

Grade 3 Math Unit 4-Measurement

UNIT OVERVIEW

The work in this unit extends the Grade 3 Areas of Focus to address **Solving multi-step problems**, and Critical Focus Area #2, **Developing understanding of fractions, especially unit fractions**.

Work in this unit centers around these clusters:

- Solve word problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects. *(See Connections for explanation)
- Represent and interpret data **

STANDARDS

CC_Common Core State Standards - Mathematics (2010) - Grade 3

Domain 3.MD Measurement and Data

Cluster Statement: Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

Standard 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Standard 3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Cluster Statement: Represent and interpret data.

Standard 3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

Standard 3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves, or quarters.

CONTENT ELABORATIONS

- 3.MD.1** **3.MD.1** calls for students to solve elapsed time, including word problems. Students could use clock models or number lines to solve. On the number line, students should be given the opportunities to determine the intervals and size of jumps on their number line. Students could use pre-determined number lines (intervals every 5 or 15 minutes) or open number number lines (intervals determined by students).
MP.1, MP.4, MP.5, MP.6 should be emphasized.
- 3.MD.2** **3.MD.2** asks for students to reason about the units of mass and volume. Students need multiple opportunities weighing classroom objects and filling containers to help them develop a basic understanding of the size and weight of a liter, gram, and a kilogram. Milliliters may also be used to show amounts that are less than a liter. Word problems should only be one-step and include the same units.
Foundational understandings to help with measure concepts:
- Understand that larger units can be subdivided into equivalent units (partition)
- Understand that the same unit can be repeated to determine the measure (iteration)
- Understand the relationship between the size of a unit and the number of units needed (compensatory principal)
MP.1, MP.2, MP.4, MP.5, MP.6 should be emphasized.

Students should have opportunities reading and solving problems using scaled graphs before being asked to draw one. Students should experience different intervals of scale to further develop their understanding of scale graphs and number facts.

While explore data concepts, students should 1) Pose a question 2) Collect data, 3) Analyze data, 4) Interpret data (**PCAI**).

Pictographs: Scaled pictographs include symbols that represent multiple units. Graphs should include a title, scale, categories, category label and data. Students need to use both horizontal and vertical bar graphs.

Single bar graphs: Students use both horizontal and vertical bar graphs. Bar graphs include a title, scale, scale label, categories, category label and data.

Analyze and Interpret data could include:

- How many more..?
- Did more people choose than? (2 categories vs. 2 categories)
- About how many?
- Using data from graphs, what ___ was ___ more often than ___, but less often than...?
- What interval was used for this scale?
- What can we say about?
- If you were to which one would be the best?

MP.1, MP.4, MP.6, MP.7 should be emphasized.

Students in Grade 2 measured length in whole units using both metric and U.S. customary systems. It's important to review with students how to read and use a standard ruler including details about halves and quarter-marks on the ruler. Students should connect their understanding of fractions to measuring to one-half and one-quarter inch. Third graders need many opportunities measuring the length of various objects in their environment.

Some important ideas related to measuring with a ruler are:

- The starting point of where one places a ruler to begin measuring
- Measuring is approximate. Items that students measure will not always measure exactly 1/4, 1/2 or one whole inch. Student will need to decide on an appropriate estimate length.
- Making paper rulers and folding to find the half and quarter marks will help students develop a stronger understanding of measuring length.

Students generate data by measuring and create a line plot to display their findings.

MP.1, MP.4, MP.5, MP.6 should be emphasized.

UNIT VOCABULARY

capacity	analog clock	pictograph
liquid volume	digital clock	key
liter	time interval	analyze
metric unit	data	interpret
milliliter	survey	bar graph
unit	tally chart	scale
gram	frequency table	line plot
kilogram	tally marks	half inch
mass	picture graph	quarter inch

BIG IDEAS

ENDURING UNDERSTANDINGS	ESSENTIALS QUESTIONS
	Choose a few questions based on the needs of your students

Time...

- The duration of an event is called elapsed time and it can be measured.

Mass and Volume...

- Mass and volume are important parts of everyday life and can be determined a variety of ways.
- Larger units can be subdivided into equivalent units (partition).
- The same unit can be repeated to determine the measure (iteration).
- There is a relationship between the size of a unit and the number of units needed (compensatory principle).

Data and Graphing...

- Charts, tables, line plot graphs, pictographs, Venn diagrams, and bar graphs may be used to display data.
- One way to compare data is through the use of graphs.
- The scale increments used when making a bar graph is determined by the scale intervals being graphed.

Telling Time...

- What strategies can I use to help me tell and write time to the nearest minute and measure time intervals in minutes?
- What connections can I make between a clock and a number line?
- How can I use what I know about number lines to help me figure out how much time has passed between two events?
- What part does elapsed time play in our daily living?

Volume and Mass...

- Why is it important to know the mass of an object?
- In what ways can we determine the mass of an object?
- How are units in the same system of measurement related?
- What happens to an item's measurement when units are changed?
- How are grams and kilograms related?
- What is the tool best to use when measuring liquid volume?
- Does volume change when you change the measurement material? Why or why not?
- How can estimating help me to determine liquid volume?

Graphing and Data...

- How are tables, bar graphs, and line plot graphs useful ways to display data?
- How can you use graphs to answer a question?
- How can graphs be used to display data gathered from a survey?
- How can graphs be used to compare related data?
- How can data displays be used to describe events?
- How do I decide what increments to use for my scale?

CONNECTIONS

*Students in grade 2 learned to tell time to the nearest five minutes (2.MD.7). In 3rd grade, they extend telling time and measure elapsed time both in and out of context using clocks and number lines.

** This cluster connects to:

- 3.OA.1-4 Represent and solve problems involving multiplication and division
- 3.OA.7 Multiply and divide within 100
- 3.OA.8 Solve problems involving the four operations, and identify and explain patterns in arithmetic
- 2.MD.9-10 Represent and interpret data

Standards for Mathematical Practice (SMP)

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.3 Construct viable arguments and critique the reasoning of others

MP.4 Model with mathematics

MP.5 Use appropriate tools strategically

MP.6 Attend to precision

MP.7 Look for and make use of structure (Deductive reasoning)

MP.8 Look for and express regularity in repeated reasoning (Inductive Reasoning)

SOLVE PROBLEMS INVOLVING MEASUREMENT AND ESTIMATION OF INTERVALS OF TIME, LIQUID VOLUMES, AND MASSES OF OBJECTS

CONTENT		SKILLS
3.MD.1	Tell and write time to the nearest minute and measure time intervals in minutes.	Tell and write time to the nearest minute and measure time intervals in minutes. 1. Recognize minute marks on analog clock face and minute position on digital clock face. 2. Know how to write time to the minute. 3. Tell time to the minute. 4. Compare an analog clock face with a number line diagram. 5. Use a number line diagram to add and subtract time intervals in minutes. 6. Solve word problems involving addition and subtraction of time intervals in minutes.
3.MD.2	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). 1. Explain how to measure liquid volume in liters. 2. Explain how to measure mass in grams and kilograms. 3. Measure liquid volumes using standard units of liters. 4. Measure mass of objects using standard units of grams (g), and kilograms (kg).
3.MD.2	Add, subtract, multiply or divide to solve one-step word problems involving masses or volumes that are given in the same units.	Add, subtract, multiply or divide to solve one-step word problems involving masses or volumes that are given in the same units. 1. Add, subtract, multiply and divide units of liters, grams, and kilograms. 2. Know various strategies to represent a word problem involving liquid volume or mass. 3. Solve one step word problems involving masses given in the same units. 4. Solve one step word problems involving liquid volume given in the same units.
REPRESENT AND INTERPRET DATA		
3.MD.3	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. 1. Explain the scale of a graph with a scale greater than one. 2. Identify the scale of a graph with a scale greater than one. 3. Analyze a graph with a scale greater than one. 4. Choose a proper scale for a bar graph or picture graph. 5. Interpret a bar/picture graph to solve one or two step problems asking “how many more” and “how many less”. 6. Create a scaled picture graph to show data. 7. Create a scaled bar graph to show data.

3.MD.4	<p>Generate measurement data and make a line plot.</p>	<p>Generate measurement data and make a line plot.</p> <ol style="list-style-type: none"> 1. Define horizontal axis. 2. Identify each plot on the line as data or a number of objects. 3. Analyze data from a line plot. 4. Determine appropriate unit of measurement. 5. Determine appropriate scale for line plot. 6. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. 7. Create a line plot where the horizontal scale is marked off in appropriate units -whole numbers, halves, or quarters.
<p>Common Core Model Curriculum McGraw-Hill, My Math Chapters 11-12 Hands-on Standards Measurement Lessons # 1-9 & Data Analysis Lessons # 2 &3 Manipulatives: fraction circles, wipe-off clocks, analog clocks, color tiles, centimeter cubes, geoboards, pattern blocks, 3 Bear Family Counters, beakers with whole number measures, graduated cylinders, measuring cups with liter markings, standard rulers Deb Diller Math Work Stations materials & process Georgia Math Frameworks, Grade 3 Unit 6 Smart Board Resources <i>United Streaming</i> : Measuring Length, Areas, and Perimeters, Volume & Capacity <i>Creating pictographs</i> http://illuminations.nctm.org/LessonDetail.aspx?ID=L536 SCS Math Resources: <i>Bang on Time</i>, <i>Time Clock</i> Possible Literature: <u>The Information Please Kid's Almanac</u> by Alice Siegel and Margo McLoone Basta: <u>The Top 10 of Everything</u> by Russell Ash; <u>Measuring Up: Experiments, Puzzles and Games Exploring Measurement</u> by Sandra Markle; <u>I Wonder Why the Sun Rises and Other Questions About Time and Seasons</u> by Barbara Taylor; <u>What a Load of Trash!</u> by Steve Skidmore; <u>Measuring</u> by Sally Hewitt; <u>Measuring Penny</u> by Loreen Leedy; <u>Counting on Frank</u> by Rod Clement; <u>Polygons</u> by David L. Stienecker; <u>Build It with Boxes</u> by Joan Irvine</p>		