

# Solutions Exponent Laws v2

$$\begin{aligned} \textcircled{1} (3^1 x^{-6} y^1)^{-3} &= 3^{-3} x^{18} y^{-3} \\ &= \frac{1}{3^3} \frac{x^{18}}{1} \frac{1}{y^3} \\ &= \boxed{\frac{x^{18}}{3^3 y^3}} = \boxed{\frac{x^{18}}{27 y^3}} \end{aligned}$$

$$\textcircled{2} \left[ \frac{(2^1 x^{-5} y^1)^{-3}}{4^1 x^2 y^{-5}} \right]^2 = \left[ \frac{2^{-3} x^{15} y^{-3}}{4^1 x^2 y^{-5}} \right]^2$$

inside/out

$$\left[ \frac{1}{2^3 4^1} \cdot \frac{x^{15}}{1} \cdot \frac{y^{-3}}{y^5} \right]^2$$

$$\left[ \frac{1}{2^3 2^2} \frac{x^{15}}{1} \frac{y^2}{1} \right]^2$$

$$\left[ \frac{1}{2^5} \frac{x^{15}}{1} \frac{y^2}{1} \right]^2$$

$$\left[ \frac{1}{2^{10}} \frac{x^{26}}{1} \frac{y^4}{1} \right]$$

$$\boxed{\frac{x^{26} y^4}{2^{10}} = \frac{x^{26} y^4}{1024}}$$

outside/in

$$\left[ \frac{2^{-6} x^{30} y^{-6}}{4^2 x^4 y^{-10}} \right]$$

$$\frac{1}{4^2 2^6} \frac{x^{30}}{1} \frac{y^{10}}{y^6}$$

$$\frac{1}{2^7 2^6} \frac{x^{30}}{1} \frac{y^4}{1}$$

$$\frac{1}{2^4 2^6} \frac{x^{30}}{1} \frac{y^4}{1}$$

$$\frac{1}{2^{10}} \frac{x^{30}}{1} \frac{y^4}{1}$$

$$\boxed{\frac{x^{30} y^4}{2^{10}} = \frac{x^{30} y^4}{1024}}$$

$$\textcircled{3} \left[ \left( \frac{2^1}{5} x^1 y^4 \right)^{-3} \left[ 4^1 x^{-3} y^2 \right]^2 \right]$$

$$\left[ \frac{2^{-3}}{5^{-3}} \frac{x^{-3}}{1} \frac{y^{-12}}{1} \right] \left[ \frac{4^2}{1} \frac{x^{-6}}{1} \frac{y^4}{1} \right]$$

$$\frac{2^{-3} 4^2}{5^{-3}} \frac{1}{x^3} \frac{1}{x^6} \frac{1}{y^{12}} \frac{y^4}{1}$$

$$\frac{2^{-3} (2^2)^2}{5^{-3}} \frac{1}{x^9} \frac{y^4}{y^{12}}$$

$$\frac{2^{-3} 2^4}{1} \frac{5^3}{1} \frac{1}{x^9} \frac{1}{y^8}$$

$$\frac{2^1}{2^3} \frac{5^3}{1} \frac{1}{x^9} \frac{1}{y^8}$$

$$\frac{2^1}{1} \frac{5^3}{1} \frac{1}{x^9} \frac{1}{y^8}$$

$$\frac{2^1 \cdot 5^3}{x^9 y^8}$$

$$= \frac{250}{x^9 y^8}$$

$$\textcircled{4} \left[ \frac{4^1 x^5 y^1}{8^1 x^1 y^0} \right]^2$$

$$= \frac{4^2 x^{10} y^2}{8^2 x^2 y^0}$$

$$= \frac{(2^2)^2}{(2^3)^2} \frac{x^8}{1} \frac{y^2}{1}$$

$$= \frac{2^4}{2^6} \frac{x^8}{1} \frac{y^2}{1}$$

$$= \frac{1}{2^2} \frac{x^8}{1} \frac{y^2}{1}$$

$$= \boxed{\frac{x^8 y^2}{2^2}} = \boxed{\frac{x^8 y^2}{4}}$$

$$\begin{aligned}
 \textcircled{5} \quad \left( \frac{2^1 x^1 y^8}{y^4} \right)^{-3} &= \frac{2^{-3} x^{-3} y^{-24}}{y^{-12}} && \text{outside/in} \\
 &= 2^{-3} x^{-3} y^{-24} y^{12} \\
 &= \boxed{2^{-3} x^{-3} y^{-12}}
 \end{aligned}$$

$$\begin{aligned}
 \text{OR} \quad \left( \frac{2^1 x^1 y^8}{y^4} \right)^{-3} &= \left( \frac{2^1}{1} \frac{x^1}{1} \frac{y^8}{y^4} \right)^{-3} && \text{inside/out} \\
 &= \left( \frac{2^1}{1} \cdot \frac{x^1}{1} \frac{y^4}{1} \right)^{-3} \\
 &= \boxed{2^{-3} x^{-3} y^{-12}}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{6} \quad 2^{-4} x^{-2} y^4 z^{-5} &= \frac{2^{-4}}{1} \cdot \frac{x^{-2}}{1} \frac{y^4}{1} \cdot \frac{z^{-5}}{1} \\
 &= \frac{1}{2^4} \cdot \frac{1}{x^2} \cdot \frac{y^4}{1} \cdot \frac{1}{z^5} \\
 &= \boxed{\frac{y^4}{2^4 x^2 z^5}} = \boxed{\frac{y^4}{16 x^2 z^5}}
 \end{aligned}$$

$$\textcircled{7} \left[ \frac{(2^1 x^{-5} y^1)^0 2^1 x^4}{4^1 x^4 y^{-5}} \right]^{-w}$$

$$\left[ \frac{2^0 x^0 y^0 2^1 x^4}{2^2 x^4 y^{-5}} \right]^{-w}$$

$$\left[ \frac{1 \cdot 1 \cdot 1 \cdot 2^1 x^4 \quad 1}{2^2 x^4 y^{-5}} \right]^{-w}$$

$$\left[ \frac{1}{2} \quad \frac{x^4}{x^4} \quad \frac{y^5}{1} \right]^{-w}$$

$$\left[ \frac{1^{-w}}{2^{-w}} \quad \frac{x^{-4w}}{x^{-4w}} \quad \frac{y^{-5w}}{1} \right]$$

$$\left[ \frac{1}{2^{-w}} \quad \frac{x^{4w}}{x^{4w}} \quad \frac{1}{y^{5w}} \right]$$

$$\left[ \frac{2^w}{1} \quad \frac{x^{4w}}{x^{4w}} \quad \frac{1}{y^{5w}} \right]$$

$$\boxed{\left[ \frac{2^w x^{4w}}{x^{4w} y^{5w}} \right]}$$

Accept

$$\boxed{2^w x^{4w-4w} y^{-5w}} \quad \text{+w}$$