

7-4 Reteaching

Division Properties of Exponents

Understanding division properties of exponents allows you to simplify quotients involving exponents.

Problem

What is 6^6 divided by 6^4 ?

Method 1: Evaluate 6^6 and 6^4 , and then divide the results.

$$6^6 = 46,656$$

$$6^4 = 1296$$

$$46,656 \div 1296 = 36$$

Method 2: Expand the numerator and denominator.

$$\frac{6^6}{6^4} = \frac{6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6}{6 \cdot 6 \cdot 6 \cdot 6}$$

After dividing out the common factors, you are left with $6 \times 6 = 36$.

When you divide powers with the same base, subtract the exponents. In the example above, 6^6 and 6^4 are powers with the same base and when you divided them, the result was $36 = 6^2$. This is the

same result you get by subtracting the exponents: $\frac{6^6}{6^4} = 6^{6-4} = 6^2$.

The division property of exponents also allows you to simplify quotients that contain variables.

Problem

How can you use the division property of exponents to show that $x^2 = \frac{x^5}{x^3}$ when $x \neq 0$?

Expand the numerator and denominator.

$$\frac{x^5}{x^3} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x}$$

After dividing out the common factors you are left with $x \cdot x = x^2$.

Division properties of exponents work whether the bases in the problem are constants or variables. When you divide powers with the same base, subtract the exponents. In this example, x^5 and x^3 are powers with the same base and when you divided them, the result was $x^2 = x^{5-3}$.

Simplify each expression.

1. $\frac{7^5}{7^2}$

2. $\frac{3^9}{3^2}$

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

4. $\frac{4^z}{4^4}$

5. $\frac{m^{\frac{3}{4}}}{m^{\frac{1}{2}}}$

6. $\frac{p^6}{p^5}$

7. $\frac{r^3}{r}$

8. $\frac{x^5 y^4}{x^3 y}$

9. $\frac{a^3}{a^5}$

10. $\frac{10x^5}{15x^2}$

11. Use properties of exponents to show that $a^0 = 1$. (*Hint:* Write the quotient of two powers that have a as their base and have the same exponent.)

12. Compare multiplying and dividing powers with the same base.