

Exponent Laws

Thursday, September 26, 2019 8:41 AM

① Exponent Law #1: $x^n \cdot x^m = x^{n+m}$

$$\underset{\wedge}{3^2} \cdot \underset{\wedge}{3^3}$$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^5 \quad 3^2 \cdot 3^3 = 3^5$$

Note: The bases must be the same.

$3^2 \cdot 4^3$ cannot be simplified.

$$x^9 \cdot x^4 = x^{13}$$

② Exponent Law #2: $\frac{x^m}{x^n} = x^{m-n}$

$$\frac{4^5}{4^3} = \frac{\cancel{4} \cdot \cancel{4} \cdot \cancel{4} \cdot 4 \cdot 4}{\cancel{4} \cdot \cancel{4} \cdot \cancel{4}} = 4^2$$

$$y^7 \div y^3 = y^4$$

$$\frac{2^5}{2^2} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 2}{\cancel{2} \cdot \cancel{2}} = 2^3 \quad \frac{2^5}{2^2} = 2^{5-2} = 2^3$$

$$\frac{2^2}{2^5} = \frac{\cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 2} = \frac{1}{2^3} \quad \frac{2^2}{2^5} = 2^{2-5} = 2^{-3}$$

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

$$\frac{y^4}{y^9} = y^{-5} = \frac{1}{y^5}$$

$$\left(\frac{4^4}{4^4} \right) = \frac{\overset{1}{4} \cdot \overset{1}{4} \cdot \overset{1}{4} \cdot \overset{1}{4}}{\underset{1}{4} \cdot \underset{1}{4} \cdot \underset{1}{4} \cdot \underset{1}{4}} = \frac{256}{256} = \textcircled{1}$$

$$\underbrace{4 \cdot 4 \cdot 4 \cdot 4}_{1 \cdot 1 \cdot 1 \cdot 1} \quad 256$$

$$\left(\frac{4^4}{4^4}\right) = 4^{4-4} = 4^0 \quad 4^0 = 1$$

Exponent Law # 6: Any number raised to an exponent of 0 has a value of 1.

$$\begin{aligned} 2^3 &= 8 && \div 2 \\ 2^2 &= 4 && \div 2 \\ 2^1 &= 2 && \div 2 \\ 2^0 &= 1 && \div 2 \end{aligned}$$

$$256^0 = 1$$

$$(-12)^0 = 1$$

$$-12^0 = -1$$

$$(12x^3y^4z^2)^0 = 1$$

③ Exponent Law # 3: $(x^m)^n = x^{mn}$

$$(4^2)^3 = 4^2 \cdot 4^2 \cdot 4^2 = 4^6$$

$$\text{eg } (7^3)^4 = 7^{3 \cdot 4} = 7^{12}$$

$$(x^2)^{10} = x^{2 \cdot 10} = x^{20}$$

$$[(-4)^2]^6 = (-4)^{12}$$

$$\text{Evaluate: } 2^3 = 8$$

Try: Simplify (means to give the answer in a simpler version of the form it was given).

$$\text{Simplify: } 2^3 \cdot 2^4 = 2^7$$

Simplify:

$$\text{a) } (-3)^4 \cdot (-3)^7 \cdot (-3)^{11} \quad \text{b) } 5^7 \cdot 5^{-1}$$

$$\frac{56}{56} = 1$$

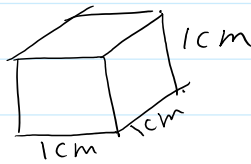
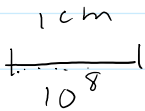
$$c) [(-2)^3]^7 = (-2)^{21}$$

$$d) \frac{x^4 \cdot x^3}{x^2} = \frac{x^7}{x^2} = x^5$$

$$e) (x^2)^3 \cdot (x^4)^2$$

$$x^6 \cdot x^8 = x^{14}$$

Worksheet.



$$\begin{aligned} \text{Volume: } & 1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm} \\ & = 10^8 \times 10^8 \times 10^8 \\ & = 10^{24} \text{ atoms} \end{aligned}$$