

Skills You'll Need

Is the expression x^5 an exponent or a power?

; the same thing as an exponential expression

Write each expression using exponents.

$$7 \cdot 7 \cdot 7 \cdot 7$$

7⁴

$$5 \cdot 5$$

5²

$$4 \cdot 4 \cdot 4$$

4³

$$1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$$

1⁵

8th Grade

Lesson 6-4: Exponents and Division

Learning Goals:

- I can divide powers with the same base.
- I can simplify expressions with negative exponents.

What I Know:

What I Learned:

Dividing Powers with the Same Base

$$\frac{7^5}{7^3} = \frac{\overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{7}} \cdot 7 \cdot 7}{\overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{7}}} = \frac{7^2}{1} = 7^2$$

$$\frac{7^5}{7^3} = 7^{5-3} = 7^2$$

Rule: To divide nonzero numbers or variables with the same nonzero base, subtract the exponents.

$$\frac{a^m}{a^n} = a^{(m-n)}, \text{ where } a \neq 0$$

$$8^4 = \frac{8^6}{8^2} = 8^{6-2} = 8^4 = 4096$$

Dividing Powers

Write the expression using a single exponent.

$$\frac{m^{12}}{m^5} = m^{12-5} = m^7$$

Quick Check

$$\frac{w^8}{w^5} = w^3$$

Zero as an Exponent

What does the exponent 0 mean?

$$\frac{3^5}{3^5} = \frac{\overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{3}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{3}}} = \frac{1}{1} = 1$$

$$\frac{3^5}{3^5} = 3^{5-5} = 3^0$$

$$w^0 = \frac{w^2}{w^2} = \frac{\overset{1}{\cancel{w}} \cdot \overset{1}{\cancel{w}}}{\underset{1}{\cancel{w}} \cdot \underset{1}{\cancel{w}}} = 1$$

Rule: For any nonzero number a , $a^0 = 1$

Expressions with a Zero Exponent

Simplify each expression.

$$(-8)^0 = 1$$

$$3m^0$$

$$3 \cdot m^0 = 3 \cdot 1 = 3$$

Quick Check

Simplify each expression.

$$(-9)^0$$

$$\textcircled{1}$$

$$(2r)^0$$

$$\textcircled{1}$$

$$2r^0$$

$$2 \cdot r^0$$

$$2 \cdot 1$$

$$\textcircled{2}$$

Negative Exponents

$$\frac{6^2}{6^5} = 6^{2-5} = 6^{-3}$$

$$\frac{6^2}{6^5} = \frac{\cancel{6} \cdot \cancel{6}}{\cancel{6} \cdot \cancel{6} \cdot 6 \cdot 6 \cdot 6} = \frac{1}{6^3}$$

$$6^{-3} = \frac{1}{6^3}$$

Rule:

For any nonzero number a and an integer n , $a^{-n} = \frac{1}{a^n}$

Expressions with Negative Exponents

Expressions with negative exponents are not simplified.

Simplify each expression.

$$3^{-2}$$
$$\frac{1}{3^2} = \frac{1}{9}$$

$$(y)^{-6} = \frac{1}{y^6}$$

Quick Check

Simplify each expression.

$$3^{-1}$$
$$\frac{1}{3^1} = \frac{1}{3}$$

$$w^{-4}$$
$$\frac{1}{w^4}$$

$$(-2)^{-3}$$
$$\frac{1}{(-2)^3} = \left(\frac{1}{-8}\right)$$

There are two ways to simplify an expression containing negative exponents with the same base...

$$4^3 \cdot 4^{-5} = 4^{3+(-5)} = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

$$4^3 \cdot 4^{-5} = \frac{4^3}{4^5} = 4^{3-5} = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

Assignment

8th Grade Lesson 6-4

Pgs. 197-198 #6-38 even
due Wednesday

