EXAMPLE 3 Use properties of exponents

Simplify the expression. Write your answer using only positive exponents.

a. $(2xy^{-5})^3 = 2^3 \cdot x^3 \cdot (y^{-5})^3$ — Power of a product property

$= 8 \cdot x^3 \cdot y^{-15}$ — Power of a power property

$= \frac{8x^3}{y^{15}}$ — Definition of negative exponents

b. $\frac{(2x)^{-2}y^5}{-4x^2y^2} = \frac{y^5}{(2x)^2(-4x^2y^2)}$ — Definition of negative exponents

$= \frac{y^5}{(4x^2)(-4x^2y^2)}$ — Power of a product property

$= \frac{y^5}{-16x^4y^2}$ — Product of powers property

$= -\frac{y^3}{16x^4}$ — Quotient of powers property

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EXAMPLE 4 TAKS PRACTICE: Multiple Choice

The order of magnitude of the weight of a polyphemus moth larva when it hatches is 10^{-5} ounce. During the first 56 days of its life, the moth larva can eat about 10^5 times its own weight in food. About how many ounces of food can the moth larva eat during its first 56 days?

(A) 10^{-25} ounce (B) 10^{-10} ounce

(C) 1 ounce (D) 1,000,000,000 ounces

Not to scale

Solution

To find the amount of food the moth larva can eat in the first 56 days of its life, multiply its original weight, 10^{-5} ounce, by 10^5.

$10^5 \cdot 10^{-5} = 10^{5+(-5)} = 10^0 = 1$

The moth larva eats about 1 ounce of food in the first 56 days of its life.

▶ The correct answer is C. (A) (B) (C) (D)

GUIDED PRACTICE for Examples 3 and 4

9. Simplify the expression $\frac{3xy^{-3}}{9x^3y}$. Write your answer using only positive exponents.

10. SCIENCE The order of magnitude of the mass of a proton is 10^4 times greater than the order of magnitude of the mass of an electron, which is 10^{-27} gram. Find the order of magnitude of the mass of a proton.