

# 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.



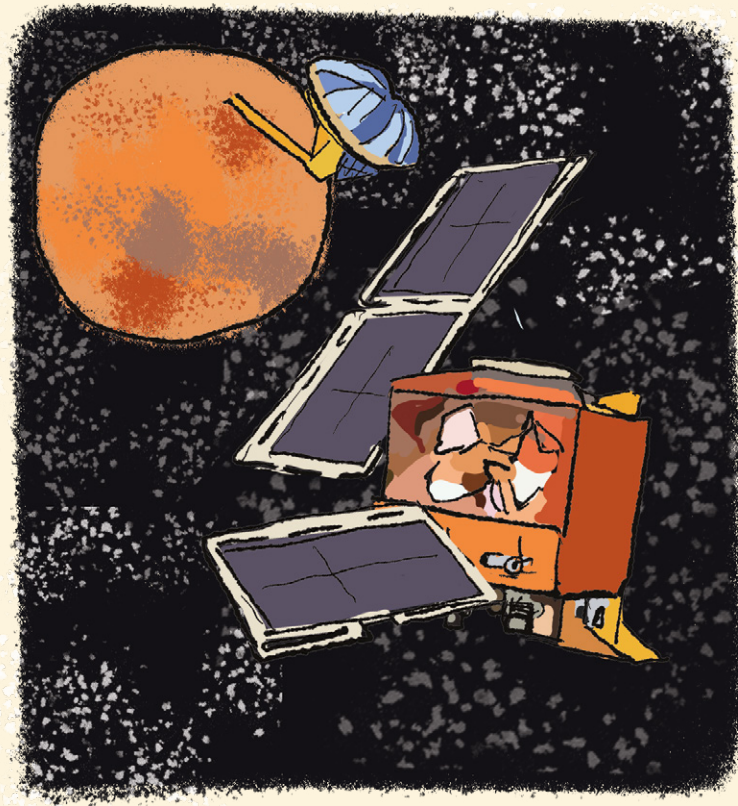
## Units of Measurement

- 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 _____ (a bit more than .6 of a mile.)	10 meters = 1 _____	
liquid: 1 liter	1,000 liters = 1 _____	10 liters = 1 _____	
mass (weight): 1 gram	1,000 grams = 1 _____ (1 kg = 2.2046 lbs.)	10 grams = 1 _____	
Unit = 1	Smaller than 1 Unit (Latin)		
	dec(i) = 10	cent(i) = 100	milli = 1,000
distance: 1 meter	10  _____ = 1 meter	100  _____ = 1 meter	1,000  _____ = 1 meter
liquid: 1 liter	10  _____ = 1 liter	100  _____ = 1 liter	1,000  _____ = 1 liter
mass (weight): 1 gram	10  _____ = 1 gram	100  _____ = 1 gram	1,000  _____ = 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		36	
6		45	
12		60	
15		90	
24		180	
30		360	

## 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 ( $60 \times 6$ ). Hipparchus of Rhodes, in second century BC Greece, used the association of 360 with Earth's full orbit to determine a  $1^\circ$  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		720 Tail Grab	
Backside 360		Cork 900	
Ollie 540		Aerial 1080	

### 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		64	
8		128	
16		256	
32			

## 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 _____	3 _____	12 _____	1/12 _____
= 1 _____	36 _____	= 1 _____	= 1 _____
	= 1 _____		

### Liquid:

gallon                  quart                  pint                  cup                  fluid ounce(s)                  tablespoons

1 gallon	1 quart (¼ of a gallon)	1 pint
128 _____	32 _____	16 _____
= _____	= _____	= _____
= _____	= _____	= 1 pint
= _____	= 1 quart	
= 1 gallon		

1 cup	1 fluid ounce
8 _____	2 _____
= 1 cup	= 1 fluid ounce

**7.7****Dictation**

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

1. \_\_\_\_\_

6. \_\_\_\_\_

2. \_\_\_\_\_

7. \_\_\_\_\_

3. \_\_\_\_\_

8. \_\_\_\_\_

4. \_\_\_\_\_

9. \_\_\_\_\_

5. \_\_\_\_\_

10. \_\_\_\_\_

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