Lesson 8-2

Example 1 Quotient of Powers

Simplify $\frac{6^3x^6y^2}{6x^4y}$. Assume that x and y are not equal to zero.

$\frac{6^3x^6y^2}{6x^4y} = \left(\frac{6^3}{6}\right)\left(\frac{x^6}{x^4}\right)\left(\frac{y^2}{y}\right)$ Group powers that have the same base.

$= (6^{3-1})(x^{6-4})(y^{2-1})$ Quotient of Powers

$= 6^2x^2y$ or $36x^2y$ Simplify.

Example 2 Power of a Quotient

Simplify $\left(\frac{-3m^2n}{5p}\right)^2$.

$\left(\frac{-3m^2n}{5p}\right)^2 = \frac{(-3m^2n)^2}{(5p)^2}$ Power of a Quotient

$= \frac{(-3)^2(m^2)^2n^2}{5^2p^2}$ Power of a Product

$= \frac{9m^4n^2}{25p^2}$ Power of a Power

Example 3 Zero Exponent

Simplify each expression. Assume that no denominator is equal to zero.

a. $(0.6a^2b^3)^0$

$(0.6a^2b^3)^0 = 1$ $a^0 = 1$

b. $\frac{x^2y}{x^0}$

$\frac{x^2y}{x^0} = \frac{x^2y}{1}$ $a^0 = 1$

$= x^2y$ Simplify.

Example 4 Negative Exponents

Simplify each expression. Assume that no denominator is equal to zero.

a. $\dfrac{x^3y^{-8}}{4x^{-2}}$

$$\frac{x^3y^{-8}}{4x^{-2}} = \left(\frac{1}{4}\right)\left(\frac{x^3}{x^{-2}}\right)\left(\frac{y^{-8}}{1}\right)$$ Group powers with the same base.

$$= \left(\frac{1}{4}\right)(x^{3-(-2)})\left(\frac{1}{y^8}\right)$$ Quotient of Powers and Negative Exponent Properties

$$= \left(\frac{1}{4}\right)\left(\frac{x^5}{1}\right)\left(\frac{1}{y^8}\right)$$ Simplify.

$$= \frac{x^5}{4y^8}$$ Multiply fractions.

b. $\dfrac{(2c^3d^{-2})^3}{-9c^{-4}d^{-6}}$

$$\frac{(2c^3d^{-2})^3}{-9c^{-4}d^{-6}} = \frac{2^3c^9d^{-6}}{-9c^{-4}d^{-6}}$$ Power of a Product

$$= \frac{8}{-9}(c^{9-(-4)})(d^{-6-(-6)})$$ Quotient of Powers, $2^3 = 8$

$$= -\frac{8}{9}c^{13}d^0$$ Simplify.

$$= -\frac{8c^{13}}{9}$$ Zero Exponent Properties and Multiply

Example 5 Apply Properties of Exponents

Multiple-Choice Test Item

Write the ratio of the height of the triangle to the base of the triangle in simplest form.

A $\dfrac{1}{x}$ **B** $\dfrac{1}{4}$ **C** $\dfrac{1}{2}$ **D** 2

Read the Test Item

A ratio is a comparison of two quantities. It can be written in fraction form.

Solve the Test Item

- the height of the triangle is x^2y
  the base of the triangle is $2x^2y$

- $\frac{\text{height of triangle}}{\text{base of triangle}} = \frac{x^2y}{2x^2y}$ Substitute.

  $= \left(\frac{1}{2}\right)(x^{2-2})(y^{1-1})$ Quotient of Powers

  $= \left(\frac{1}{2}\right)x^0y^0$ or $\frac{1}{2}$ $x^0 = 1$ and $y^0 = 1$

The answer is C.