

Lesson 7-5 Division Properties of Exponents

Quotient of Powers

To divide two powers that have the same base, subtract the exponents.

A. $\frac{x^7 y^{12}}{x^6 y^3} = \frac{x^7}{x^6} \cdot \frac{y^{12}}{y^3}$ (Group powers that have the same base.)

$= \frac{x^{7-6} \cdot y^{12-3}}{1}$ (Quotient of powers)

$= \frac{x y^9}{1}$ Simplify

Power of a Quotient

To raise a power to a quotient, find the power of the numerator and the power of the denominator.

B. Simplify $\left(\frac{4c^3 d^2}{5e^4 f^7}\right)^3 = \frac{64c^9 d^6}{125e^{12} f^{21}}$ Power of a Quotient

$=$ Power of a Product

$=$ Power of a Power

Zero Exponent

Any nonzero number raised to the zero power is 1.

C. Simplify $\left(\frac{12m^8 n^7}{8m^5 n^{10}}\right)^0 = 1$

D. $\frac{m^0 n^3}{n^2} = \frac{1 \cdot n^3}{n^2} = n$

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Key Negative Exponents: $a^{-n} = \frac{1}{a^n}$ and $\frac{1}{a^{-n}} = a^n$

E. Simplify $\frac{x^{-6}}{y^{-4}z^9} = \frac{y^4}{x^6 z^9}$

F. Simplify $\frac{75p^3q^{-5}}{15p^5q^{-4}r^{-8}} = \frac{75}{15} \cdot \frac{p^3}{p^5} \cdot \frac{q^4}{q^5} \cdot \frac{r^8}{1} = \frac{5r^8}{p^2q}$

Practice: Simplify. Assume that no denominator is equal to zero.

1. $\frac{5^5}{5^2} = 5^3 = 125$

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

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

4. $\frac{xy^6}{y^4x} = y^2$

5. $\left(\frac{2a^2b}{a}\right)^3 = (2ab)^3 = 8a^3b^3$

6. $\left(\frac{3r^6s^3}{2r^3s}\right)^4 = \left(\frac{3r^3s^2}{2}\right)^4 = \frac{81r^{12}s^8}{16}$

7. $\frac{m}{m^{-4}} = m^{(1-(-4))} = m^5$

8. $\frac{b^{-4}}{b^{-5}} = b^{-4-(-5)} = b$

9. $\frac{6x^4y^6}{4w^{-1}y^2} = \frac{3x^4y^4w}{2}$

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

$$\frac{36a^2b^2}{b^8} = \frac{36}{a^2b^6}$$

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

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

$$\frac{1}{(-2mn^2)^3(4m^{-6}n^4)} = \frac{1}{-8m^3n^6 \cdot 4n^4} = \frac{1}{-32m^3n^{10}}$$

$$\frac{m^3}{-32n^{10}}$$