

# Algebra I

## Lesson 7-2

### Standard:

**N.RN.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

### Learning Goal:

- I can multiply powers with the same base.

$$3^4 \cdot 3^2$$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$$

$$3^6$$

$$3^4 \cdot 3^2 = 3^6$$

$$3^4 \cdot 3^2 = 3^{4+2} = 3^6$$

Rule for multiplying exponents

$$a^m \cdot a^n = a^{m+n}, \text{ where } a \neq 0 \text{ and } m \text{ and } n \text{ are rational numbers}$$

**Multiplying Powers**

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

$$12^4 \cdot 12^3$$

$$12^{4+3}$$

$$(12^7)$$

$$(-5)^{-2} \cdot (-5)^7$$

$$(-5)^{-2+7}$$

$$(-5)^5$$

**Got It?**

$$8^3 \cdot 8^6$$

$$8^9$$

$$(0.5)^{-3} \cdot (0.5)^{-8}$$

$$(0.5)^{-11}$$

$$9^{-3} \cdot 9^2 \cdot 9^6$$

$$9^5$$

## Multiplying Powers in Algebraic Expressions

What is the simplified form of each expression?

$$4z^5 \cdot 9z^{-12}$$

$$4 \cdot z^5 \cdot 9 \cdot z^{-12}$$

$$4 \cdot 9 \cdot z^5 \cdot z^{-12}$$

$$36z^{-7}$$

$$\frac{36}{z^7}$$

$$2a \cdot 9b^4 \cdot 3a^2$$

$$2 \cdot 9 \cdot 3 \cdot a \cdot a^2 \cdot b^4$$

$$54a^3b^4$$

## Got It?

What is the simplified form of each expression?

$$5x^4 \cdot x^9 \cdot 3x$$

$$15x^{14}$$

$$-4c^3 \cdot 7d^2 \cdot 2c^{-2}$$

$$-4 \cdot 7 \cdot 2 \cdot c^3 \cdot c^{-2} \cdot d^2$$

$$-56c^1d^2$$

$$-56cd^2$$

$$j^2 \cdot k^{-2} \cdot 12j$$

$$\frac{12j^3}{k^2}$$



# Assignment

## Algebra I Lesson 7-2a

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### Multiplying with Scientific Notation

What is scientific notation?

A way to write very large and very small numbers using powers of 10

$$a \times 10^b \quad \text{where } 1 \leq |a| < 10$$

$$2.56 \times 10^5$$

$$256,000$$

At 20°C, one cubic meter of water has a mass of about  $9.98 \times 10^5$  g. Each gram of water contains about  $3.34 \times 10^{22}$  molecules of water. About how many molecules of water does a droplet of water, with the volume below, contain?

$$V = 1.13 \times 10^{-7} \text{ m}^3$$

$$\frac{1.13 \times 10^{-7} \text{ m}^3}{1} \cdot \frac{9.98 \times 10^5 \text{ g}}{1 \text{ m}^3} \cdot \frac{3.34 \times 10^{22} \text{ molecules}}{1 \text{ g}}$$

$$(1.13 \times 10^{-7})(9.98 \times 10^5)(3.34 \times 10^{22}) \text{ molecules}$$

$$1.13 \times 9.98 \times 3.34 \times 10^{-7} \times 10^5 \times 10^{22}$$

$$37.7 \times 10^{20}$$

$$3.77 \times 10^{21} \text{ molecules}$$

## Got It?

About how many molecules of water are in a swimming pool that holds  $200 \text{ m}^3$  of water?

$$\frac{3.34 \times 10^{22} \text{ molecules}}{1 \text{ g}} \cdot \frac{9.98 \times 10^5 \text{ g}}{1 \text{ m}^3} \cdot \frac{200 \text{ m}^3}{1}$$

$$6666.6 \times 10^{27} \text{ molecules}$$

$$6.7 \times 10^3 \times 10^{27}$$

$$6.7 \times 10^{30} \text{ molecules}$$

At 20°C, one cubic meter of water has a mass of about  $9.98 \times 10^5$  g. Each gram of water contains about  $3.34 \times 10^{22}$  molecules of water.

## Expressions with Rational Exponents

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

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

$$a^{\frac{1}{m}} = b \quad \text{means that } b$$

multiplied as factor  $m$  times  
equals  $a$

**Simplify each expression.**

$$81^{\frac{1}{4}}$$

$$81^{\frac{1}{4}} = b$$

$$3 \cdot 3 \cdot 3 \cdot 3 = 81$$

$$b = 3$$

$$16^{\frac{1}{4}}$$

$$16^{\frac{1}{4}} = b$$

$$b^4 = 16$$

$$b = 2$$

$$27^{\frac{1}{3}}$$

$$27^{\frac{1}{3}} = b$$

$$b^3 = 27$$

$$b = 3$$

$$64^{\frac{1}{2}}$$

$$64^{\frac{1}{2}} = b$$

$$b^2 = 64$$

$$b = 8$$

Simplify each expression.

$$64^{\frac{3}{2}}$$

$$64^{\frac{1}{2}} \cdot 64^{\frac{1}{2}} \cdot 64^{\frac{1}{2}}$$

$$64^{\frac{1}{2}} = b \quad 8 \cdot 8 \cdot 8 = 512$$

$$b^2 = 64$$

$$b = 8$$

$$25^{\frac{3}{2}}$$

$$25^{\frac{1}{2}} \cdot 25^{\frac{1}{2}} \cdot 25^{\frac{1}{2}}$$

$$25^{\frac{1}{2}} = b \quad b^2 = 25 \quad b = 5$$

$$5 \cdot 5 \cdot 5 = 125$$

$$27^{\frac{2}{3}}$$

$$27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}}$$

$$3 \cdot 3 = 9$$

$$16^{\frac{3}{4}}$$

$$16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}}$$

$$2 \cdot 2 \cdot 2 = 8$$



# Assignment

## Algebra I Lesson 7-2b

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