

MUST KNOWS --- EXPONENT PROPERTIES

Product of a Power	Power of a Power	Power of a Product	Negative Exponents
$(a^m)(a^n) = a^{m+n}$	$(a^m)^n = a^{m(n)}$	$(ab)^m = a^m b^m$	$a^{-m} = \frac{1}{a^m}$
Quotient of Powers	Power of Quotient	Zero Exponent	Negative Exponents
$\frac{a^m}{a^n} = a^{m-n}$	$\left(\frac{a^m}{b^n}\right)^p = \frac{a^{m(p)}}{b^{n(p)}}$	$a^0 = 1$	$\frac{1}{a^{-m}} = a^m$

Simplify.

$$\begin{aligned}
 1.) \quad & (2ab^3c^{-2})^3 \\
 & = 2^3 a^3 b^{3(3)} c^{-2(3)} \\
 & = 8a^3 b^9 c^{-6} \\
 & = \boxed{\frac{8a^3 b^9}{c^6}}
 \end{aligned}$$

$$\begin{aligned}
 2.) \quad & (5m^3n^{-2})(-3m^5n^{-3}) \\
 & = (5 \cdot -3) m^{3+5} n^{-2+(-3)} \\
 & = -15m^8 n^{-5} \\
 & = \boxed{\frac{-15m^8}{n^5}}
 \end{aligned}$$

$$\begin{aligned}
 3.) \quad & \frac{12x^3y^4z}{36x^3yz^{-6}} \\
 & = \frac{12}{36} x^{3-3} y^{4-1} z^{1-(-6)} \\
 & = \frac{1}{3} x^0 y^3 z^7 \\
 & = \boxed{\frac{y^3 z^7}{3}}
 \end{aligned}$$

$$\begin{aligned}
 4.) \quad & \frac{(3xy^2)^2}{15x^4y^{-2}} \\
 & = \frac{3^2 x^2 y^{2(2)}}{15x^4 y^{-2}} \\
 & = \frac{9}{15} x^{2-4} y^{4-(-2)} \\
 & = \frac{3}{5} x^{-2} y^6 \\
 & = \boxed{\frac{3y^6}{5x^2}}
 \end{aligned}$$

$$\begin{aligned}
 5.) \quad & (4m^3n^{-2}p^2)^{-4} \\
 & = 4^{-4} m^{3(-4)} n^{-2(-4)} p^{2(-4)} \\
 & = \frac{n^8}{4^4 m^{12} p^8} \\
 & = \boxed{\frac{n^8}{256 m^{12} p^8}}
 \end{aligned}$$

$$\begin{aligned}
 6.) \quad & (6x^2y^{-3}z)^0 \\
 & = 6^0 x^{2(0)} y^{-3(0)} z^0 \\
 & = \boxed{1}
 \end{aligned}$$

$$\begin{aligned}
 7.) & (2xy^3)^3(4x^{-4}y^{-2}) \\
 &= (2^3 x^3 y^{3(3)})(4x^{-4}y^{-2}) \\
 &= (8x^3 y^9)(4x^{-4}y^{-2}) \\
 &= (8 \cdot 4) x^{3+(-4)} y^{9+(-2)} \\
 &= 32 x^{-1} y^7 \\
 &= \boxed{\frac{32y^7}{x}}
 \end{aligned}$$

$$\begin{aligned}
 8.) & \frac{3^{-2}ab^2c^4}{4^{-3}abc^{-3}} \\
 &= \frac{4^3}{3^2} a^{1-1} b^{2-1} c^{4-(-3)} \\
 &= \frac{64}{9} a^0 b^1 c^7 \\
 &= \boxed{\frac{64bc^7}{9}}
 \end{aligned}$$

$$\begin{aligned}
 9.) & (6x^{-3}y^2z^4)^2 \\
 &= 6^2 x^{-3(2)} y^{2(2)} z^{4(2)} \\
 &= 36 x^{-6} y^4 z^8 \\
 &= \boxed{\frac{36y^4z^8}{x^6}}
 \end{aligned}$$

$$\begin{aligned}
 10.) & (-5x^4yz^3)(2x^{-3}y^{-2}z)(3x^{-1}yz^{-5}) \\
 &= (-5 \cdot 2 \cdot 3) x^{4+(-3)+(-1)} y^{1+(-2)+1} z^{3+1+(-5)} \\
 &= -30 x^0 y^0 z^{-1} \\
 &= \boxed{\frac{-30}{z}}
 \end{aligned}$$

$$\begin{aligned}
 11.) & \frac{24ab^{-2}}{-4a^{-3}c^{-3}} \\
 &= \frac{24}{-4} a^{1-(-3)} b^{-2} c^{-3} \\
 &= \boxed{\frac{-6a^4c^3}{b^2}}
 \end{aligned}$$

$$\begin{aligned}
 12.) & \left(\frac{15m^4n^{-6}}{5ac^{-3}}\right)^0 \\
 &= \frac{15^0 m^{4(0)} n^{-6(0)}}{5^0 a^0 c^{-3(0)}} \\
 &= \boxed{1}
 \end{aligned}$$

$$\begin{aligned}
 13.) & \left(\frac{4x^2y^{-3}}{5xy^4z^{-2}}\right)^3 \\
 &= \frac{(4^3 x^{2(3)} y^{-3(3)})}{5^3 x^3 y^{4(3)} z^{-2(3)}} \\
 &= \frac{64 x^6 y^{-9}}{125 x^3 y^{12} z^{-6}} \\
 &= \frac{64 x^{6-3} y^{-9-12}}{125 z^{-6}} \\
 &= \boxed{\frac{64 x^3 z^6}{125 y^{21}}}
 \end{aligned}$$

$$\begin{aligned}
 14.) & \left(\frac{2x^3y^2}{5y^2z^{-3}}\right)\left(\frac{10x^4y^4z^4}{9x^5z^{-3}}\right) \\
 &= \frac{2 \cdot 10}{5 \cdot 9} x^{3+4} y^{2+4-2} z^{4-(-3)} \\
 &= \frac{20}{45} x^7 y^4 z^7 \\
 &= \boxed{\frac{4x^7y^4}{9z^7}}
 \end{aligned}$$

$$\begin{aligned}
 15.) & (5^{-2}x^3y^{-4}z^5)^2 \\
 &= 5^{-2(2)} x^{3(2)} y^{-4(2)} z^{5(2)} \\
 &= 5^{-4} x^6 y^{-8} z^{10} \\
 &= \frac{x^6 z^{10}}{5^4 y^8} \\
 &= \boxed{\frac{x^6 z^{10}}{625 y^8}}
 \end{aligned}$$