North Penn School District

Elementary Math Parent Letter

Grade 4

Unit 6 – Chapter 12: Relative Sizes of Measurement Units

Examples for each lesson:

Lesson 12.1

Measurement Benchmarks

You can use benchmarks to estimate measurements.

The chart shows benchmarks for customary units of measurement.

Benchmarks for Some Customary Units					
 1 ft	 1 yd				
about 1 foot	about 1 yard	about 1 cup	about 1 gallon	about 1 ounce	about 1 pound

Here are some more examples of estimating with customary units.

- The width of a professional football is about 1 foot.
- A large fish bowl holds about 1 gallon of water.
- A box of cereal weighs about 1 pound.

The chart shows benchmarks for metric units of measurement.

Benchmarks for Some Metric Units					
					
about 1 centimeter	about 1 meter	about 1 milliliter	about 1 liter	about 1 gram	about 1 kilogram

Here are some more examples of estimating with metric units.

- The width of a large paper clip is about 1 centimeter.
- A pitcher holds about 1 liter of juice.
- Three laps around a track is about 1 kilometer.

Lesson 12.2

Customary Units of Length

A ruler is used to measure length. A ruler that is 1 foot long shows 12 inches in 1 foot. A ruler that is 3 feet long is called a yardstick. There are 3 feet in 1 yard.

How does the size of a foot compare to the size of an inch?

Step 1 A small paper clip is about 1 inch long. Below is a drawing of a chain of paper clips that is about 1 foot long. Number each paper clip, starting with 1.

Step 2 Complete this sentence.

In the chain of paper clips shown, there are 12 paper clips.

Step 3 Compare the size of 1 inch to the size of 1 foot.

There are 12 inches in 1 foot.

So, 1 foot is 12 times as long as 1 inch.

More information on this strategy is available on Animated Math Model #45.

Lesson 12.3

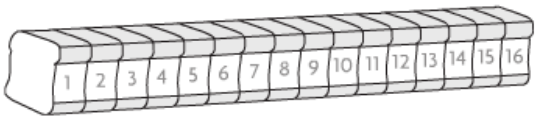
Customary Units of Weight

Ounces and **pounds** are customary units of weight. A **ton** is a unit of weight that is equal to 2,000 pounds.

A slice of bread weighs about 1 ounce. Some loaves of bread weigh about 1 pound.

How does the size of 1 ounce compare to the size of 1 pound?

Step 1 You know a slice of bread weighs about 1 ounce. Below is a drawing of a loaf of bread that weighs about 1 pound. Number each slice of bread, starting with 1.



Step 2 Complete this sentence.

In the loaf of bread shown above, there are 16 slices of bread.

Step 3 Compare the size of 1 ounce to the size of 1 pound.

There are 16 ounces in 1 pound.

So, 1 pound is 16 times as heavy as 1 ounce.

More information on this strategy is available on Animated Math Model #46.

Lesson 12.4

Customary Units of Liquid Volume

Liquid volume is the measure of the space a liquid occupies. Some basic units for measuring liquid volume are **gallons, half gallons, quarts, pints, cups,** and **fluid ounces**. The table at the right shows the relationships among some units of liquid volume.

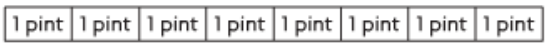
1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 half gallon = 2 quarts
1 gallon = 4 quarts

How does the size of a gallon compare to the size of a pint?

Step 1 Use the information in the table. Draw a bar to represent 1 gallon.

Step 2 The table shows that 1 gallon is equal to 4 quarts. Draw a bar to show 4 quarts.

Step 3 The table shows that 1 quart is equal to 2 pints. Draw a bar to show 2 pints for each of the 4 quarts.



Step 4 Compare the size of 1 gallon to the size of 1 pint.

There are 8 pints in 1 gallon.

So, 1 gallon is 8 times as much as 1 pint.

More information on this strategy is available on Animated Math Model #47.

Lesson 12.5

Line Plots

Howard gave a piece of paper with several survey questions to his friends. Then he made a list to show how long it took for his friends to answer the survey. Howard wants to know how many surveys took longer than $\frac{2}{12}$ hour.

Time for Survey Answers (in hours)

$\frac{1}{12}$ $\frac{3}{12}$ $\frac{1}{12}$ $\frac{2}{12}$ $\frac{6}{12}$ $\frac{3}{12}$ $\frac{5}{12}$

Make a line plot to show the data.

Step 1 Order the data from least to greatest.

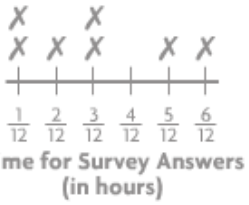
$\frac{1}{12}, \frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \frac{3}{12}, \frac{5}{12}, \frac{6}{12}$

Step 2 Make a tally table of the data.

Survey	
Time (in hours)	**Tally**
$\frac{1}{12}$	||
$\frac{2}{12}$	|
$\frac{3}{12}$	||
$\frac{5}{12}$	|
$\frac{6}{12}$	|

Step 3 Label the fractions of an hour on the number line from least to greatest. Notice that $\frac{4}{12}$ is included even though it is not in the data.

Step 4 Plot an *X* above the number line for each piece of data. Write a title for the line plot.



Time for Survey Answers (in hours)

Step 5 Count the number of *X*s that represent data points greater than $\frac{2}{12}$ hour.

There are 4 data points greater than $\frac{2}{12}$ hour.

So, 4 surveys took more than $\frac{2}{12}$ hour.

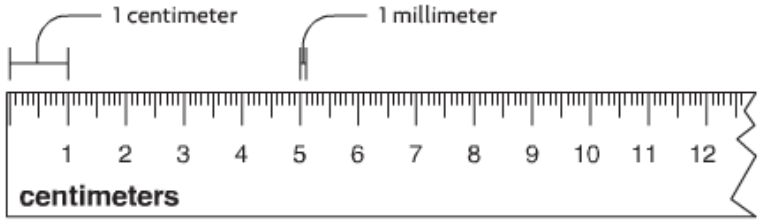
Lesson 12.6

Metric Units of Length

Meters (m), **decimeters** (dm), centimeters (cm), and **millimeters** (mm) are all metric units of length. You can use a ruler and a meterstick to find out how these units are related.

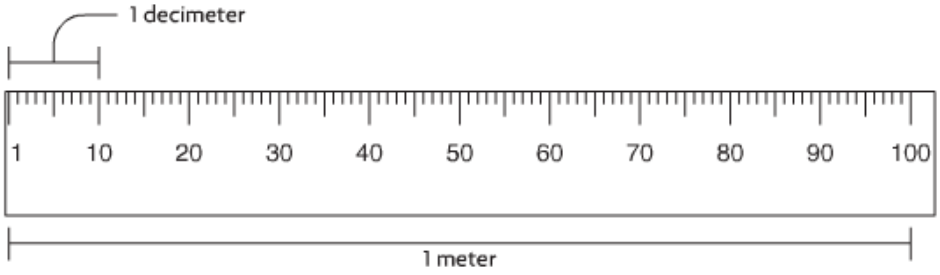
Materials: ruler, meterstick

Step 1 Look at a metric ruler. Most look like the one below.



The short marks between each centimeter mark show millimeters.
1 centimeter has the same length as a group of 10 millimeters.

Step 2 Look at a meterstick. Most look like the one below.



1 decimeter has the same length as a group of 10 centimeters.

Step 3 Use the ruler and the meterstick to compare metric units of length.

1 centimeter = 10 millimeters

1 decimeter = 10 centimeters

1 meter = 10 decimeters

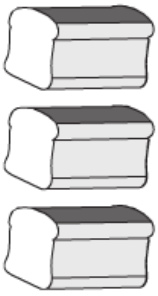
1 meter = 100 centimeters

More information on this strategy is available on Animated Math Models #48, 49.

Lesson 12.7

Metric Units of Mass and Liquid Volume

Mass is the amount of matter in an object. Metric units of mass include grams (g) and kilograms (kg). 1 kilogram represents the same mass as 1,000 grams.



One large loaf of bread has a mass of about 1 kilogram. Jacob has 3 large loaves of bread. About how many grams is the mass of the loaves?

3 kilograms = 3 × 1,000 grams

= 3,000 grams

Liters (L) and **milliliters** (mL) are metric units of liquid volume. 1 liter represents the same liquid volume as 1,000 milliliters.

A large bowl holds about 2 liters of juice. Carmen needs to know the liquid volume in milliliters.

2 liters = 2 × 1,000 milliliters

= 2,000 milliliters

More information on this strategy is available on Animated Math Models #50, 51.

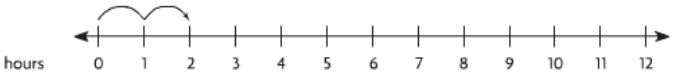
Lesson 12.8

Units of Time

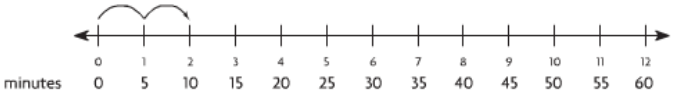
Some analog clocks have an hour hand, a minute hand, and a **second** hand.

There are 60 seconds in a minute. The second hand makes 1 full turn every minute. There are 60 minutes in an hour. The minute hand makes 1 full turn every hour. The hour hand makes 1 full turn every 12 hours.

You can think of the clock as unrolling to become a number line.



The hour hand moves from one number to the next in 1 hour.



The minute hand moves from one number to the next in 5 minutes.

Use the table at the right to change between units of time.

Units of Time
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 year = 12 months
1 year = 52 weeks

1 hour = 60 minutes, or 60 × 60 seconds, or 3,600 seconds.

So, 1 hour is 3,600 times as long as 1 second.

1 day = 24 hours, so 3 days = 3 × 24 hours, or 72 hours.

1 year = 12 months, so 5 years = 5 × 12 months, or 60 months.

More information on this strategy is available on Animated Math Model #52.

Lesson 12.9

Problem Solving • Elapsed Time

Opal finished her art project at 2:25 P.M. She spent 50 minutes working on her project. What time did she start working on her project?

Read the Problem		
What do I need to find?	**What information do I need to use?**	**How will I use the information?**
I need to find Opal's start time.	End time: 2:25 P.M. Elapsed time: 50 minutes	I can draw a diagram of a clock. I can then count back 5 minutes at a time until I reach 50 minutes.

Solve the Problem

I start by showing 2:25 P.M. on the clock.
Then I count back 50 minutes by 5s.

Think: As I count back, I go past the 12.
The hour must be 1 hour less than the ending time.

The hour will be 1 o'clock.

So, Opal started on her project at 1:35 P.M.

More information on this strategy is available on Animated Math Model #53.

Lesson 12.10

Mixed Measures

Gabrielle's puppy weighs 2 pounds 7 ounces. What is the weight of the puppy in ounces?

Step 1 Think of 2 pounds 7 ounces as 2 pounds + 7 ounces.

Step 2 Change the pounds to ounces.
Think: 1 pound = 16 ounces

So, 2 pounds = 2 × 16 ounces, or 32 ounces.

Step 3 Add like units to find the answer.

32 ounces
+ 7 ounces
39 ounces

So, Gabrielle's puppy weighs 39 ounces.

Gabrielle played with her puppy for 2 hours 10 minutes yesterday and 1 hour 25 minutes today. How much longer did she play with the puppy yesterday than today?

Step 1 Subtract the mixed measures. Write the subtraction with like units lined up.
Think: 25 minutes is greater than 10 minutes.

2 hr 10 min
− 1 hr 25 min

Step 2 Rename 2 hours 10 minutes to subtract.
1 hour = 60 minutes

So, 2 hr 10 min = 1 hr + 60 min + 10 min, or 1 hr 70 min.

1 70
~~2~~ hr ~~10~~ min
− 1 hr 25 min

Step 3 Subtract like units.
1 hr − 1 hr = 0 hr; 70 min − 25 min = 45 min

0 hr 45 min

So, she played with the puppy 45 minutes longer yesterday than today.

Lesson 12.11

Algebra • Patterns in Measurement Units

Use the relationship between the number pairs to label the columns in the table.

?	?
1	8
2	16
3	24
4	32

Step 1 List the number pairs. 1 and 8; 2 and 16; 3 and 24; 4 and 32

Step 2 Describe the relationship between the numbers in each pair.

The second number is 8 times as great as the first number.

Step 3 Look for a relationship involving 1 and 8 in the table below.

Length	Weight	Liquid Volume	Time
1 foot = 12 inches 1 yard = 3 feet 1 yard = 36 inches	1 pound = 16 ounces 1 ton = 2,000 pounds	1 cup = 8 fluid ounces 1 pint = 2 cups 1 quart = 2 pints 1 gallon = 4 quarts	1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours 1 week = 7 days 1 year = 12 months 1 year = 52 weeks

So, the label for the first column is Cups.
The label for the second column is Fluid Ounces.

Vocabulary

Cup – a customary unit used to measure a liquid volume

Decimeter – a metric unit for measuring length or distance

Fluid ounce – the smallest customary unit for measuring liquid volume

Gallon – a customary unit used to measure liquid volume

Half gallon – a customary unit used to measure liquid volume

Line plot – a graph that shows the frequency of data along a number line

Milliliter – a metric unit used to measure liquid volume

Millimeter – a metric unit used to measure length

Ounce – a customary unit used to measure weight

Pint – a customary unit used to measure liquid volume

Pound – a customary unit used to measure weight

Quart – a customary unit used to measure liquid volume

Second – a small unit of time

Ton -- a customary unit used to measure weight