



Math Virtual Learning

Algebra 1 S1

All rules of exponents-Part 2

May 14, 2020



Algebra I S1
Lesson: May 14, 2020

Objective/Learning Target:

Students will find equivalent expressions using all rules of exponents.

EXPONENT RULES

EXPONENT RULES & PRACTICE

1. **PRODUCT RULE:** To multiply when two bases are the same, write the base and ADD the exponents.

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

Examples:

A. $x^3 \cdot x^8 = x^{11}$

B. $2^4 \cdot 2^2 = 2^6$

C. $(x^2y)(x^3y^4) = x^5y^5$

2. **QUOTIENT RULE:** To divide when two bases are the same, write the base and SUBTRACT the exponents.

$$\frac{x^m}{x^n} = x^{m-n}$$

Examples:

A. $\frac{x^5}{x^2} = x^3$

B. $\frac{3^5}{3^3} = 3^2$

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

3. **ZERO EXPONENT RULE:** Any base (except 0) raised to the zero power is equal to one.

$$x^0 = 1$$

Examples:

A. $y^0 = 1$

B. $6^0 = 1$

C. $(7a^3b^{-1})^0 = 1$

EXPONENT RULES-CONTINUED

EXPONENT RULES & PRACTICE

4. **POWER RULE:** To raise a power to another power, write the base and MULTIPLY the exponents.

$$(x^m)^n = x^{m \cdot n}$$

Examples:

A. $(x^3)^2 = x^6$

B. $(3^2)^4 = 3^8$

C. $(z^5)^2 = z^{10}$

5. **EXPANDED POWER RULE:**

$$(xy)^m = x^m y^m \qquad \left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$$

Examples:

A. $(2a)^3 = 2^3 a^3 = 8a^3$

B. $(6x^3)^2 = 6^2 (x^3)^2 = 36x^6$

C. $\left(\frac{x^2}{y}\right)^4 = \frac{(x^2)^4}{y^4} = \frac{x^8}{y^4}$

D. $\left(\frac{2x}{3y^2}\right)^3 = \frac{(2x)^3}{(3y^2)^3} = \frac{2^3 x^3}{3^3 (y^2)^3} = \frac{8x^3}{27y^6}$

EXPONENT RULES-CONTINUED

EXPONENT RULES & PRACTICE

- 6. NEGATIVE EXPONENTS:** If a factor in the numerator or denominator is moved across the fraction bar, the sign of the exponent is changed.

$$x^{-m} = \frac{1}{x^m} \quad \frac{1}{x^{-m}} = x^m \quad \left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$$

Examples:

A. $x^{-3} = \frac{1}{x^3}$

B. $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

C. $-4x^5y^{-2} = \frac{-4x^5}{y^2}$

D. $\left(\frac{x^2}{y}\right)^{-3} = \left(\frac{y}{x^2}\right)^3 = \frac{y^3}{x^6}$

E. $(3x^{-2}y)(-2xy^{-3}) = -6x^{-1}y^{-2} = \frac{-6}{xy^2}$

F. $\frac{a^{-2}b^3}{c^{-4}d^{-1}} = \frac{b^3c^4d}{a^2}$

G. $(-2x^2y^{-4})^{-2} = \left(\frac{-2x^2}{y^4}\right)^{-2} = \left(\frac{y^4}{-2x^2}\right)^2 = \frac{y^8}{4x^4}$

CAUTION: $-x \neq \frac{1}{x}$ For example: $-3 \neq \frac{1}{3}$

REMEMBER: An exponent applies to only the factor it is directly next to *unless* parentheses enclose other factors.

Examples:

A. $(-3)^2 = (-3)(-3) = 9$

B. $-3^2 = -9$



DAY 2 PRACTICE-PART 1

More Properties of Exponents

Simplify. Your answer should contain only positive exponents.

1) $(x^{-2}x^{-3})^4$

2) $(x^4)^{-3} \cdot 2x^4$

3) $(n^3)^3 \cdot 2n^{-1}$

4) $(2v)^2 \cdot 2v^2$



DAY 2 PRACTICE-PART 1

$$5) \frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$$

$$6) \frac{2y^3 \cdot 3xy^3}{3x^2y^4}$$

$$7) \frac{x^3y^3 \cdot x^3}{4x^2}$$

$$8) \frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$$



DAY 2 PRACTICE-PART 1 (answer key)

VIDEO ANSWER KEY:

https://www.youtube.com/watch?v=x4A_K5BbodY



DAY 2 PRACTICE-PART 2

$$9) \frac{x}{(2x^0)^2}$$

$$10) \frac{2m^{-4}}{(2m^{-4})^3}$$

$$11) \frac{(2m^2)^{-1}}{m^2}$$

$$12) \frac{2x^3}{(x^{-1})^3}$$



DAY 2 PRACTICE-PART 2

13) $(a^{-3}b^{-3})^0$

14) $x^4y^3 \cdot (2y^2)^0$

15) $ba^4 \cdot (2ba^4)^{-3}$

16) $(2x^0y^2)^{-3} \cdot 2yx^3$



DAY 2 PRACTICE-PART 2 (answer key)

VIDEO ANSWER KEY:

https://www.youtube.com/watch?v=YV_sJHgRSqM