

2.4 – Exponent Laws (Part 1)

INVESTIGATE

1. Complete the following table:

Product of Powers with the Same Base	Product as Repeated Multiplication	Product as a Single Power
$5^4 \times 5^2$	$5 \times 5 \times 5 \times 5 \times 5 \times 5$	5^6
$(-2)^1 \times (-2)^3$	$(-2) \times (-2) \times (-2) \times (-2)$	$(-2)^4$
$3^4 \times 3^3 \times 3^2$	$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$	3^9

2. What rule can you create to reduce a product of powers with the same base to a single power?

Keep the base, add the exponents

3. Now complete this table:

Quotient of Powers with the Same Base	Quotient as Repeated Multiplication	Quotient as a Single Power
$5^5 \div 5^3$ or $\frac{5^5}{5^3}$	$\frac{5 \times 5 \times 5 \times 5 \times 5}{5 \times 5 \times 5}$	5^2
$(-2)^3 \div (-2)^2$ or $\frac{(-2)^3}{(-2)^2}$	$\frac{(-2) \times (-2) \times (-2)}{(-2) \times (-2)}$	$(-2)^1$
$4^7 \div 4^4$ or $\frac{4^7}{4^4}$	$\frac{4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4}{4 \times 4 \times 4 \times 4}$	4^3

4. What rule can you create to reduce a quotient of powers with the same base to a single power?

Keep the base, subtract exponents

5. Use the rules you created to write the following as a single power: $\frac{(-7)^{10}(-7)^6(-7)^1}{(-7)^{13}(-7)^2}$

$$= \frac{(-7)^{11}}{(-7)^{15}}$$

$$= (-7)^{-4}$$

Exponent Laws (Part 1)

Product of Powers: $a^m \times a^n = a^{m+n}$

Quotient of Powers: $a^m \div a^n = a^{m-n}$

Where a is any rational base, except 0; m and n are rational exponents

Ex. 1: Use the exponent laws to simplify where possible, then evaluate.

$$\begin{aligned} \text{(a)} \quad & (-2)^3 \times (-2)^2 \\ &= (-2)^{3+2} \\ &= (-2)^5 \\ &= -32 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 9^{10} \div 9^9 \\ &= 9^{10-9} \\ &= 9^1 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & \frac{(3^2)(3^4)}{3^3} \\ &= \frac{3^6}{3^3} \\ &= 3^3 \\ &= 27 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad & (-3)^3(-3)(-3)^2 \\ &= (-3)^6 \\ &= 729 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad & 4^2 + 4^3 \\ &= 16 + 64 \\ &= 80 \end{aligned}$$

*Not product or quotient rule!
Just evaluate*

$$\begin{aligned} \text{(e)} \quad & 2^6 - 2^4 \\ &= 64 - 16 \\ &= 48 \end{aligned}$$

Not product or quotient rule!

Assignment: 2.4 Blue worksheet