

Content and Language Objective:

Students will learn the product rule for exponents and be able to explain in their own words how the product rule is used when dealing with exponents.

Warm-Up

Evaluate each expression.

1. $\left(-\frac{1}{4}\right)^4 = \left(-\frac{1}{4}\right)\left(-\frac{1}{4}\right)\left(-\frac{1}{4}\right)\left(-\frac{1}{4}\right) = \frac{1}{256}$

2. $\left(-\frac{1}{4}\right)^{-3} = \left(-\frac{4}{1}\right)^3 = (-4)^3 = -64$

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The Product Rule for Exponents

We can calculate products of exponential expressions provided their bases are the same!

Example:

$$4^2 \bullet 4^3 = (4 \bullet 4) \bullet (4 \bullet 4 \bullet 4) = 4^{2+3} = 4^5$$

The diagram shows the expansion of the exponents. Under the first parentheses (4 • 4), there is a bracket with the text "2 factors of 4". Under the second parentheses (4 • 4 • 4), there is a bracket with the text "3 factors of 4".

This expression has a total of $2 + 3 = 5$ factors of 4.

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The Product Rule:

To multiply exponential expressions with like bases, add exponents.

Try It!!

$$x^4 \bullet x^3 \bullet y^2 \bullet x^5$$
$$x^4 \cdot x^3 \cdot x^5 \cdot y^2$$
$$x^{12} y^2$$

$$10^5 \bullet 10^{-2}$$
$$10^{5+(-2)} = 10^3$$

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Practice:

$$2^3 \cdot 3^2 = 8 \cdot 9 = 72$$

$$1. 10^2 \bullet 10^4 = 10^6$$

$$2. 7^3 7^{-4} = 7^{-1} = \frac{1}{7}, \text{ or } \frac{1}{7}$$

$$3. x^3 x^{-2} x^4 = x^5$$

$$4. 3y^2 \bullet 2y^{-4} = 3 \cdot 2 \cdot y^2 \cdot y^{-4} = 6y^{-2} = \frac{6}{y^2}$$

