

7-2

Exponents and Multiplication

 Check Skills You'll Need


Need Help?

 3^2 ← exponent
 ↑
 base

Simplify each expression.

1. $2^3 \cdot 5^2$ $8 \cdot 25 = 200$

2. $(-3)^2$ $(-3)(-3) = 9$

3. -3^2 $-3 \cdot 3 = -9$

4. -1^4 $-1 \cdot 1 \cdot 1 \cdot 1 = -1$

5. $(-1)^4$ $(-1)(-1)(-1)(-1) = 1$

6. $3 \cdot 3^2$ $3 \cdot 3 \cdot 3 = 27$

7. Explain why -4^4 is a negative number and $(-4)^4$ is a positive number.

Exponential form	Expanded form	Simplified	Standard form
$2^1 \cdot 2^1$	$2 \cdot 2$	2^2	4
$2^1 \cdot 2^2$	$2 \cdot 2 \cdot 2$	2^3	8
$2^2 \cdot 2^2$	$2 \cdot 2 \cdot 2 \cdot 2$	2^4	16
$2^2 \cdot 2^3$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	2^5	32

Key Concepts

Multiplying Powers With the Same Base

To multiply numbers or variables with the same base, add the exponents.

Arithmetic

$$3^2 \cdot 3^7 = 3^{(2+7)} = 3^9$$

Algebra

$$a^m \cdot a^n = a^{(m+n)}$$

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EXAMPLE

Multiplying Powers

Write each expression using a single exponent.

a. $(-2)^3 \cdot (-2)^5$

$$(-2)^{3+5} = (-2)^8$$

b. $a^1 \cdot a^4$

$$a^{1+4} = a^5$$

✓ Check Understanding

1 Write each expression using a single exponent.

a. $6^2 \cdot 6^3 = 6^5$

b. $(-4) \cdot (-4)^7 = (-4)^8$

c. $m^1 \cdot m^{11} = m^{12}$

d. **Reasoning** Explain why you cannot write $5^3 \cdot 7^9$ as $(35)^{12}$.

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Different Bases!

2**EXAMPLE****Multiplying Numbers in Scientific Notation**

Find the product $(5 \times 10^6)(9 \times 10^3)$. Write the result in scientific notation.

$$\begin{aligned} & 5 \cdot 10^6 \cdot 9 \cdot 10^3 \\ & 5 \cdot 9 \cdot 10^6 \cdot 10^3 \\ & (5 \cdot 9) \cdot (10^6 \cdot 10^3) = 45 \times 10^9 = 4.5 \times 10^{10} \end{aligned}$$

 **Check Understanding**

2 Multiply. Write each result in scientific notation.

a. $(2 \times 10^6)(4 \times 10^3)$

$$8 \times 10^9$$

b. $(3 \times 10^5)(2 \times 10^8)$

$$6 \times 10^{13}$$

c. $12(8 \times 10^{20})$

$$96 \times 10^{20}$$

$$9.6 \times 10^{21}$$

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EXAMPLE**Real-World Problem Solving**

Science A light-year, the distance light travels in one Earth year, is 5.9×10^{12} miles. A mile is 5.28×10^3 feet. How many feet are in a light-year? Write your answer in scientific notation.

$$(5.9 \times 10^{12})(5.28 \times 10^3)$$

$$31.2 \times 10^{15}$$

(rounded)

$$3.12 \times 10^{16}$$

 **Check Understanding**

- 3 a. Astronomy** The speed of light is 3.00×10^5 kilometers/second. Use the formula $d = r \cdot t$ to find the distance light travels in 3.6×10^3 seconds.
- b. Mental Math** Multiply 4.17×10^{20} by 10^3 .

$$a) (3 \times 10^5)(3.6 \times 10^3) = 10.8 \times 10^8 = 1.08 \times 10^9$$

$$b) 4.17 \times 10^{20+3} = 4.17 \times 10^{23}$$