### 7.1: Multiplying and Dividing Monomials

#### Lesson Goals

- Explore the exponent rule for multiplying monomials.
- Explore the exponent rule for dividing monomials.

Recall that a power has a base and an exponent.

- When no exponent is present, then it is implied that the exponent is 1.
- To expand a power, we use repeated multiplication. In other words, we multiply the base by itself the number of times specified by the exponent.
- To write the expanded form in exponential form, or as a simplified power, we raise the base to the number of times it is multiplied by itself.

QUESTION: What are some different ways to express the product of powers?

Expression	Expanded Form
$3^4 \times 3^2$	$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 36$
$j^2 \times j^6 \times j^3 \times j$	$j \times j = 0$
$a^2b^3 \times a^3b^4$	axaxbxbxbxbxaxaxaxbxbxbxb=
	$as \times b^{\dagger}$

#### Important Fact

The **exponent product rule** states that when multiplying powers that have the same base, you may add their exponents to simplify the expression as a single power.

$$x^a x^b = x^{a+b}$$

# Example 1

Simplify  $2 \times n \times 3 \times n^4$ .  $= 2 \times 3 \times n \times n^4$ 

#### Exponent Product Rule with Coefficients

When multiplying monomials in the same variable, multiply the coefficients and use the exponent product rule to simplify the powers.

# Example 2

7xy x4xy2 Simplify  $(7y^8)(4y^2)$ . = 7x4 xy8xy2 = 28y 8+2 = 28y 10

# Example 3

Simplify  $(-10x^2)(2x^4)$ .

Sources: CEMC Open Courseware

### **Dividing Monomials**

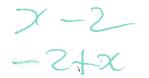
QUESTION: What are some different ways to express the quotient of powers?

Expression	Expanded Form
$4^3 \div 4^2$	
$7^6 \div 7^4$	7×7×7×7×7 =7×7=2 7×7×7×7
$15a^8b^3 \div 5a^7b$	15 diarararararara bibib 5 diararararara bibib
	$=3ab^2$

#### Important Fact

The **exponent quotient rule** states that when dividing powers that have the same base, you subtract their exponents to simplify the expression as a single power. (Note that the value of the base can never be equal to zero.)

$$\frac{x^a}{x^b} = x^{a-b}, x \neq 0$$



### Exponent Quotient Rule with Coefficients

When dividing monomials in the same variable, divide the coefficients and use the exponent quotient rule to simplify the powers.

## Example 4

Simplify  $4n^5 \div 2n^2$ .

# Example 5

Simplify  $\frac{5y^8}{10y^3}$ .

## Example 6

Simplify 
$$\frac{20x^4}{4x}$$
.

$$-\frac{20}{4} \cdot \frac{2}{x^4} = -5x^4 - 5x^4 - 5x^4$$

Sources: CEMC Open Courseware

Homework:

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