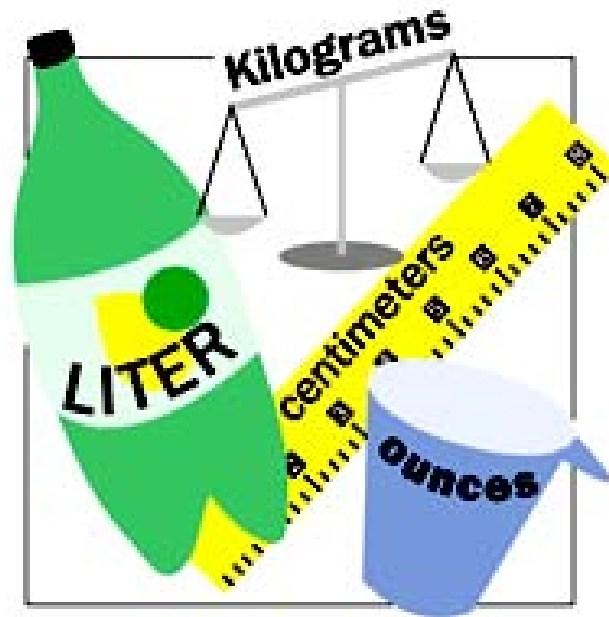


Measurement-A Common Language



Density, Time, & Temperature

Density

Density

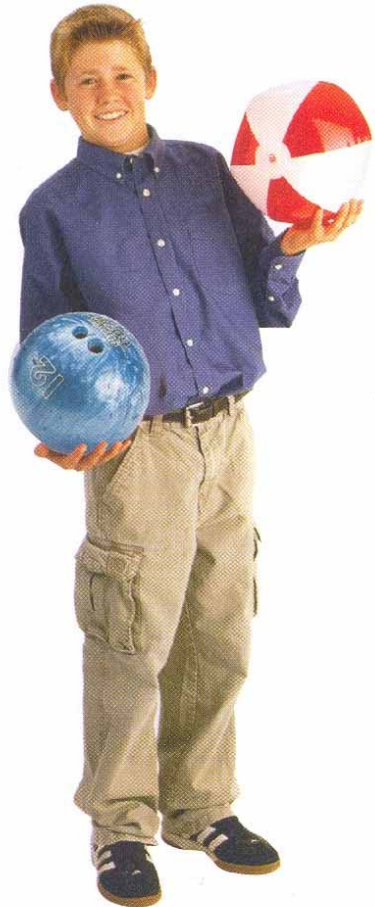
- The measure of how much mass is contained in a given volume

The formula of density is:

$$\text{Density} = \text{Mass} / \text{Volume}$$

Figure 5: Comparing Densities

- **Inferring:** Which item has the greater density?



- The bowling ball
- Since the bowling bowl has a greater mass, it has a greater density, even though both balls have the same volume

FIGURE 5

Density

Units of Density

Why is density expressed as a combination of two different units?

- Because density is actually made up of two other measurements - mass and volume - an objects density is expressed as a combination of two units

Two Common Units For Density

- Grams per cubic centimeter (g/cm^3)
- Grams per milliliter (g/mL)

Math Practice: What is the density of a wood block with a volume of 125 cm^3 and a mass of 57 g ?

$$\text{Density} = \text{mass} / \text{volume}$$

$$\text{Density} = 57 \text{ g} / 125 \text{ cm}^3$$

$$\text{Density} = 0.46 \text{ g} / \text{cm}^3$$

Math Practice: What is the density of a liquid with a mass of 45 g and a volume of 48 mL?

$$\text{Density} = \text{mass} / \text{volume}$$

$$\text{Density} = 45 \text{ g} / 48 \text{ mL}$$

$$\text{Density} = 0.94 \text{ g/mL}$$

Density

Densities of Common
Substances

The density of a substance is the _____ for all samples of that substance.

- Same

Figure 6: Applying Concepts: How could you use density to determine whether a bar of metal is pure gold?

- If the bar of gold has a density that is greater than or less than 19.3 g/cm^3 , then the sample is not pure gold.

Densities of Some Common Substances	
Substance	Density (g/cm^3)
Air	0.001
Ice	0.9
Water	1.0
Aluminum	2.7
Gold	19.3

✓ **Reading Checkpoint (page 53):** Will an object with a density of 0.7 g/cm^3 float or sink in water?

- An object that has a density of 0.7 g/cm^3 will float in water (1 g/cm^3) because it is less dense than water

Time

Time

Units of Time

What is the SI unit used to measure time?

- The second(s) is the SI unit to measure time

Common Conversions for Time

1s

=

60 s

1h

=

Common Conversions for Time

1s	=	1,000 ms
	=	60 s
1h	=	

Common Conversions for Time

1s	=	1,000 ms
1 min	=	60 s
1h	=	

Common Conversions for Time

1s	=	1,000 ms
1 min	=	60 s
1h	=	60 min

Time

Measuring Time

Why would a stop watch be used to measure time in an important race?

- Because stop watches measure in units smaller than the second
- These measurements include the tenth and hundredth of a second

✓ Reading Checkpoint (page 53) - How many milliseconds are in one second?

- 1,000 milliseconds

Temperature

Temperature

Units of Temperature

A common unit to measure temperature is the _____.

- Celsius scale

Water freezes at _____
and boils at _____.

- $0\text{ }^{\circ}\text{C}$
- $100\text{ }^{\circ}\text{C}$

The normal human body temperature is approximately _____.

- 37 °C

What is the official SI unit for temperature?

- The Kelvin Scale ($^{\circ}\text{K}$)
- $0\text{ }^{\circ}\text{K} = 273\text{ }^{\circ}\text{C}$

Figure 8: Measuring Temperature - **Observing:** At what temperature on the Kelvin scale does water boil?



- 373 K

FIGURE 8

What is absolute zero?

- Absolute zero is considered by scientists to be the coldest temperature possible
- $0\text{ }^{\circ}\text{K}$ or $-273\text{ }^{\circ}\text{C}$

Temperature

Measuring Temperature

What instrument is used to measure temperature?

- Thermometer