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Warm-Up | Measurement

Lesson Question

Lesson Goals

Explain how things are measured using the _____.

Identify the _____ and _____ of the metric system.

Perform metric system _____.

_____ length, mass, volume, and temperature.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

International System of Units (SI)	the modern form of the _____; units of measurement built around seven base units
length	the distance from one _____ to another
mass	the amount of _____ in an object

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Words to Know

meniscus	the _____ upper surface of a column of liquid
temperature	a measure of the average _____ of the particles in a substance
volume	the amount of _____ an object takes up

Scientific Inquiry

Scientific inquiry involves:

- asking a _____.
- performing _____.
- collecting _____.
- providing _____.
- communicating _____.

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The Metric System

- The metric system originated in _____ in 1799.
- It uses the _____ (SI).
- Science uses the _____ for measurements.
- SI units are _____ and _____.

Comparison of Units

- _____ is the distance from one point to another.
- _____ is the amount of space an object takes up.
- _____ is the amount of matter in an object.
- _____ is a measure of the average kinetic energy of the particles in a substance.

Fill in the missing information in the table.

Property	SI Unit	Symbol	English Unit
	meter		yard or foot
volume		L	
mass	kilogram		
	degrees Celsius	°C	degrees Fahrenheit
	kelvins		

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The Metric System: Multiples of 10

Fill in the missing information in the table.

Prefix	Symbol	Multiple of 10
	k	1,000
hecto-		100
deca-	da	
base unit		
deci-	d	
		0.01
milli-	m	

To remember the order of prefixes and base units, you can use this memory device:

King **H**enry **D**ied **B**y **D**rinking **C**hocolate **M**ilk.

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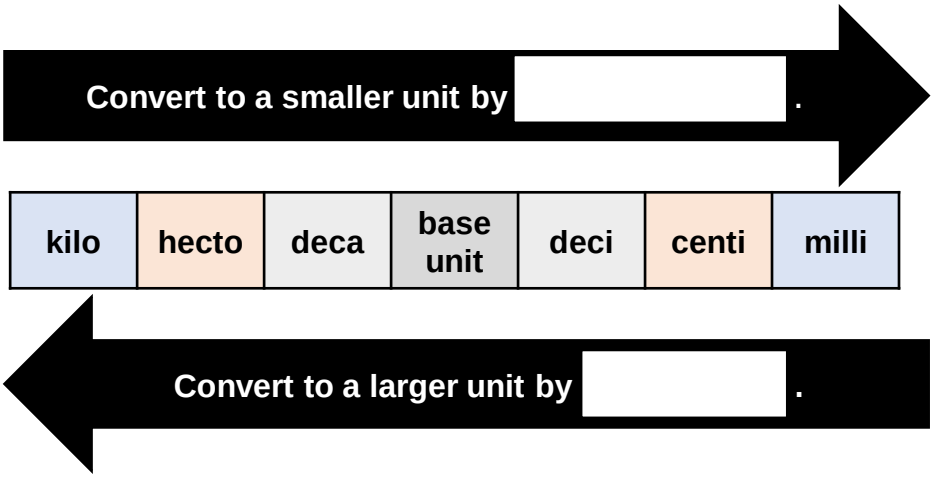
Metric Unit Conversions



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Metric Unit Conversions

Example: Convert from a Larger Unit to Smaller Unit

Convert 5.64 centimeters to millimeters.

- Decide whether to multiply or divide. In this example, you will ☐.
- Select the multiple of 10. In this example, the multiple is ☐.

$5.64 \text{ cm} = 5.64 \times \square = 56.4 \text{ mm}$

Here is another way to convert centimeters to millimeters. Since we are multiplying by 10, we can simply move the decimal place to the right one space (making the number larger). We move it one space because the number 10 contains one zero.

$5.64 \text{ cm} = \square$

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Metric Unit Conversions

Example: Convert from a Smaller Unit to Larger Unit

Convert 25.3 grams to kilograms.

- Decide whether to multiply or divide. In this example, you will ☐.
- Select the multiple of 10. In this example, the multiple is ☐.

$25.3 \text{ g} \div \square = 0.0253 \text{ kg}$

We can move the decimal place to make this conversion. Since we are dividing by 1,000, we can move the decimal place to the left three spaces (making the number smaller). We move it three spaces because the number 1,000 contains three zeros.

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Metric Unit Conversions

Example: Convert from a Smaller Unit to Larger Unit

Convert 91.7 kilowatts to milliwatts.

- To convert from a larger unit to smaller unit, we ☐.

Step 1: Convert to the base unit first.

- To convert from kilowatts to watts, multiply by ☐.
- The number 1,000 has ☐ zeros.
- We are converting a larger unit to a smaller unit, so the decimal will move to the right three places.

$$91.7 \text{ kilowatts} = 91.7 \times \square = 91{,}700 \text{ watts}$$

Step 2: Convert from the base unit to the smaller unit.

- To convert from a larger unit to smaller unit, we ☐.
- To convert from watts to milliwatts, again multiply by 1,000.

$$91{,}700 \text{ watts} = 91.700 \times \square = 91{,}700{,}000\square$$

These two steps can be done as one. Multiplying by 1,000 twice means you have six zeros. So the decimal place will move six places to the right.

$$91.700 \text{ kilowatts} = 91.7 \times \square \times 1000 = \square$$

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Measurements of Length

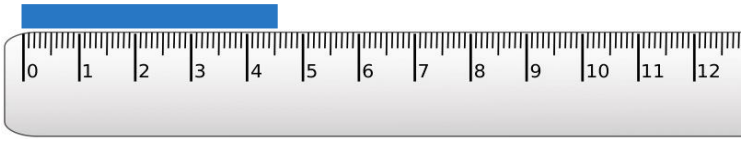
Length can be measured using:

- Ruler
- [ ]
- Micrometer
- [ ]

Measurement with a Ruler

- Whenever possible, use [ ] units.
- [ ] the edge of the object with the [ ] mark on the ruler.

Circle the "0" mark on the ruler.



The line is [ ] long.

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Measurements of Mass

Mass can be measured using:

- _____ balance
- Electronic _____
- _____ balance

Triple-Beam Balance

1. Move the _____ to the far _____ so the balance reads _____ when the pan is empty.
2. Place the object on the _____ .
3. Move the sliders _____ until the pointer rests at the _____ mark. (Always start with the _____ marker.)
4. _____ the numbers from the _____ sliders to find the _____ of the object on the pan.

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Measurements of Volume of a Solid

- The volume of a regular solid is measured using a [ ]
- The volume of an irregular solid is measured using [ ].
  - The irregularly shaped solid is placed into a known volume of water, and the volume change of the water is observed.
  - The change in volume is equal to the volume of the solid.

Measurements of Volume of a Liquid

The volume of a liquid can be measured using:

- [ ] cylinder
- Pipette
- [ ] and volumetric [ ]
- Buret

Graduated Cylinder

- Liquid forms a concave [ ].
- Measurement is taken at the [ ] of the meniscus.
- The [ ] of water measures the volume of irregular solids.

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Measurements of Temperature

The temperature can be measured using:

- Liquid _____
- _____ thermometer

Thermometer

- Handle carefully to prevent _____ .
- Completely _____ the bulb in the liquid.
- Keep the bulb away from _____ .
- Do not use for _____ .
- Measure in degrees _____ .

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Summary | Measurement

Lesson Question

How are things measured using the metric system?

Answer

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Review: Key Concepts

Complete the table by writing the metric prefix represented by each word in the mnemonic device. Then write the symbol and multiple of 10 that each prefix represents.

	King	Henry	Died	By	Drinking	Chocolate	Milk
Prefix		hecto-		base unit		centi-	
Symbol	k		da		d		m
Multiple of 10		100				0.01	

- Science uses the _____ system for measurements.

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Summary | Measurement

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Review: Key Concepts

Complete the table.

Property	SI Unit	Common Measuring Device
length		ruler
	liter	
mass		triple-beam balance
	degrees Celsius	
	kelvins	

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

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