

SPELLOGRAPHY

Book D, Unit 24

Supplemental Activities

Print out the student pages for the supplemental lesson on units of measurement and related terms, following completion of Lesson 6.

Lesson 7.1 (page 2)

Metric Numbers

Use Latin prefixes and Greek combining forms to write metric numbers.

Lesson 7.2 (page 3)

Speed Read

Practice reading metric numbers; then learn more about the English system.

Lesson 7.3 (page 4)

Multiples of 3: Common Uses

Consider ways that multiples of 3 are used in everyday life.

Lesson 7.4 (page 5)

A 360 View

Learn about angles in a 360-degree circle and apply the knowledge to skateboard rotations.

Lesson 7.5 (page 5)

The Handy Number 4

Consider ways that multiples of 4 are used in everyday life.

Lesson 7.6 (page 6)

English Measurements

Write terms for distances and liquids using the English system of measurements.

Lesson 7.7 (page 7)

Dictation

Write words related to metric and English systems of measurement.



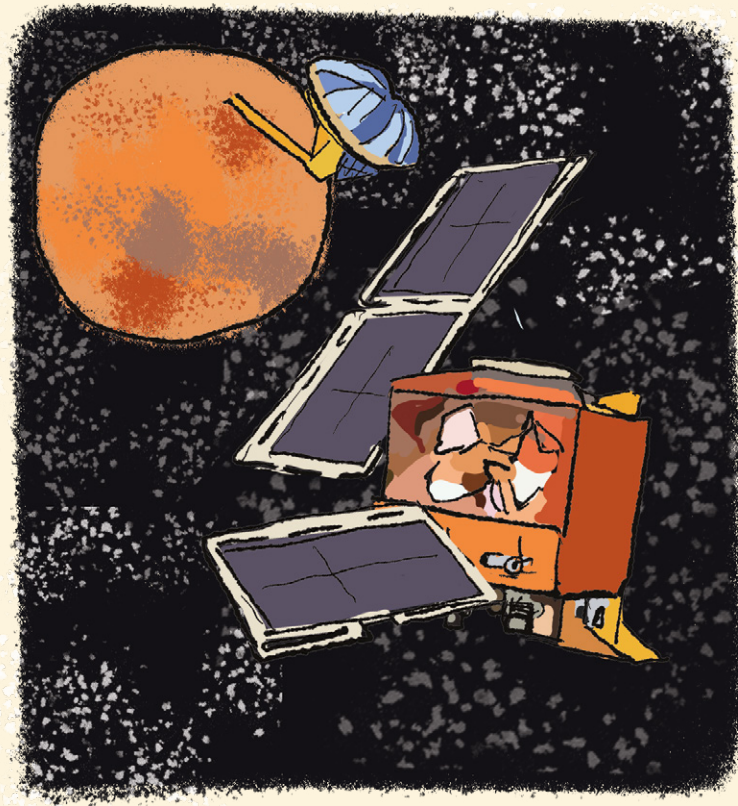
Units of Measurement

- Objectives**
- Explore metric versus English systems of measurement and terms for units of measurement.
 - Learn how the English system grew out of the ancient practice of counting by hand.



Grandpa Mahesh asked me if I ever heard of the Mars Climate Orbiter. I had not. The Orbiter was launched in 1998 by NASA to study the climate of Mars. On the day it was supposed to begin orbiting Mars, it broke apart. An investigation found the cause was an error by an engineer who used the English system of measurement (inches, feet, ...) instead of metric units of measurement (centimeters, meters, ...).

"Don't let this happen to you!" he said, and then we compared measurement systems.



7.1

Metric Numbers

Latin prefixes name metric units smaller than one unit. Greek combining forms name metric units greater than one unit.

The metric system was developed in France in the late 1700s. The metric system, including decimals, relies on a base 10 system. Metric numbers are used in numerous ways, including for measuring distance, liquids, and weight. The metric system is customarily used in every country of the world except for three: United States, Myanmar, and Liberia.

- Fill in the cells of these tables by combining the unit names for 1 with the Latin or Greek number prefix. Name each measure, including those bigger or smaller in relation to 1.

Unit = 1	Bigger than 1 Unit (Greek)		
	kilo = 1,000	deka = 10	
distance: 1 meter	1,000 meters = 1 <u> kilometer </u> (a bit more than .6 of a mile.)	10 meters = 1 <u> dekameter </u>	
liquid: 1 liter	1,000 liters = 1 <u> kiloliter </u>	10 liters = 1 <u> dekaliter </u>	
mass (weight): 1 gram	1,000 grams = 1 <u> kilogram </u> (1 kg = 2.2046 lbs.)	10 grams = 1 <u> dekagram </u>	
Unit = 1	Smaller than 1 Unit (Latin)		
	dec(i) = 10	cent(i) = 100	milli = 1,000
distance: 1 meter	10 <u> decimeters </u> = 1 meter	100 <u> centimeters </u> = 1 meter	1,000 <u> millimeters </u> = 1 meter
liquid: 1 liter	10 <u> deciliters </u> = 1 liter	100 <u> centiliters </u> = 1 liter	1,000 <u> milliliters </u> = 1 liter
mass (weight): 1 gram	10 <u> decigrams </u> = 1 gram	100 <u> centigrams </u> = 1 gram	1,000 <u> milligrams </u> = 1 gram

- Meters, liters, and grams also are measured in *hecto* (100) size, 10x larger than *deka* (10), and 10x smaller than *kilo* (1,000).

7.2 Speed Read

- Read with accuracy, going across the rows.
- Try increasing your speed on a reread.
- Record your times.

meter	liter	gram
millimeter	centimeter	decimeter
dekameter	hectometer	kilometer
milliliter	centiliter	deciliter
dekaliter	hectoliter	kiloliter
milligram	centigram	decigram
dekagram	hectogram	kilogram

T1: _____ T2: _____

The English System

Many things about the English system line up strangely with the metric system. For example, here are equivalent measurements across systems:

English system	Metric system
1 yard	= about 0.9144 meters
1 mile	= about 1.60934 kilometers
1 pound (lb.)	= about 0.453592 kilograms

Both the English and metric systems are broadly used in the United States.

Why do we still use the English System?

Way before calculators and before most people read or wrote, numbers were used that were easy to remember and work with in everyday life. Using three per finger on four left-hand fingers, and five fingers of the right hand, a lot of math was literally done *by hand* and involved multiples of 3, 4, and 5.

Pythagoras considered 3 to be the noblest number. Given three knuckles per finger, we commonly use multiples of 3, including 6, 12, 15, 24, 30 ... up to 60 (12 knuckles x 5 right-hand fingers). And $60 \times 6 = 360$. Many multiples of 3 are handy numbers.



7.3 Multiples of 3: Common Uses

- What are some common ways we use these numbers?
- Fill in the "common uses" boxes as you discuss this with your classmates.

Digit	Common uses	Digit	Common uses
3	3 feet = 1 yard; triads, trios, tripods, triangulation	36	inches in a yard, 3 dozen, 2 rounds of a golf tournament, number of outcomes if you roll 6-sided dice
6	half dozen, hexagon (6-sided dice), six-pack	45	$\frac{3}{4}$ hour, half a 90° angle, $\frac{1}{8}$ of a circle, commonly used in building trades
12	inches in a foot, hours in half a day, dozen (eggs)	60	seconds in a minute, minutes in an hour, 5 dozen
15	quarter of an hour	90	right (90°) angle, left or right, perpendicular, right triangle
24	hours in a day, 2 dozen	180	angles in a half circle, turnaround
30	half hour	360	angles in a full circle, degrees in one complete rotation

What about 360?

Babylonian astronomers measured the motion of Earth against the sun, noticing how the moon moved relative to the planets (Mercury, Mars, Venus, Jupiter, and Saturn) and the constellations. Astronomers in India saw how the shadows of objects changed over the year. By the time of Aryabhata, the motion of planets was treated to be elliptical. It was understood that Earth came fully around the sun about every 360 days (60×6). Hipparchus of Rhodes, in second century BC Greece, used the association of 360 with Earth's full orbit to determine a 1° angle is $1/360$ of a circle. This provided the basis for measurement of angles used in trigonometry, in our GPS systems, and in skateboarding.

7.4 A 360 View

When Yogi, Hari, and the crew want to learn about skateboard tricks, they look at videos of awesome skateboarders and figure the number of rotations in the tricks.

Skateboard tricks	Number of rotations	Skateboard tricks	Number of rotations
Frontside 180	half	720 Tail Grab	2 full
Backside 360	1 full	Cork 900	2½
Ollie 540	1½	Aerial 1080	3 full

7.5 The Handy Number 4

Another handy number is 4, which probably came from using the four left-hand fingers (not the thumb). Counting by 4 provides another set of common, useful numbers.

- What common units of measure fit these numbers?

Digit	Common uses	Digit	Common uses
4	quarters in a football or basketball game, quadrants, quarters in a dollar	64	number of squares in a checker or chess board
8	ounces in half a pound, skating a figure 8, a lucky number in Hinduism, sideways—a symbol of infinity	128	fluid ounces in a gallon of liquid
16	ounces in a pound	256	a computer byte contains 8 bits, and each bit can either be 0 or 1, so a byte has 256 possible values; the square of 16 is 256; a perfect square (16^2)
32	fluid ounces in a quart		

7.6 English Measurements

We cannot list English system measurement terms in one table as we can with metric measurement terms. One reason is that the names for distances are built on units of three, whereas the names for liquids are built on units of four.

- Place the terms where they fit in the chart for distance first, and then the chart for liquids. You will need to use some of the terms more than once.

Distance:

mile yard foot/feet inch(es)

5280 units	3 units	1 unit	1/12
5280 <u>feet</u>	3 <u>feet</u>	12 <u>inches</u>	1/12 <u>foot</u>
= 1 <u>mile</u>	36 <u>inches</u>	= 1 <u>foot</u>	= 1 <u>inch</u>
	= 1 <u>yard</u>		

Liquid:

gallon quart pint cup fluid ounce(s) tablespoons

1 gallon	1 quart (¼ of a gallon)	1 pint
128 <u>fluid ounces</u>	32 <u>fluid ounces</u>	16 <u>fluid ounces</u>
= <u>16 cups</u>	= <u>4 cups</u>	= <u>2 cups</u>
= <u>8 pints</u>	= <u>2 pints</u>	= 1 pint
= <u>4 quarts</u>	= 1 quart	
= 1 gallon		

1 cup	1 fluid ounce
8 <u>fluid ounces</u>	2 <u>tablespoons</u>
= 1 cup	= 1 fluid ounce

7.7

Dictation

- Listen to, repeat, and write the dictated words.

1. **eight-tenths**

6. **centimeter**

2. **fifteen and thirty-six hundredths**

7. **milliliter**

3. **gallons**

8. **kilometer**

4. **pints**

9. **liter**

5. **fluid ounces**

10. **dekagram**

Optional Sentence: The winner of the twenty-five kilometer, or fifteen-mile, race won by eight centimeters, or three-hundredths of a second.

- Dictate the words for students to write.
- Give corrective feedback by showing correct spellings; have students fix their own mistakes.
- Reteach concepts for any recurring error patterns you see.
- Optional: Dictate the sentence for students to write.