

Product of Powers

For any number a and all integers m and n ,

$$a^m \cdot a^n = a^{m+n}$$

Simplify $(4a^3b)(3a^2b^5)$

$$(4 \cdot 3)(a^{3+2})(b^{1+5}) \rightarrow 12a^5b^6$$

Power of a Power

For any number a and all integers m and n ,

$$(a^m)^n = a^{mn}$$

Simplify $(b^5)^3$

$$b^{5 \cdot 3} \rightarrow b^{15}$$

Power of a Product

For all numbers a and b and integer m ,

$$(ab)^m = a^m b^m$$

Simplify $(3a^2b^5)^3$

$$3^3 a^{2 \cdot 3} b^{5 \cdot 3} \rightarrow 27a^6b^{15}$$

Multiplication Properties of EXPONENTS

$y(y^5)$	$m^2 \cdot m^7$	$(rn)(rn^3)(n^2)$	$(-4x^3)(-5x^7)$	$(-3j^2k^4)(2jk^6)$
$(y^5)^2$	$(x^2)^5(x^3)$	$(-3ab^4)^3$	$(4a^2)^2(b^3)$	
$(-4xy)^3(-2x^2)^3$	$-3(2x)^4(4x^5y)^2$	$(2xy)^2(-3x^2)(4y^4)$	$(-3j^2k^3)^2(2j^2k)^3$	

Power of a Quotient

For any real numbers a and $b \neq 0$, and any integer m ,

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

Simplify

$$\left(\frac{3p^3}{7}\right)^2 \rightarrow \frac{3^2 p^{3 \cdot 2}}{7^2} = \frac{9p^6}{49}$$

Quotient of Powers

For any nonzero number a , and any integers m and p ,

$$\frac{a^m}{a^p} = a^{m-p}$$

Simplify

$$\frac{g^3 h^5}{g h^2} \rightarrow g^{3-1} h^{5-2} = g^2 h^3$$

Negative Exponents

For any nonzero number a and any integer n ,

$$a^{-n} = \frac{1}{a^n}$$

$$\frac{1}{a^{-n}} = a^n$$

Zero Exponent

For any nonzero number a ,

$$a^0 = 1$$

Simplify

$$15^0 \quad \left(\frac{b}{c}\right)^0$$

↓ ↓
1 1

$$1. \frac{5^5}{5^2}$$

$$2. \frac{m^6}{m^4}$$

$$3. \frac{p^5 n^4}{p^2 n}$$

$$4. \frac{a^2}{a}$$

$$5. \frac{x^5 y^3}{x^5 y^2}$$

$$6. \frac{-2y^7}{14y^5}$$

$$7. \frac{xy^6}{y^4 x}$$

$$8. \frac{r^7 n^7 t^2}{n^3 r^3 t^2}$$

$$1. \left(\frac{2a^2 b}{a} \right)^3$$

$$2. \left(\frac{4p^4 r^4}{3p^2 r^2} \right)^3$$

$$3. \left(\frac{2r^5 w^3}{r^4 w^3} \right)^4$$

$$4. \left(\frac{3r^6 n^3}{2r^5 n} \right)^4$$

$$1. \frac{2^2}{2^{-3}}$$

$$2. \frac{m}{m^{-4}}$$

$$5. \frac{(-x^{-1})^0}{4w^{-1}y^2}$$

$$6. \frac{(a^2 b^3)^2}{(ab)^{-2}}$$

$$3. \frac{p^{-8}}{p^3}$$

$$4. \frac{b^{-4}}{b^{-5}}$$

$$7. \frac{x^4 y^0}{x^{-2}}$$

$$8. \frac{(6a^{-1}b)^2}{(b^2)^4}$$

$$9. \frac{(3rt)^2 u^{-4}}{r^{-1} t^2 u^7}$$

$$10. \frac{m^{-3} t^{-3}}{(m^2 t^3)^{-1}}$$

$$11. \left(\frac{4m^2 n^2}{8m^{-1} \ell} \right)^0$$

$$12. \frac{(-2mn^2)^{-3}}{4m^{-6} n^4}$$