

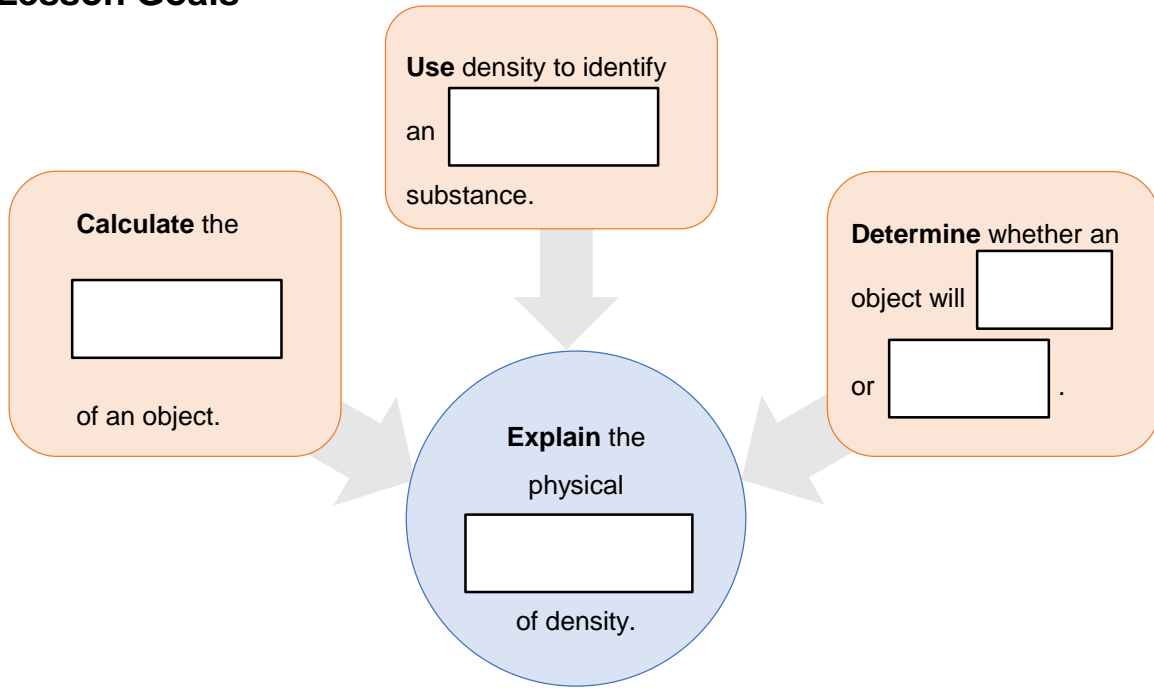
# Warm-Up | Density



## Lesson Question



### Lesson Goals



### Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

- |                |   |
|----------------|---|
| _____ derived  | A. the amount of matter in an object      |
| _____ relative | B. the amount of space an object takes up |
| _____ density  | C. obtained from something else           |
| _____ mass     | D. the amount of mass in a given volume   |
| _____ volume   | E. compared to something else             |



### Physical Properties of Matter

- A  is a characteristic of a substance that can be  and that does  the  of the substance.
- Examples of physical properties include
  - color,
  - ,
  - odor,
  - point,
  - point, and
  - conductivity.

## Instruction | Density

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**Mass**

is the amount of matter in an object.

- The mass of an object is .
- Mass is  with a .
- Common units for mass are  and .

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**Volume**

is the amount of space that an object takes up.

- Volume is  for  and ; it varies for gases.
- The volume of an object can be measured in many ways.
  - For a , use formulas like  $V = lwh$  or  $V = Bh$ .
  - For an , use the water displacement method.
  - For a , use a graduated cylinder.
- Common  for volume include cubic centimeters, , and liters.

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**Density**

- is the amount of mass in a given volume.
- It is a  unit of measure, meaning the measurement is obtained from a combination of two other characteristics of an object—its mass and volume.
- It is equal to mass divided by volume.

$$\boxed{\phantom{D}} = \frac{M}{V}$$

- It is measured in units such as grams per cubic centimeter and grams per milliliter.

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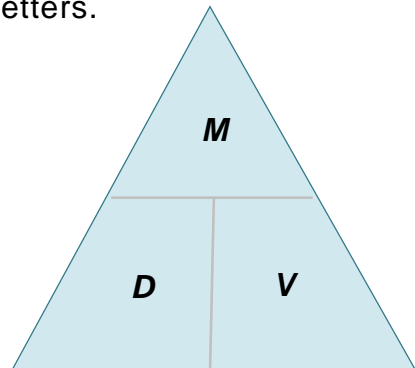
**The Density Triangle: Strategy**

- Use the  to solve for density, mass, or volume.
- Determine which  you need to solve for.
- Cover up the  value.
- Create the equation using the remaining letters.

$$\boxed{\phantom{D}} = \frac{M}{V}$$

$$\boxed{\phantom{D}} = D \times V$$

$$\boxed{\phantom{D}} = \frac{M}{D}$$



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**The Density of Gold: Example**Mass of  = 154.4 gVolume of  = 8.0 cm<sup>3</sup>

$$D = \text{$$

$$D = \frac{152.4 \text{ g}}{8.0 \text{ cm}^3}$$

$$D = \text{$$

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**The Mass of Olive Oil: Example**Volume of  = 1,000 mLDensity of  = 0.9 g/cm<sup>3</sup> or 0.9 g/mL (1 cm<sup>3</sup> = )

$$M = \text{$$

$$M = 0.9 \text{ g/mL} \times 1,000 \text{ mL}$$

$$M = \text{$$

# Instruction | Density

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## The Volume of Water: Example

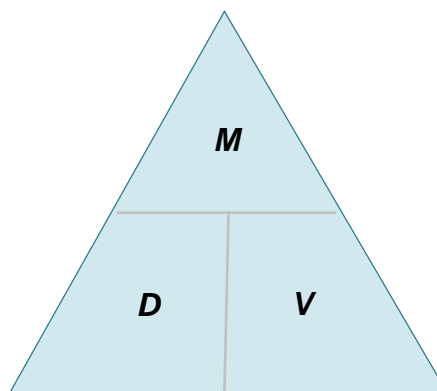
Mass of water = 357 g

Density of water = 1.0 g/cm<sup>3</sup> or 1.0 g/mL (  = 1 mL)

$V =$

$V = 357 \text{ g} / 1.0 \text{ mL}$

$V =$



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## Gold or Iron Pyrite: Example

Complete the table to determine which sample is gold and which is iron pyrite.

Sample A	Sample B
Volume = 5.0 cm <sup>3</sup>	Volume = 5.0 cm <sup>3</sup>
Mass = <input type="text"/>	Mass = <input type="text"/>
$D = $ <input type="text"/>	<input type="text"/> = $\frac{M}{V}$
$D = \frac{\text{}}{5.0 \text{ cm}^3}$	$D = \frac{25.0 \text{ g}}{\text{}}$
$D = $ <input type="text"/>	$D = $ <input type="text"/>

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**Gold or Iron Pyrite: Example, Continued**

- Gold is four times denser than pyrite.
- The densities of gold and pyrite have a ratio of 4:1.
- Sample A is .

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**Relative Density**

density is used to separate solids, liquids, and gases. The term *relative* means to be compared to something else. So when you look at relative density, you are comparing the densities of different substances.

- The  in the container rises to the  because it has the  density.
- The  separate into individual  based on their relative densities.
  - The  dense liquid is on .
  - The  dense liquid is on .
- The  sink to the  of the container because they have the  density.

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**Sinking vs. Floating**

Objects may  or  in a liquid.

- Objects sink when their density is  the density of the surrounding liquid.
- Objects float when their density is  the density of the surrounding liquid.

**Sinking or Floating: Example**

Density of water =  $1.0 \text{ g/cm}^3$

Density of honey =  $1.4 \text{ g/cm}^3$

Honey is denser than water, so it sinks in water.

*Write S or F to tell whether each object will sink or float in water and honey.*

Object	Density	Water	Honey
Pumice	$0.7 \text{ g/cm}^3$		
Quarter	$8.9 \text{ g/cm}^3$		
Rubber toy	$1.2 \text{ g/cm}^3$		



## Summary

## Density

**Lesson Question**

What is density?

**Answer**

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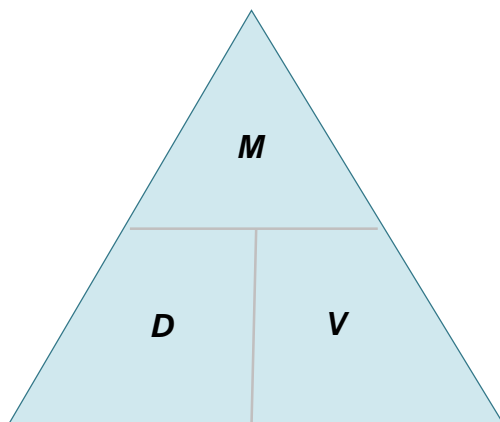
**Review: Key Concepts**

	<b>Definition</b>	<b>Units</b>
<b>Mass</b>	The amount of <input type="text"/> in an object	g kg
<b>Volume</b>	The amount of <input type="text"/> an object takes up	cm <sup>3</sup> mL L
<b>Density</b>	The amount of <input type="text"/> in a given <input type="text"/>	$D = \frac{M}{V}$

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## Review: Density Triangle



Use the  to solve for density, mass, or volume.

- Determine which  you need to solve for.
- Cover up the  value.
- Create the  using the remaining letters.

- $D =$

- $M =$

- $V =$

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**Review: Relative Density**

compares the density of one material to that of another.

Relative density can be used to determine whether an object

will  or  in a liquid.

- An object  when its density is greater than that of the surrounding liquid.
- An object  when its density is less than that of the surrounding liquid.

*Use this space to write any questions or thoughts about this lesson.*