Red Level

TEACHER EDITION

MASTERING MATH

Editorial Project Manager:
Rabbi Levi Friedman

Content Manager:
Adina Rosen

Program Authors:
Chana Sarah Smith
Malky Kahn
Ettel Royde
Yael Edelstein
Norit Binat

Editor:
Miriam Shulamis Eisemann

Creative Director:
Glenna Daniel

Graphic Designer:
Anabelle Farinas
Miranda Brown

Printed in the USA in August 2025.

ISBN: 978-1-963536-17-1

Achievements
Educational Services

1072 Madison Ave.
Lakewood, NJ 08701

www.achievementsES.com
info@achievementsES.com
800-742-1803

Table of Contents

UNIT 1: MEASUREMENT

CHAPTER 1: Volume 7

1. *Units of Volume*
2. *Adding and Subtracting With Place Value*
3. *Adding and Subtracting With Regrouping*
4. *Properties of Addition*
5. *Modeling With Volume*
6. *Word Problems With Volume*

CHAPTER 2: Mass 21

1. *Units of Mass*
2. *Solving for an Unknown*
3. *Word Problems With Mass*
4. *Math Patterns*

CHAPTER 3: Estimating and Rounding .....

1. *Estimating*
2. *Rounding to the Nearest 10*
3. *Rounding to the Nearest 100*
4. *Using Rounding*

CHAPTER 4: Length .....

1. *Inches and Feet*
2. *Half and Quarter Inches*
3. *Line Plots*

UNIT 2: MULTIPLICATION 0-4

CHAPTER 5: Introduction to Multiplication.....

1. *What Is Multiplication?*
2. *Multiplication as Repeated Addition*
3. *Multiplication in Arrays*
4. *Zero and Identity Property*
5. *Commutative Property*

CHAPTER 6: Multiplication Tables Through.....

1. *Multiplying by 2,3, and 4 With Skip Counting*
2. *Multiplying by 2,3, and 4 With Tape Diagrams*
3. *Multiplying by 2,3, and 4 Using Patterns and Arrays*
4. *Associative and Distributive Property*
5. *Solving Equations*
6. *Solving Word Problems*

UNIT 3: DIVISION 1-4

CHAPTER 7: Introduction to Division .....

1. *What Is Division?*
2. *Division as Repeated Subtraction*
3. *Division by Decomposing Numbers*

CHAPTER 8: Divide by 0,1,2,3,4.....

1. *Dividing by 0 and 1*
2. *Division Strategy, Model*
3. *Division Strategy, Tape Model and Array*
4. *Division Strategy, Distributive Property*

CHAPTER 9: Division and Multiplication.....

1. *Order of Operations*
2. *Fact Families*
3. *Equations With Unknowns*
4. *Solving Equations*
5. *Solving Word Problems*

UNIT 4: MULTIPLICATION AND DIVISION 5-10

CHAPTER 10: Multiply by 5s and 10s.....

1. *Multiplying by 5s Using Skip Counting/Tape Diagram*
2. *Multiplying by 5 Using Patterns and Arrays*
3. *Skip Counting by 10s*
4. *Patterns for Multiplying by 10s*
5. *Multiply by Multiples of 10*

CHAPTER 11: Divide by 5s and 10s .....

1. *Model*
2. *Fact Families*
3. *Division as the Unknown*
4. *Solving Equations*
5. *Solving Word Problems*

UNIT 5: MULTIPLY/DIVIDE 6, 7, 8, 9

CHAPTER 12: Multiply by 6, 7, 8 .....

1. *Use Commutative Property to Find Known Facts of 6, 7, 8 Tables*
2. *Use Associative and Distributive to Find Known Facts of 6, 7, 8*
3. *Skip Counting by 6, 7, 8 Using Number Bonds to Decompose*

Table of Contents

CHAPTER 13: Multiply by 9

1. *Use Commutative Property to Find Known Facts of 9*
2. *Strategy, Distributive Property*
3. *Skip Counting by 9 Using Number Bonds to Decompose*
4. *Multiplying by 10 and Subtract 1*
5. *Patterns in the Nine Tables*
6. *Optional Fluency Practice Lesson*

CHAPTER 14: Divide by 6, 7, 8, 9

1. *Model*
2. *Fact Families*
3. *Relate multiplication to division, use letter for unknown*
4. *Solving equations*
5. *Solving word problems*

CHAPTER 15: More Multiplication

1. *Solving for the Unknown*
2. *Equations Within 100*
3. *More Equations*
4. *Solving Word Problems*

UNIT 6: FRACTIONS

CHAPTER 16: What is a Fraction?

1. *What Are Fractions?*
2. *Naming and Writing*
3. *Modeling in Shapes and Objects*
4. *Partitioning Shapes Into Equal Parts*
5. *Modeling on a Number Line*
6. *Fractions as a Part of a Group*
7. *Mixed Numbers*

CHAPTER 17: Compare Fractions

1. *Whole Number Fractions Written More Than One Way*
2. *Modeling Equivalent Fractions*
3. *Equivalent Fractions on a Number Line*
4. *Finding Equivalent Fractions*
5. *Comparing/Ordering Fractions With Same Denominator*
6. *Comparing/Ordering Fractions With Same Numerator*
7. *Comparing/Ordering Fractions With Modeling*
8. *Word Problems With Fractions*

UNIT 7: TIME AND DATA

CHAPTER 18: Data and Graphs

1. *Line Plots, Bar Graphs, Pictographs*
2. *Reading Data on Graphs*
3. *Making Graphs*
4. *Solving Word Problems Using Graphs*

CHAPTER 19: Time

1. *Reading Digital/Analog Clocks by the Hour/Half Hour Interval*
2. *Reading Clocks by 15-Minute Intervals*
3. *Reading Clocks by 5-Minute Intervals*
4. *Reading Clocks by 1-Minute Intervals*
5. *Am/PM*
6. *Time Intervals/Word Problems*

UNIT 8: SHAPES AND LINES

CHAPTER 20: Area

1. *What Is Area?*
2. *Formula for Area*
3. *Combined Rectangles Using Adding Strategy*
4. *Combined Rectangles Using Subtraction*

CHAPTER 21: Perimeter

1. *What Is Perimeter?*
2. *Find Length of Unknown Side*
3. *Same Area, Different Perimeter*
4. *Same Perimeter, Different Area*
5. *Problem Solving*

CHAPTER 22: Plane Shapes

1. *Types of Lines*
2. *Plane Shapes*
3. *Quadrilaterals*
4. *Shapes With Same and Different Attributes*

Mastering Math: Red Level

Dear Educators,

Welcome to "Mastering Math: Red Level," a comprehensive and standards-based math curriculum that introduces students to multiplication, division, fractions, measurement, and geometry in the form of a set of engaging thematic units of study.

The curriculum was designed to be rigorous, thorough, age-appropriate, and standards-aligned by a team of certified and experienced elementary educators. It was also designed to engage elementary students by incorporating interactive activities and thematic interdisciplinary units of study.

This introduction to the curriculum includes the following:

Overview of Skills and Standards II

A Note on Themes III

Lesson Components IV

Guided Math: Whole Group/Small Group/Centers VI

Suggestions for Classroom Routines VII

A Note on Assessment VIII

Opportunities for Differentiation VIII

Using Manipulatives/Resources Strategically IX

USB Materials and Additional Resources IX

Overview of Skills and Standards

In this curriculum, students will learn the following skills (that are linked to the Common Core Standards for third-grade math):

- Measuring and Estimating Volume, Mass, and Length (3.MD.A.2) (3.MD.B.4)
- Solving Word Problems That Involve Measurement (3.MD.A.2)
- Adding and Subtracting Within 1,000 (3.NBT.A.2)
- Solving Multistep Word Problems (3.OA.A.3) (3.OA.D.8)
- Identifying Patterns and Using Them as Strategies to Solve Equations (3.OA.C.7) (3.OA.D.9) (3.NBT.A.2)
- Rounding to the Nearest 10 (3.NBT.A.1)
- Rounding to the Nearest 100 (3.NBT.A.1)
- Using Rounding to Estimate and Check Answers (3.OA.D.8) (3.NBT.A.1)
- Creating Line Plots Showing Half and Quarter Inches (3.NF.A.2) (3.MD.B.4)
- Representing an Unknown With a Letter and Solving to Find the Value of the Unknown (3.OA.A.3) (3.OA.A.4) (3.OA.D.8)
- Modeling Multiplication Using Tape Models and Arrays (3.OA.A.1) (3.OA.C.7)
- Identifying the Parts of a Multiplication Equation (3.OA.A.1)
- Relating Multiplication to Addition and Setting up Repeated Addition Equations (3.OA.A.1) (3.OA.C.7)
- Identifying and Applying the Properties of Addition and Multiplication (3.OA.B.5) (3.OA.C.7) (3.OA.D.9) (3.NBT.A.2) (3.NBT.A.3)
- Fluently Multiplying Numbers 0-9 (3.OA.A.1) (3.OA.C.7)
- Multiplying and Dividing Within 100 (3.OA.A.1) (3.OA.A.2) (3.OA.A.3) (3.OA.C.7)
- Modeling Division Using Tape Models and Arrays (3.OA.A.2) (3.OA.C.7)
- Identifying the Parts of a Division Equation (3.OA.A.2)
- Relating Division to Repeated Subtraction (3.OA.A.2) (3.OA.C.7)
- Relating Multiplication to Division (3.OA.A.4) (3.OA.B.6) (3.OA.C.7)
- Multiplying by Multiples of 10 (3.NBT.A.3)
- Labeling the Parts of a Fraction (3.NF.A.1)
- Modeling, Naming, and Writing Fractions (3.NF.A.1) (3.NF.A.2)
- Partitioning Shapes into Equal Parts (3.NF.A.1) (3.G.A.2)
- Writing Mixed Numbers (3.NF.A.2)
- Finding, Modeling, and Writing Equivalent Fractions (3.NF.A.3)
- Comparing and Ordering Fractions With the Same Denominator (3.NF.A.3)
- Comparing and Ordering Fractions With the Same Numerator (3.NF.A.3)
- Creating and Reading Bar Graphs and Pictographs (3.MD.B.3)

Reading Clocks Within One-Minute Intervals (3.MD.A.1)
Modeling and Finding the Area of a Rectangle (3.MD.C.5) (3.MD.C.6) (3.MD.C.7)
Finding the Area of a Combined Rectangle (3.MD.C.5)
Finding the Perimeter of a Polygon (3.MD.D.8)

Given the Perimeter of a Polygon, Finding the Length of an Unknown Side (3.MD.D.8)
Finding Rectangles with the Same Perimeter but Different Areas and the Same Areas but Different Perimeters (3.MD.D.8)
Identifying Plane Shapes and Sorting Them by Attributes (3.MD.C.5) (3.G.A.1)

A Note on Themes

A growing body of research outlines the benefits of incorporating cross-curricular thematic units of study into core curricular concepts for early elementary.

With regards to math, this means that students explore addition, subtraction, geometry, and measurement through the lens of social studies and science concepts. For example, in this textbook, while learning about the area of shapes, students can explore related concepts in art, including mosaic squares and the area of large murals, and they can experiment with energy while being introduced to multiplication.

Some of the benefits of incorporating themes into math learning include:

- It helps students relate math concepts to their daily lives and to concepts they are familiar with.
- It keeps the students engaged and makes the learning exciting and relatable.
- It allows opportunities for interdisciplinary learning connecting science, social studies, literacy, and math.

However, there are also challenges to incorporating themes, including:

- Keeping the lessons rigorous and ensuring that the core concepts are still taught thoroughly and that the theme doesn't become a distraction
- Keeping the time needed for students to complete each lesson short enough that teachers can finish all the material in the year

We've tried to overcome these challenges by:

- Putting additional thematic material as "extra," not required for completing the lesson
- Incorporating themes into lesson elements like visuals on the worksheets and examples in word problems where they don't distract from the core competencies

For more information about this, see the **"LESSON COMPONENTS"** section of the teacher introduction below.

Lesson Components

Each lesson contains the following components:

The highlighted components are found only in the teacher's edition.

UNIT OVERVIEW: At the beginning of every unit in the teacher's book is an introductory section containing concepts, standards, and vocabulary related to the unit.

LESSON OBJECTIVE/THEMATIC UNIT/STANDARD: At the beginning of every chapter in the teacher's book, there is a small box with information for the teacher about the common core standard linked to the lesson, the lesson's objective (what the student should be able to accomplish after the lesson), and the thematic unit.

VOCABULARY: Each lesson contains a list of relevant math vocabulary, along with the definition. Teachers can use this to guide how they explain words and concepts to students. They can also print the vocabulary anchor chart for each chapter from the USB and hang it in the classroom to help students remember the vocabulary. The vocabulary words are also found in student workbooks alongside the definitions and a small icon.

PRE-ACTIVITY: The pre-activity is related to the thematic unit of study and usually also contains elements of math review. It consists of activities like read-alouds, movement activities, games, directed drawings, or discussions.

*PLEASE NOTE: **THE PRE-ACTIVITY IS AN OPTIONAL ACTIVITY.** If teachers don't have the time for the pre-activity or they want to skip it, that is okay. The lesson objective is taught in the mini-lesson, guided practice, and independent practice sections. **STUDENTS WILL STILL LEARN THE LESSON OBJECTIVE** without the pre-activity. It is an "extra." However, students will benefit from doing the pre-activity if teachers have time for it and the classroom is set up for it because it's fun, engaging, interdisciplinary, and a review of concepts.*

MINI-LESSON: The mini-lesson is designed to be taught by the teacher to the students in a whole-group setting. During the mini-lesson, the teacher presents the relevant vocabulary and math concepts. The teacher models how to solve math problems related to the lesson objective and how to solve problems that will be on the independent practice worksheets.

GUIDED PRACTICE: Immediately following the mini-lesson is a scripted guided practice section. In this section, students complete hands-on math activities related to the lesson, and the teacher offers support and assesses if students have mastered the lesson content or require more modeling and practice. The guided practice exercises are in both the teacher's and students' books.

EXIT TICKET: This is an optional part of the lesson that the teacher can use at the end of each lesson as a quick formative assessment to determine if students have mastered the lesson objective. The exit ticket consists of a single question that students can answer quickly. We recommend asking students to put their names on the exit ticket so the teacher can later review them and note which students require extra support or would benefit from one-on-one or small group review of the lessons' content without having to flip through dozens of workbooks to see how students completed independent math tasks.

Please note that the exit ticket can also be printed from the USB.

INTERVENTION: For students who require extra support to master the lesson objective, the intervention section lists ways that teachers and assistant teachers can support these students or review and reteach the lesson content.

EXTENSION: The extension section contains suggestions for extra challenges that teachers can assign to advanced students who master the lesson objective and complete the independent practice quickly.

MATH STATIONS: Just like the pre-activity section, the centers are OPTIONAL suggestions for teachers. Every teacher structures their classroom differently, and this curriculum aims to be flexible enough to meet the needs of all teachers and all classroom setups. For teachers who do use math stations (see the Guided Math section of the teacher intro below), this part of the lesson contains suggestions for learning centers related to the lesson objective. Occasionally, the stations require additional materials that can be printed from the USB.

UNIT INTRODUCTION – STUDENT WORKBOOK: Every unit in the student workbook is introduced with a story that connects the theme to the learning. The beginning of each unit also contains visuals related to the vocabulary and concepts taught in that unit.

INDEPENDENT PRACTICE: The independent practice portion of the lesson contains worksheets in the student workbook for students to complete.

The independent practice contains a mixture of math equations, word problems, cumulative review, and application of concepts.

The student workbook contains the following components:

📖 Vocabulary

VOCABULARY: The vocabulary for each lesson is included at the beginning of each lesson in the student workbook, along with relevant visuals.

🥜 Math in a Nutshell

MATH IN A NUTSHELL: For every lesson in the student workbook, there is a section containing the concepts, steps, and strategies taught in the lesson in a visual format. This allows students to review and learn concepts on their own and take agency over their own learning.

✏️ Let's Try It Together

LET'S TRY IT TOGETHER: This is where the guided practice activities are included in the student workbook. This section consists of exercises for students to complete with teacher support.

🔍 Check Your Skills

CHECK YOUR SKILLS: Check Your Skills questions require students to solve basic equations and problems where they demonstrate mastery of knowledge and concepts taught in the lesson.

🌎 Real-World Math

REAL-WORLD MATH: Most, but not all, lessons contain real-world math questions where students are required to solve word problems related to the math objective taught in the lesson.

Review & Remember

REVIEW & REMEMBER: Some lessons contain Review & Remember questions. Review & Remember questions are cumulative review problems that require students to apply concepts learned in previous lessons.

Bonus:

BONUS: Some lessons contain bonus questions. Bonus questions are "extra credit" problems where students need to apply the information they learned in the lesson in a way that hasn't been explicitly taught to them, using their mastery of math concepts and critical thinking skills. It should be noted that it is beneficial for students to challenge themselves, think critically about, and apply the math concepts they learned. **However, if students cannot solve the bonus questions, that is okay. They can still meet the lesson objective even if they cannot solve the bonus questions.**

Think Smarter

THINK SMARTER: Some lessons contain Think Smarter questions. Think Smarter questions are questions that are either open-ended and require students to come up with their own creative solutions or answers or that require students to write their answers in more than a sentence, describing how they solved a problem or explaining a certain math concept or principle. (*Note: The answers to these questions often vary, and there may be more than one correct answer.)

Guided Math

As mentioned above, this curriculum is designed to be flexible enough to be used in a wide variety of classroom structures and setups.

Many teachers nowadays are choosing to structure their classrooms according to research-based guided math routines. The benefit of guided math is that it balances whole group instruction (the mini-lesson) with small group work where the teacher can meet students at their ability level. A one-size-fits-all rarely works in a classroom environment that contains students of varying ability levels.

For teachers who want to structure their classroom according to this method, we recommend the following:

Begin with a mini-lesson that is whole group. Afterward, transition the students to math stations. In their stations, students explore and review math concepts through a variety of activities.

One of the activities that teachers will have access to on the USB is math journaling. Math journaling provides students with the opportunity to make connections, apply their knowledge, and reflect on what they have learned. The journaling resource consists of open-ended questions related to the theme or math objective for each lesson. There are two journaling questions for each lesson, so the teacher can choose which one to give to students. The teacher can print the journal questions, and students can glue them into a math journal and write/draw a response.

While the students are engaging in stations, teachers and assistants can pull groups of students and work with them in small groups. This gives teachers the opportunity to reteach concepts to students who are struggling with them and extend the learning for students who have mastered them. Students can also complete their independent practice worksheets as a station during this time.

There are many ways to structure the station transitions and math groupings. Each teacher can choose the system that works best for their classroom.

Suggestions for Memorizing Math Tables

At this grade level, there are a number of math concepts that need to be rote learned or memorized. For example, students need to learn the multiplication and division tables by memory. One of the most effective ways to commit something to memory is to drill and practice it over and over.

Classroom routines are a great way to incorporate these on a daily basis.

One option for incorporating math into daily routines is to use a math problem as a call-and-response. When students are working, and the teacher wants to get their attention, the teacher may say a phrase, and the students know that when they hear it, they respond with a specific phrase, stop working, and listen for instructions. The teacher can use multiplication and division equations as a call and response.

Other options include assigning homework where students have to practice and review the tables at home in order to memorize them. You can also add in other classroom activities like a Do Now or daily timed quiz where students quickly solve math equations.

A Note on Assessment

Assessments help teachers evaluate if students have mastered the material. There are many uses for assessments, including:

- Identifying the students' level and mastery of the material
- Identifying which students require additional review and support
- Adjusting the learning to meet the needs of the classroom
- Determining when a concept has been mastered by the majority of the class and the teacher can move on to the next concept
- Identifying where the breakdown in understanding is happening for a specific standard
- Creating homogenous groupings for small group work based on ability

There are two broad categories of assessments:

- Summative: These are the chapter and unit tests. They are administered at the end of a unit of study and are used to determine how much of the unit students have mastered and grade them.
- Formative: Formative assessments take place during the learning process itself. The exit ticket is a form of formative assessment that the teacher can use to determine groups and the need for review. The teacher can also use their observations of student work during the guided practice as a formative assessment.

Opportunities for Differentiation

Differentiation in the classroom is the recognition that not all students learn the same way or at the same pace and that teachers should endeavor to reach every learning style and level as much as possible.

There are a number of ways to differentiate. This curriculum encourages differentiating in the following ways:

- Allowing opportunities for small group and one-on-one instruction
- Providing suggestions for intervention and extension activities
- Encouraging manipulatives and visuals
- Creating many opportunities for formative assessment that can be used to identify student strengths, weaknesses, and needs
- Offering suggestions for open-ended centers and math activities
- Using worksheets that contain a variety of math problems, including ones that are more difficult and ones that are simpler

Using Manipulatives/Resources Strategically

The curriculum comes with a number of manipulatives, and the USB also contains resources and printables.

We recommend using these resources in the following ways:

- Each chapter comes with printable anchor charts related to vocabulary and concepts in the lessons. We recommend that teachers hang these charts in the classroom to provide students with a visual of the material learned. This will help reinforce the material, and students can also use them as a reference.
- The curriculum comes with printables and other manipulatives that can be used to make math kits for students. These kits can be used during the guided practice section of the lesson, but students should also be encouraged to use the manipulatives in the kits to solve problems during independent practice and centers. The goal is to empower students to solve math problems autonomously, finding the resources they need to apply math strategies and using them.
- Flashcards that can be printed from the USB resources can and should be used to review and reinforce material as well as to drill math tables.
- Math journaling prompts can be printed out and placed into a math journal for students to respond to during their math centers or as an extension activity.

USB Materials and Additional Resources

UNIT AT A GLANCE:

UNIT OBJECTIVES:

By the end of this unit, students should be able to:

- Measure, describe, and estimate the length, width, height, volume, and mass of objects
- Measure, visualize, and estimate using liters, milliliters, cups, gallons, quarters, grams, kilograms, pounds, ounces, inches, feet, half inches, and quarter inches
- Select the best unit of measurement from a list to measure a particular quality and amount
- Decompose numbers into hundreds, tens, and ones, and add each place separately with and without regrouping
- Set up and solve vertical addition and subtraction equations (standard algorithm) with and without regrouping
- Explain how the standard algorithm works using knowledge of what addition and subtraction are and how place value works
- Add two, three, and four addends within 1,000 using the standard algorithm (vertical addition)
- Subtract within 1,000 using the standard algorithm (vertical subtraction)
- List the properties of addition and explain why they work
- Use models to solve equations
- Solve multistep word problems related to mass, length, and volume
- Represent an unknown in a subtraction or addition equation with a letter and solve to find the value of that letter
- List patterns in the addition and subtraction tables and use these patterns to predict the characteristics of sums and differences
- Round numbers to the nearest ten and hundred and use rounding to check and estimate answers
- Measure and write half and quarter inch units as fractions and mixed numbers
- Plot length on a line plot

STANDARDS:

By the end of Unit 1, students will have been introduced to the following common core standards:

- **3.MD.A.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.
- **3.MD.B.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.
- **3.NBT.A.1** Use place value understanding to round whole numbers to the nearest 10 or 100.
- **3.NBT.A.2** Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- **3.OA.D.8** Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.
- **3.OA.D.9** Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Themes: Students will learn about measuring, graphing, and estimating volume, mass, and length while learning about lab safety, the scientific method, energy, and balance.

KEY VOCABULARY:

addend: a number that is added to another number

associative property of addition: when you add three or more numbers, you can group them differently, and the sum will remain the same

commutative property of addition: when you add numbers, you can change the order in which you add, and the sum will remain the same

compare: to look at two numbers and see which one is more or less or if they are the same

cup: a unit of measurement that is smaller than a quart

data: a set of information

decompose: take a number and break it into two smaller parts

difference: result after subtracting one number from another number

even numbers: numbers that can be paired evenly without leftovers; these numbers end in 0, 2, 4, 6, or 8

estimate: make a sensible guess that is as close as possible to the actual number

foot (ft or '): a unit used to measure length; one foot equals 12 inches

fourth: one part of something that is split into four equal parts

gallon: a unit of measurement that can hold a large amount of liquid

gram (g): metric unit of measurement used to measure very light objects

graph: a way to organize and show data in a way that it can be easily seen and read

half: one part of something that is split into two equal parts

hundreds place: the number that shows how many hundreds there are in a number

identity property of addition: when you add zero to any addend, the sum will be the same as the addend

inch (in or "): a unit used to measure length; there are 12 inches in a foot

kilogram (kg): a metric unit of measurement used to measure heavier objects

line graph: shows data or information using dots or symbols above a number

liter: a metric standard unit used to measure volume

mass: the amount of substance that makes up an object or how heavy it is

measurement scale: the set of lines, numbers, and units on a given tool that helps you measure

milliliter: a metric unit used to measure small volumes

odd numbers: numbers that cannot be paired evenly and result in a leftover; these numbers end in 1, 3, 5, 7, or 9

ounces (oz): a unit of measurement used to measure light objects

pattern: a sequence of shapes, numbers, or pictures that follows a specific rule

place value: the place where the digit is located in the numeral tells the value of the digit

plot: find an exact point where to put a mark on the graph to show something

pound (lb): a unit of measurement used to measure heavier objects

rounding: making a number easier to use by finding the nearest "easy" number that is close to its value but not exact

quart: a unit of measurement that is smaller than a gallon and bigger than a cup

quarter: another word for fourth; one part of something that is split into four equal parts

regrouping: rearranging numbers when adding or subtracting by moving a value from one place value to another (sometimes called "carrying" in addition or "borrowing" in subtraction)

standard unit: a unit of measurement whose size is agreed upon

sum: result of adding two or more numbers together

tens place: the number that shows how many tens there are in a number

unit: a standard way of measuring things like pounds, ounces, grams, or kilograms

unknown: the missing number being solved for

volume: the amount of space that something, especially a liquid, takes up

x-axis: a horizontal line that has points along it with different numbers

LESSON BREAKDOWN:

Chapter 1: Volume

- Lesson 1: Units of Volume
  - Defining the word volume and describing how to measure it using standard units
  - Measuring volume using liters, milliliters, cups, quarts, and gallons
  - Describing and contrasting the relative size of different units of measurement (students do not need to convert between units at this point)
  - Selecting the best unit to measure a particular amount of volume from a list of measurement units

  - Writing volume amounts using the measurement units liter, milliliter, cup, quart, and gallon and the abbreviations for each unit

- Lesson 2: Adding and Subtracting with Place Value
  - Decomposing numbers into hundreds, tens, and ones in order to add the numbers
  - Adding and subtracting the ones, tens, and hundreds places without regrouping
  - Setting up a vertical addition and vertical subtraction equation (standard algorithm) equation
  - Recognizing that the standard algorithm for adding (vertical addition) works because we are adding each place in the addends separately and that the standard algorithm works for subtraction (vertical subtraction) because we are subtracting each place separately

- Lesson 3: Adding and Subtracting with Regrouping
  - Demonstrating understanding that each place in a number is 10x the place before it
  - Regrouping groups of ones into tens and ones and groups of tens into hundreds and tens
  - Solving addition and subtraction equations using the standard algorithm (vertical equations) with regrouping
  - Adding three and four-volume measurements using the standard algorithm

- Lesson 4: Properties of Addition
  - Explaining why the commutative, associative, and identity properties of addition work
  - Applying the properties as strategies to add and subtract volumes
  - Decomposing numbers to use compensation and equivalent sums as a strategy to solve equations

- Lesson 5: Modeling with Volume
  - Using models and drawing with scale to solve addition and subtraction equations
  - Using scaling in picture models and finding amounts in between tick marks

- Lesson 6: Word Problems with Volume
  - Writing equations based on word problems
  - Solving one and two-step word problems that involve addition, subtraction, and volume

Chapter 2: Mass

- Lesson 1: Units of Mass
  - Defining the words mass and weight and describing how to measure them using standard units
  - Measuring mass using grams, kilograms, pounds, and ounces
  - Describing and contrasting the relative size of different units of measurement (students do not need to convert between units at this point)
  - Selecting the best unit to measure a particular weight from a list of measurement units
  - Writing mass amounts using the measurement units grams, kilograms, pounds, and ounces and the abbreviations for each unit

- Lesson 2: Solving for an Unknown
  - Writing an equation with an unknown based on a word problem
  - Representing an unknown with a letter
  - Rewriting equations using the relationship between addition and subtraction
  - Solving to find the value of an unknown in addition, subtraction, or multistep equations related to mass

- Lesson 3: Word Problems with Mass
  - Writing equations based on word problems
  - Representing an unknown with a letter
  - Solving one and two-step word problems with unknowns that involve addition, subtraction, and volume

- Lesson 4: Math Patterns
  - Listing math patterns in addition and subtraction tables and explaining why these patterns work
  - Describing sums and differences as even or odd and predicting whether a sum or difference will be even or odd

Chapter 3: Estimating and Rounding

- Lesson 1: Estimating
  - Identifying the difference between estimating and making random guesses
  - Formulating realistic estimates of mass and volume
  - Determining if an estimate is realistic or not

- Lesson 2: Rounding to the Nearest 10
  - Finding the digit in the ones place in a number and determining which tens it is in between
  - Determining whether to round up or round down
  - Rounding numbers to the nearest ten
- Lesson 3: Rounding to the Nearest 100
  - Finding the digit in the tens place in a number and determining which hundreds it is in between
  - Determining whether to round up or round down
  - Rounding numbers to the nearest hundred
- Lesson 4: Using Rounding
  - Using rounding to estimate sums and differences
  - Using rounding to determine if the answer to a math equation is sensible or not

Chapter 4: Length

- Lesson 1: Inches and Feet
  - Defining the word length and describing how to measure it using standard units
  - Measuring length using inches and feet
  - Describing and contrasting the relative size of different units of measurement (students do not need to convert between units at this point)
  - Selecting the best unit to measure a particular length from a list of measurement units
  - Writing length amounts using the measurement inches and feet and the abbreviations for each unit
- Lesson 2: Half and Quarter Inches
  - Measuring half and quarter inches
  - Writing half and quarter-inch measurements as fractions or mixed numbers
- Lesson 3: Line Plots
  - Drawing line plots
  - Plotting measurement data on a line plot
  - Reading line plots

MATH KIT MATERIALS:

It's recommended for students to have access to the following manipulatives and materials to assist them in solving Unit 1 math problems.

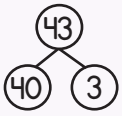
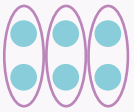
- Ruler with inches, half, and quarter inches
- Volume and Mass Measurement cards
- Vertical Addition and Subtraction Templates (laminated or in a dry-erase sleeve)
- Blank Number Lines (laminated or in a dry-erase sleeve)
- Set of Base 10 Blocks
- Blank Line graph (laminated or in a dry-erase sleeve)
- Whiteboards
- Dry-Erase Markers

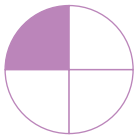
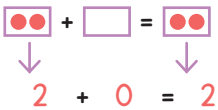
Measurement: Let's Get Started!

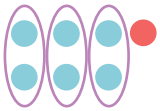
Have you ever wondered how much water fills your bottle or how heavy your backpack is? In this unit, you'll learn all about measuring. You'll learn to measure liquids using liters, cups, and gallons. You'll also find out how much things weigh using grams, kilograms, and pounds. You'll estimate and round numbers to make smart guesses and measure lengths in feet, inches, half-inches, and quarter-inches. You'll also learn how to add and subtract measurements in different ways. Let's get started!

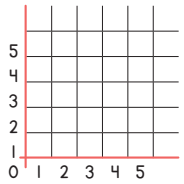
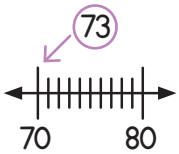
Words to Know

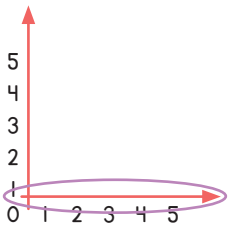
Words / Picture	What It Means
addend 1 + 1 = 2	a number that is added to another number
associative property of addition (5 + 3) + 2 = 10	when you add three or more numbers, you can group them differently, and the sum will remain the same
commutative property of addition 5 + 3 = 3 + 5 8 8	when you add numbers, you can change the order in which you add, and the sum will remain the same
compare 	to look at two numbers and see which one is more or less or if they are the same
cup 	a unit of measurement that is smaller than a quart

Words / Picture	What It Means
data 	a set of information bar
decompose 	take a number and break it into two smaller parts
difference 4 - 3 = 1	result after subtracting one number from another number
even numbers 	numbers that can be paired evenly without leftovers; these numbers end in 0, 2, 4, 6, or 8
estimate 	make a sensible guess that is as close as possible to the actual number
foot (ft or ')	a unit used to measure length; one foot equals 12 inches

Words / Picture	What It Means
fourth 	one part of something that is split into four equal parts
gallon 	a unit of measurement that can hold a large amount of liquid
gram (g) 	a metric unit of measurement used to measure very light objects
graph 	a way to organize and show data in a way that it can be easily seen and read
half 	one part of something that is split into two equal parts
hundreds place 264	the number that shows how many hundreds there are in a number
identity property of addition 	when you add zero to any addend, the sum will be the same as the addend
inch (in or ") 	a unit used to measure length; there are 12 inches in a foot

Words / Picture	What It Means
kilogram (kg) 	a metric unit of measurement used to measure heavier objects
line plot 	shows data or information using dots or symbols above a number
liter 	a metric standard unit used to measure volume
mass 	the amount of substance that makes up an object or how heavy it is
measurement scale 	the set of lines, numbers, and units on a given tool that helps you measure
milliliter 	a metric unit used to measure small volumes
odd numbers 	numbers that cannot be paired evenly and result in a leftover; these numbers end in 1, 3, 5, 7, or 9
ounces (oz) 	a unit of measurement used to measure light objects
pattern 	a sequence of shapes, numbers, or pictures that follows a specific rule

Words / Picture	What It Means
place value HUNDREDS TENS ONES 5 3 4	the place where the digit is located in the numeral tells the value of the digit
plot  	find an exact point where to put a mark on the graph to show something
pound (lb) 	a unit of measurement used to measure heavier objects
rounding  	making a number easier to use by finding the nearest "easy" number that is close to its value but not exact
quart (qt) 	a unit of measurement that is smaller than a gallon and bigger than a cup
quarter 	another word for fourth; one part of something that is split into four equal parts
regrouping 1 + 614 299 913 5 10 1 - 6 ~~1~~ 4 299 315	rearranging numbers when adding or subtracting by moving a value from one place value to another (sometimes called "carrying" in addition or "borrowing" in subtraction)

Words / Picture	What It Means
standard unit 	a unit of measurement whose size is agreed upon
sum 1 + 1 = 2	result of adding two or more numbers together
tens place 24	the number that shows how many tens there are in a number
unit 	a standard way of measuring things like pounds, ounces, grams, or kilograms
unknown 	the missing number being solved for
volume 	the amount of space that something, especially a liquid, takes up
x-axis  	a horizontal line that has points along it with different numbers

Fun Measurement Activities!

- **Liquid Lab:** Use cups, bottles, and measuring spoons to explore how many milliliters or cups fill a container. Try guessing first, then measure to check!
- **Weight Guess & Check:** Pick different classroom objects and guess their weight in grams or pounds. Then, use a scale to check how close you were.
- **Estimate & Measure Hunt:** Walk around the room or your home estimating lengths, weights, or volumes of objects. Then, use rulers, scales, or measuring cups to measure and compare.
- **Line Plot Mystery:** Measure something many times (like how far a toy car rolls or the length of pencils) and make a line plot to show the data.
- **Water Transfer Challenge:** Use containers of different shapes and sizes to move water from one to another without spilling. Practice measuring in milliliters and liters.
- **Rounding Relay:** Play a game where you round numbers to the nearest 10 or 100 quickly to win points for your team.

A Measurement Story:

TK

The End

UNITS OF VOLUME

LESSON OBJECTIVE:

Students will demonstrate a visual understanding of measurement in liters, as well as other common measurement units (milliliters, cups, gallons, and quarts), and correctly measure liquids using those units.

Note: *Students don't need to convert between units yet.*

STANDARD:

3.MD.A.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.

NEW VOCABULARY:

cup: a unit of measurement that is smaller than a quart

gallon: a unit of measurement that can hold a large amount of liquid

quart: a unit of measurement that is smaller than a gallon and bigger than a cup

standard unit: a unit of measurement whose size is agreed upon

volume: the amount of space that something, especially a liquid, takes up

PREPARATION:

Bring in a large empty milk carton or other container that holds one liter, a medicine dropper (ideally, one with milliliter measurements on it), a measuring cup with liters and milliliters (if you don't have one, you can print the measuring cup image from the USB), and a medicine cup measurer with milliliters (if you don't have one, you can print the image from the USB).

You will also need an empty gallon-size milk carton, an empty quart-size milk or juice carton, a one-cup measuring cup, a teaspoon, an empty water bottle, and water. If you don't have these, you can print the images from the USB as well.

On your chart paper, draw a cup (label it "cup"), a quart of juice (label it "quart"), a gallon of milk (label it "gallon"), and a big empty container.

Note: *According to the grade-level standards, students need to be familiar with the idea of volume and how to measure it in liters, including understanding how much a liter is and estimating liter amounts. We've chosen to include milliliters in this curriculum because it allows for the potential of real-world problems involving volume that students can visualize. Students can more easily visualize, estimate, and work with amounts that require adding 500 ml (about the size of a standard water bottle) than adding 500 liters (about two bathtubs filled with water).*

Since this curriculum is intended for students living in America, it also teaches imperial units (cups, ounces, etc.).

Please note that students DO NOT need to convert between units at this grade level.

PRE-ACTIVITY: (OPTIONAL)

Note: *This textbook is set up to allow students to explore hands-on and age-appropriate thematic units that are integrated into the math curriculum (where time permits). The thematic unit is integrated both into the lessons themselves where appropriate and through optional pre-activities that allow students to explore relevant concepts that include the math standards along with science (or other subjects at times).*

We understand that many classrooms may not have time to complete these pre-activities. Therefore, this section is OPTIONAL and is not needed for students to understand and learn the math objectives of each lesson. Additionally, each pre-activity is designed to be standalone so teachers can do as many or as few as they want with their students.

Preparation and Materials for Pre-activity:

Students will be exploring thematic units that are integrated into a math curriculum and, at times, will involve scientific experimentation (where time permits). Therefore, it is advisable for the teacher to preview some lab safety guidelines. A teacher cannot envision every possible scenario that could happen during science experiments, but you can establish lab safety guidelines for the classroom that prevent accidents, promote learning, and guarantee that teachers and students enjoy discovering the curious and mysterious world of math and science.

The first group of pre-activities is designed to help students realize the need for safety rules and their benefits. By following safety rules, they will avoid accidents and have a chance to do fun activities. The process of reinforcing safety rules should be ongoing throughout the year. Students can create safety posters and hang them up around the classroom.

In this first activity, students will observe an interesting teacher demonstration and develop a set of safety rules. Here's the list of materials and preparations you'll need for your first teacher demo:

Lab Safety Rules (print out this poster)

My Lab Safety Protocol page

Guided Pre-Activity Worksheet (optional, time permitting)

Reflection Questions (optional, time permitting)

Materials and Preparations

7 plastic cups (clear plastic so students can observe the changes)

Food coloring: red, yellow, blue

Paper towels: Use six paper towels to make six strips. Fold each paper towel in half on the long side to make a long strip. Press it down tightly, and then fold it in half again. Press it down firmly. Then, fold it in half lengthwise (in the opposite direction) to make it a short strip. Press down nice and tight. Cut a little off the end. You will be putting these strips into each cup, and the end of each strip needs to reach the bottom of each cup. (Note: Only every other cup is filled with water.) Save more paper towels to clean up possible small spills.

Measuring cup marked with liters and milliliters (preferably glass): You will need to fill **every other cup** with about 120 milliliters of water. Mix food coloring into four of the cups, e.g., red, yellow, blue, red.

The Experiment: Add paper towel strips to each cup, going from one cup to the next. There will be one strip in the first cup, two in the second through six cups, and one in the seventh cup. Three cups will not have any water.

Capillary action will cause the water in the cups to move through the paper towels, eventually bringing water into all the cups until all the cups have an equal volume. The strips of paper towels will have the colors of the traveling waters on them. Some strips will become a mixture of two colors.

Procedure:

Tell students that we will be integrating math with the "real world" this year by doing experiments and learning about all sorts of things as they relate to math. The first experiment is a Travel Waters Experiment that will allow students to explore measurements through a cool scientific demonstration.

Set up the cups of water as shown in the preparation section.

Tell students that you will be pouring water from a one-liter bottle into different cups. The water will travel even into the empty cups on its own. Students can use a thumbs up or thumbs down to show if they think the experiment will succeed.

Before setting up the experiment, discuss safety rules with the students. Explain that loud disruptions will make it difficult to observe the science and that spilled water can be hazardous. Encourage students to pay attention to how the experiment is carried out because the class will use this demonstration to brainstorm safety rules in a future lesson.

Call up four students. These students will, under your guidance, measure and pour 120 milliliters of water into the first, third, fifth, and seventh cups, respectively. If there is no 120-milliliter line on the measuring cup, students can recognize that 120 falls between 100 and 150 and measure an amount that is about halfway between those measures.

Explain that a milliliter is a measurement of volume that tells us how much of a liquid there is. A milliliter is a metric measurement. Even though there are many different ways to measure volume, most scientists use the metric standard because it allows all scientists to measure the same way. A milliliter is one-thousandth of a liter. A small spoon holds about five milliliters.

Students measure and pour the water into their designated cups. Then, tell students we need to check for spills and clear the area right away to keep the classroom clean, safe, and dry. Explain that "Clean as you go" is an important science safety rule.

Add red food coloring into cup #1, yellow into cup #3, blue into cup #5, and red into cup #7. Explain that this is so we can keep track of which cup of water is "traveling." Then, check for spills again and clean up again if needed.

Explain to students that the water will be able to travel on its own because water has a property called capillary action. That means it gets pulled up through very narrow spaces. Paper towels are spongy and filled with narrow spaces, and the water will travel up them on its own.

Call up students to put a paper towel strip on each side of a cup, going from one cup to the next. Note that the cups should be close enough to each other so the paper towel strip folds over one cup, touches the bottom, and then folds into the second cup next to it, touching the bottom of that cup as well.

Tell students that now we will observe what happens. To observe means a lot more than just to look. Observe means to watch carefully, keeping an eye on what's going on. We don't have to watch it every second, but we do want to observe the cups frequently and watch for changes. Some experiments take a long time, and this is one of them. Since it takes a long time for the waters to "travel," we can continue to work on safety rules and protocol while we wait.

Note: It usually takes up to a half hour before the water "travels" to a new cup, so you can continue with classroom work in the meantime. By the end, most cups will have about an equal volume of water. The paper towers will be fully dyed to the color in the glass. The towels between the two glasses will mix colors, so green and orange will show up on some of the strips. If you want to dry the strips after the experiment for further discussion later, at the end of the experiment, take them out and put them on a paper towel.

Students brainstorm safety rules. Hand out the **Lab Safety Protocol** page and have students fill it out. You can assign this as individual work, fill it out as a class, or, if you are short on time, assign it for homework. You can compile a master list of rules from the brainstorming or **Lab Safety Protocol** pages when they are finished and use it to create a rules poster to hang in the classroom.

LESSON:

HOOK:

Ask, "Have you ever shopped for milk or water? If so, you've probably seen that milk and water can come in different-sized and shaped containers. We use the word volume to describe how much space something, especially a liquid, takes up. So, a bigger milk container would have a greater volume than a smaller container because it can hold more. Today, we will learn standard units that are used to measure volume. A standard unit means something that people use, and everyone agrees on how big it is. For example, if I asked you for a handful of water, you might all bring me different amounts of water because everyone's hands are a diffent size. These units that we are learning about, liters and milliliters, cups, quarts, and gallons, mean the same to everyone. So, everyone in this class will measure a liter and milliliter the same way."

MINI-LESSON:

Say, "Before we start anything that we use liquids to experiment with, what do we need to do to stay safe and keep the classroom environment a safe space for learning?"

Let students answer.

Say, "Since we are just working with water, I will put my material on the table in the big plastic container so everything stays in one spot and doesn't make a mess. Here is a fun fact: 1,000 milliliters equals one liter. Let's first compare objects to see what is measured in liters and what is measured in milliliters."

Show students the measuring cup or the picture of a cup that shows liters and milliliters.

Explain, "If I filled this cup up to the one-liter line, I would have one liter of water. If I filled the cup (or eye dropper) up to the one-milliliter line, I would have one milliliter of water. A liter measures a larger amount of liquid, and a milliliter measures a smaller amount of liquid."

Hold up the milk carton and the eye dropper.

Continue, "Since we said that liters measure a larger amount of liquid, and milliliters measure a smaller amount, which of these two containers do you think we would measure with liters, and which do you think we would use milliliters for?"

Students should answer that it makes more sense to measure liquid that fills up a milk carton in liters and liquid that fills up an eye dropper with milliliters.

Hold up the chart showing gallons, quarts, and cups.

Say, "Liters and milliliters are common units of measurement used all around the world. They are also used to measure materials in science experiments. In the United States, you might hear different measurement units used. Here is an example of three units of measurement that are often used for volume in the United States. We have a cup, which is the smaller measurement of the three but is bigger than measuring in milliliters and smaller than a liter. The next size up is called a quart. This size is bigger than a cup but still smaller than a liter. Finally, we have something called a gallon, which is bigger than a liter and all the other measurements."

Let students examine the different images or containers showing units of measurement so they begin to understand how much volume each unit of measurement represents.

Show the one-liter milk cartoon.

Say, "If I filled this milk carton to the top, it would hold one liter. If I filled up two milk cartons, how many liters would we have?"

Students should answer two liters.

Fill up the measuring cup or color in the picture up to the liter mark. Ask students to identify how much "liquid" is in the cup. Repeat for the milliliter cup to show one milliliter. Explain that if you pour water from a different cup into the measuring cup, you can use the measuring cup to see how many liters or milliliters of water you have. Also, if you take the liquid in the cup and pour it into a different cup, you will still have the same amount. The liter looked different in the milk container and the measuring cup, but it was the same amount. If you have both containers, you can pour the water back and forth to demonstrate that the quantity doesn't change when pouring from container to container.

Say, "Now, I'm going to show you how to measure the volume of a liquid and write the measurement."

Draw a four-liter measuring cup and color it to the two-liter line.

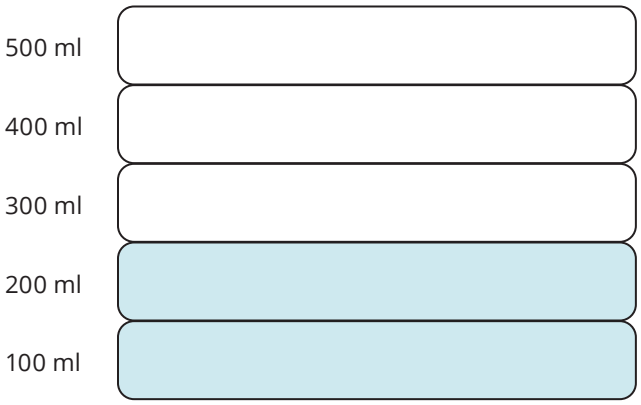
Say, "This container is filled to the two-liter line. If I wanted to write that down, I could write the measurement as 2 liters or 2L."

Write 2 liters or 2L on the board.

Say, "Both "liters" and "L" refer to the measurement liter. "L" is just a shorter way of writing it, but you can write it either way. If I'm writing it in shorthand, the "L" is capitalized. Let's do another example."

Say, "Now, I'm going to show you an example of measuring volume using milliliters."

Draw a 500-milliliter container and fill it to the 200-milliliter mark.



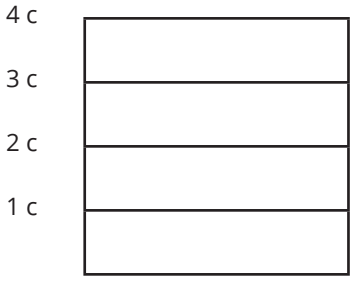
Say, "When you look at this container, what do you notice about the unit of measurement?"

Guide students to see that this time, the unit of measurement is milliliters.

Say, "The unit of measurement here is milliliters. I see that the liquid is filled to the 200-milliliter mark. I can show that by writing 200 ml like the container shows. But I can also write it as 200 milliliters. ml is a shorter and faster way of writing the unit milliliter. Notice that the m and l are both lowercase. But, ml and milliliter both refer to the same unit of measurement, milliliters."

Say, "Let's practice drawing and labeling measurements with cups, quarts, and gallons. Let's start with cups."

Draw a container showing four cups.



Say, "This container shows four cups. I know that because the container is marked with numbers till four, and next to each number, the abbreviation for cups, "c," is written. Suppose I wanted to fill this with two cups of water. I would color until the two-cup line to show that."

Color to the two-cup line.

Say, "Now, this container shows two cups. I can write that as 2 cups or 2 c, which is the abbreviation for cups."

Write that below the drawing.

Say, "Now, let's do an example for quarts. A quart is bigger than a cup but less than a gallon. Let's draw a six-quart container."

Draw a container and model your thinking out loud, explaining how to label the container with the correct measurements. Label it with the abbreviation qt.

Say, "Here is a six-quart container. I know that because next to each measurement, the abbreviation for quarts, which is qt, is written. The top number on the container is six, so I know that the most this container can hold is six quarts. Now, what if I want to fill it so that the liquid inside is four quarts? I'm going to color to the four-quart line."

Color in four quarts. Write 4 quarts.

Say, "Below the container, I wrote 4 quarts. I could have also written 4 qts, and that would show the same thing. That's because qts is the abbreviation for quarts."

Draw a two-gallon container. Label it with the abbreviation gal. Fill it to the 1.5-gallon mark. Write 1.5 gallons below it.

Say, "This container shows that it is filled with one and a half gallons of liquid. The container itself is labeled with the abbreviation for gallons, which is gal. But, when I wrote my measurement of one and a half gallons, I used the regular unit, gallons. Again, gal and gallons refer to the same thing, and we can use either one when writing the unit."

Say, "One really important thing to keep in mind is that we always need to write the unit we are measuring with. That's because one cup and one gallon are really different. And, if we don't write the unit, we won't know how much we actually have."

Say, "Let's do one more example. This time, I'm going to practice filling up a container to a given measurement."

Draw a container that shows a capacity of 100 ml, marked every 10 ml. Explain your thinking out loud, talking through each step of how you first mark the top with 100 ml. Then, mark the rest of the measurements in increments.

Say, "Suppose I wanted to fill this container with 25 milliliters of water. How would I do that? Well, I see that it's marked every 10 milliliters. I need to get to 25. I'm going to count 10, 20…" But I don't see 25. The container goes from 20 to 30. Well, I know that 25 is between 20 and 30, so I'm going to color in from the bottom of the container till halfway between 20 and 30 to show 25 ml."

Color in 25 milliliters.

Say, "Let's continue practicing examples of measuring volume together."

GUIDED PRACTICE:

Students open their workbooks to page 7.

Say, "Now that we know more or less what a liter and milliliter look like, we are going to do some math with liters and milliliters."

Read the first problem out loud. Ask students that if each water bottle holds one liter of water, how much water do all the water bottles together hold? Guide students to add up the total amount of liters and then draw a container that could hold six liters. Remind students that they need to write 6 liters or 6L, not just 6.

Read the next question and prompt students to count by five to find how many milliliters in all.

Guide students to look at the baby bottle that has measurement lines on it. Students guess if the lines show milliliters or liters, and then they draw to fill up the bottle with 230 milliliters. Remind students that even though the bottle does not have a marking for 230 milliliters, you can find what numbers 230 falls in between and use those as a guide.

Say, "Now, let's try some questions that use cups, quarts, and gallons. Look at the next question. We need to decide if we will need to use cups, quarts, or gallons. The first question says: You are making a cake, and it calls for 2 cups of milk. Which would you use? Circle the answer. Which picture shows a measurement tool that can be used to measure a cup and would be the perfect measurement for a cake?"

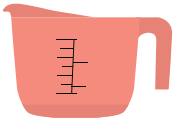
Continue, "The second question asks: Your mom sends you to the store to get a quart of juice. What are you buying? Circle the correct answer. Which of the three pictures shows a quart, which is bigger than a cup and smaller than a gallon?"

Continue, "Let's look at the last question. You and your siblings all want cereal for breakfast. You take out a gallon of milk so that you all get a nice amount of milk in your bowls. Which one are you using? Circle the gallon."

EXIT TICKET: (OPTIONAL)

You can choose to have students fill out the following exit ticket before starting the independent practice found on the following pages of their workbooks.

Name: _____



Draw a 5-liter container. Show the container filled to the 2-liter mark.

1. Order the following measurements from least to greatest: 1 gallon, 1 quart, 1 cup

WORKSTATION IDEAS: (OPTIONAL)

- Provide students with an empty water bottle or milk carton, a teaspoon, a medicine dropper, and a plastic pitcher. Have students find an object that measures liters and fill it up with water. Do the same with milliliters. Students can also carefully pour the water back and forth into different containers to experiment with how different amounts look in different containers.
- Print pictures of things that hold cups, quarts, and gallons. Have students sort all the measurement tools used to measure cups, quarts, and gallons.
- Provide students with different scenarios and ask which tool of measurement they would need. For example, Dovid wanted to buy milk, but he didn't want to buy a big bottle since he will be going away for vacation. But he also didn't want to use a small measurement because he needed the milk for a few days. Which unit of measurement would be best for him to buy?
- Cut out pictures of items that are used to measure different units of volume. Have students sort the measurement objects by the units they measure.
- If students completed the optional pre-activity, they can fill out the Reflection sheet and create an experiment safety poster.

INTERVENTION:

Provide items that measure liters (big water bottle, carton of milk, etc.) and milliliters (medicine dropper, teaspoon, small cup, etc.) and a container to contain the spills. Have students fill up a container that holds a liter and a milliliter. Have students try to pour the item holding a liter into the milliliter container. (It will spill.) Then, you can say, "Liters can hold a lot more liquid. When you tried to pour the liters into the object that measures milliliters, it spilled all over because there was no room to hold it. "Now, have them spill out some of the water in what they used to measure a liter. Say, "Now, try to pour the milliliter into the liter container. What happens?" Students will say that it can fit in the liter bottle. Explain, "The reason you had room to pour the milliliters into the liters is because the liter bottle can hold a lot more liquid and had space for the milliliters. Therefore, we know that anything that can hold a small amount is milliliters, and anything that can hold a bigger amount is liters."

Display an empty cup, a quart of juice or milk, and a gallon of water. Have students fill the cup and time them. Then, have students pour the water into the quart until it is filled and time them. Do the same with the gallon. Say, "It took us ____ seconds to fill the cup because it can't hold a lot of water. It took us ____ seconds to fill the quart because it can hold more water than the cup. Finally, it took us ____ seconds to fill up the gallon because this can hold a lot of liquid. Let's write different scenarios where we would only need a small amount of liquid, a medium amount of liquid, and a lot of liquid." Write and draw each measurement tool and when it would be used.

EXTENSION:

Students can be challenged to try to convert milliliters to liters. For example, you can give a student a measuring cup and have them pour amounts of water into the liter bottle in units of milliliters to see how much is needed to get a liter (for example, adding 250 milliliters of water to the bottle four times and then adding to find out how many milliliters they used in all).

Vocabulary

- gallon: a unit of measurement that can hold a large amount of liquid
- cup: a unit of measurement that is smaller than a quart one cup measuring cup
- liter: a standard unit used to measure volume
- milliliter: a small standard unit used to measure volume
- quart: a unit of measurement that is smaller than a gallon and bigger than a cup
- standard unit: a unit of measurement whose size is agreed upon
- → volume: the amount of space that something, especially a liquid, takes up

Math in a Nutshell

Liters and Milliliters

Liters and millimeters are standard units for measuring volume.

liters	milliliters
L	ml
A way to measure a large amount of liquid	A way to measure a small amount of liquid

Cups, Quarts, and Gallons

Cups, quarts, and gallons are standard units for measuring volume.

cup	quart	gallon
C	qt	gal
A unit of measurement that is smaller than a quart	A unit of measurement that is smaller than a gallon and bigger than a cup	A unit of measurement that can hold a large amount of liquid

Let's Try It Together

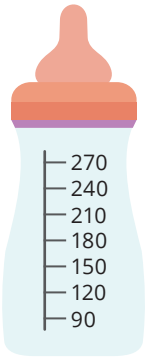
a Each bottle holds one liter of water. Count how many liters there are in all. Don't forget to write the unit. Then, draw a container that could hold the total amount of liters.

6 liters

b Each teaspoon holds 5 milliliters of liquid. Count how many milliliters there are in all. Don't forget to write the unit. Then, draw a container that could hold the total amount of milliliters.

10 ml

c Look at the unit markings on the baby bottle. Do you think they show liters or milliliters? Explain.



Sample Answer: I think they show milliliters because 270 liters would be much larger than a baby bottle.

d Color the baby bottle to "fill" it with 220 milliliters of water.

e You are making a cake, and the recipe calls for 2 cups of milk. What woul you use to measure? Circle the answer.

Check Your Skills

1 Directions: Sort the following list of items by what you would best use to measure the volume.

Cup of tea	Bathtub	Bowl of soup	Fish tank	Perfume
Swimming pool	Pond	Medicine	Juice box	

Measure in Milliliters (mL)	Measure in Liters (L)
Cup of tea Medicine Bowl of soup Juice box	Bathtub Fish tank Swimming pool Pond

2 a Draw an 800 ml container. Show the container filled to the 650-ml mark.

b Draw a container of any size and label it with measurements. Then, fill it to any level you choose. Write the volume of the filled part below your drawing.

Answers will vary

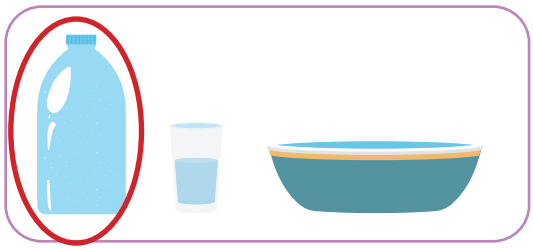
3 Directions: Circle the objects that are more likely to be used to measure milliliters in red and the objects used to measure liters in blue.

4 Bonus: If one liter is equal to 1,000 milliliters, how many milliliters would two liters equal?

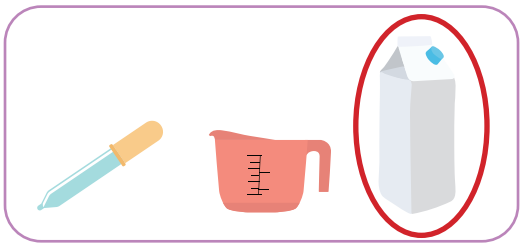
Answer: 2,000 ml

Check Your Skills

5 a If you were going on a trip and wanted to take a gallon of water, which would you take? Circle the correct answer.



b At the store, you spot a quart of juice to bring home for dinner. Which picture is most likely to show a quart? Circle the correct answer.



Think Smarter

6 Circle how much you estimate (guess) that each container holds.

Soup pot	Refrigerator	Soup spoon
		
Less than 1 Liter / About 1 Liter / More than 1 Liter	Less than 1 Liter / About 1 Liter / More than 1 Liter	Less than 1 Liter / About 1 Liter / More than 1 Liter

7 a Describe a situation where you would measure with cups.

Answers will vary.

b Describe a situation where you would measure with quarts.

Answers will vary.

c Describe a situation where you would measure with gallons.

Answers will vary.

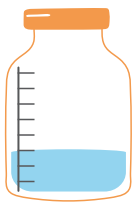
Real-World Math

8 Chava's mom must give her medicine. The medicine must be given in milliliters. What could Chava's mom use to measure the medicine that Chava needs? Draw a picture in the box.

Answers will vary.

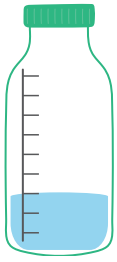
9 Bonus

a This jar holds 8 quarts of liquid when full. Make a guess as to how much liquid is in the container now.



3 qts

b The line shows 3 cups of liquid. Make a guess as to how much liquid the bottle holds when full.



9 cups

c This bin holds 40 gallons of liquid when full. Make a guess as to how much liquid is in the container now.

10 gallons