{-2-(-5)} \\ &= 7^{-2+5} \\ &= 7^3 \end{aligned}$$

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

$$\begin{aligned} \text{c) } (4^3)^{-2} &= 4^{3 \cdot -2} \\ &= 4^{-6} \\ &= \frac{1}{4^6} \end{aligned}$$

$$\begin{aligned} \text{d) } 7^{-5} \times 7^8 &= 7^{-5+8} \\ &= 7^3 \end{aligned}$$

$$\begin{aligned} \text{e) } 5^{10} \times 5^{10} \times 5^{-20} &= 5^{10+10-20} \\ &= 5^0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} \text{f) } \left(\frac{2^{-2}}{2^7}\right)^3 &= (2^{-2-7})^3 \\ &= (2^{-9})^3 \\ &= 2^{-27} \end{aligned}$$

$$\begin{aligned} \text{g) } \frac{x^{-5}x^3x^{-3}}{x^{10}} &= \frac{x^{-5+3-3}}{x^{10}} = \frac{x^{-5}}{x^{10}} \\ &= x^{-5-10} = x^{-15} \end{aligned}$$

$$\begin{aligned} \text{h) } \frac{bb^8}{b^{-5}} &= \frac{b^{1+8}}{b^{-5}} = \frac{b^9}{b^{-5}} \\ &= b^{9-(-5)} = b^{14} \end{aligned}$$

$$\begin{aligned} \text{i) } (y^{-3})^{-5} &= y^{(-3)(-5)} \\ &= y^{15} \end{aligned}$$

2) Evaluate the following, do **NOT** leave decimals answers, leave them in fraction form.

$$\begin{aligned} \text{a) } (-3)^3 &= (-3)(-3)(-3) \\ &= -27 \end{aligned}$$

$$\begin{aligned} \text{b) } \left(\frac{3}{5}\right)^{-2} &= \left(\frac{5}{3}\right)^2 = \left(\frac{5}{3}\right)\left(\frac{5}{3}\right) = \frac{25}{9} \end{aligned}$$

$$\text{c) } (-1)^{99} = -1$$

$$\text{d) } -1^{100} = -1$$

$$\begin{aligned} \text{e) } \left[\left(\frac{1}{5}\right)^2\right]^{-3} &= \left(\frac{1}{5}\right)^{-6} = 5^6 = 15625 \end{aligned}$$

$$\text{f) } 343.248^0 = 1$$

$$\text{g) } (5)^{-2} = \frac{1}{5^2} = \frac{1}{25}$$

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