Gateway Regional School District

Atlas

Unit Plan

3.6 Measuring Length, Time, Volume, and Weight

Chester / Littleville Elementary / Grade 3 / Mathematics

Week 25 - Week 27 | 4 Curriculum Developers | Last Updated: Mar 19, 2024 by LeBlanc, Deanna

Style Guide

What is the purpose of the unit? What are the major take-aways?

Standards

MA: Mathematics (2017)
MA: Grade 3
Operations & Algebraic Thinking

3.OA Represent and solve problems involving multiplication and division.

- [x] 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. Show Details

3.OA Multiply and divide within 100.

- [x] 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two single-digit numbers and the related division facts. For example, the product 4 x 7 = 28 has related division facts 28 ÷ 7 = 4 and 28 ÷ 4 = 7.

Number & Operations in Base Ten

3.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic. Show Details

- [x] 2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Number & Operations—Fractions

3.NF Develop understanding of fractions as numbers for fractions with denominators 2, 3, 4, 6, and 8. Show Details

- [x] 3d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
- [x] 2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.
- [x] 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
- [x] 3a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- [x] 3b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.
- [x] 3c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Show Details
- [x] 1. Understand a fraction 1/b as the quantity formed by 1 part when a whole (a single unit) is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.
- [x] 2a. Represent a unit fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the fraction, 1/b, is located 1/b of a whole unit from 0 on the number line.
- [x] 2b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

Measurement & Data

3.MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

- [x] 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.
- [x] 2. Measure and estimate liquid volumes and masses of objects using standard metric units of grams (g), kilograms (kg), and liters (l).6 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same metric units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Show Details

3.MD Represent and interpret data.

- [x] 4. Generate measurement data by measuring lengths of objects using rulers marked with halves and fourths of an inch. Record and show the data by making a line plot (dot plot), where the horizontal scale is marked off in appropriate units— whole numbers, halves, or fourths. (See glossary for example).

Enduring Understandings

1. **Understanding Measurement as Multiplication and Division:**
Students will grasp that measurement involves multiplicative comparison. For example, they understand that measuring length in units is essentially multiplying the number of units by the size of one unit and that dividing the total length by the size of one measuring unit tells us how many units long an object is. Students will apply their knowledge of multiplication and division facts within 100 to solve real-world measurement problems.

2. **Proficiency in Basic Operations:**
Students will realize the importance of fluent multiplication and division within 100, which underpins their ability to measure and compare lengths, times, volumes, and weights accurately and efficiently. Having the multiplication and division facts memorized facilitates quick and precise calculations necessary in measurement. For example, when converting inches to feet or ounces to pounds, knowing the multiplication facts allows for fast and reliable computations.

3. **Place Value and Operations in Measurement:**
Students will understand that adding and subtracting quantities within 1000 using place value concepts extends beyond pure numbers to include measurements. This foundational skill helps them when dealing with larger measurements and when they need to aggregate or compare lengths, volumes, and weights, facilitating an understanding of scale and conversion between different measurement units.

4. **Fractional Understanding in Measurement:**
Recognizing fractions as numbers and understanding their placement on the number line equips students with the ability to measure to a finer degree of accuracy than whole numbers allow. This understanding is crucial when dealing with units that do not fit a given number of times into the quantity being measured, requiring a fractional unit to express the measurement.

5. **Comparative Reasoning using Fractions:**
Students' conceptualization of a fraction as a division (1/b) of a whole into equal parts and their ability to see a fraction (a/b) as a

Essential Questions

1. How can we use multiplication and division to solve real-world problems involving measurement quantities such as length, time, volume, and weight?
2. In what ways do equal groups, arrays, and measurement quantities help us understand and apply multiplication and division?
3. How can fluency in multiplication and division within 100 help us measure and compare objects more efficiently?
4. Why is it useful to know multiplication and division facts from memory when measuring and comparing quantities?
5. How does understanding the relationship between multiplication and division assist us in solving measurement problems?
6. What strategies can we use to fluently add and subtract measurements within 1000, and how do place value and properties of operations support these strategies?
7. How do fractions represent divisions of whole numbers, and how can they be used in measuring and comparing lengths and volumes?
8. What is the role of a number line in understanding and representing fractions, and how does this support measurement?
9. How do equal partitions on a number line relate to understanding fractions, and how can this concept be used in measuring lengths more precisely?
10. How can understanding fractions as parts of a whole improve our ability to measure and accurately describe objects and quantities in the real world?

sum of these equal parts is key to comparing and computing measurements. This is particularly vital when dealing with units like cups in a pint or pints in a quart, where parts of a whole are explicitly or implicitly involved. They will learn to use this knowledge when expressing measurements that do not align conveniently with standard units.

6. **Measurement as Applied Number Sense:**
Students will come to see that their numeracy skills are directly applicable to real-life situations. They will understand that the quantities formed by equal parts of a whole (fractions) can pertain to lengths, time intervals, liquid volumes, or weights, broadening their ability to measure and compare different types of quantities in the world around them.

Content

In this unit, students measure length, weight, liquid volume, and time. They begin with a study of length measurement, building on their recent work with fractions.
In grade 2, students measured lengths using informal and formal units to the nearest whole number. They plotted length data on line plots. Here, students explore length measurements in halves and fourths of an inch. They use a ruler to collect measurements and then display the data on line plots, learning about mixed numbers and revisiting equivalent fractions along the way.

Kiran says that the worm is 424 inches long.
Jada says that the worm is 412 inches long.
Use the ruler to explain how both of their measurements are correct.

Next, students learn about standard units for measuring weight (kilograms and grams) and liquid volume (liters). To build a sense of weights such as 1 gram or 1 kilogram, students hold common objects such as paper clips and bottles of water.
To gain familiarity with liters, they fill a container with water by the liter and estimate the volume of everyday containers such as pots, tubs, and buckets. They then use the scale on measurement tools to measure and represent liquid volume.

From there, students move on to measure time. In grade 2, they told and wrote time to the nearest 5 minutes. Now, they tell time to the minute, using the relationship between the hour hand and the minute hand to make sense of times such as 3:57 p.m.
In the final section of the unit, students make sense of and solve problems related to all three measurements. The work here allows students to continue to develop their fluency with addition and subtraction within 1,000 and understanding of properties of operations. It also prompts them to use the relationship between multiplication and division to solve problems.
Throughout the unit
The progression of warm-ups in the first three sections of the unit reflect the progression of ideas in those sections of the unit. In these sections students begin with opportunities to build conceptual understanding of an attribute and notice structures in the tools used to measure the attribute. The notice and wonder routine is used for these purposes. Warm-ups in the last section of

Skills

Section A Goals
- Measure lengths using rulers marked with halves and fourths of an inch to generate data for making a line plot.

Section B Goals
- Measure and estimate weights and liquid volumes of objects.

Section C Goals
- Solve problems involving addition and subtraction of time intervals in minutes.
- Tell time to the minute.

Section D Goals
- Solve problems involving the four operations and measurement contexts.

the unit are directly connected to supporting students to apply what they've learned about a variety of measurement contexts to the last section themed around exploring the fair.
Throughout the unit, students participate in Number Talks to continue the development of multiplication and division strategies as they work toward fluent division within 100.

How will you gauge student learning?

Assessments

3.6 End-of-Unit Assessment | Summative | Written Test

Grade3-6-End-of-Unit-Assessment-assessment.pdf

4 State Standards Assessed

How will students learn?

Learning Activities

Section A:
In this section, students learn to measure lengths in fractions of an inch—first in halves of an inch, and then fourths of an inch. They partition rulers with whole-number inch marks into equal intervals and then use them to measure lengths of objects in the classroom.
Students learn that measurements that are greater than 1 can be expressed with mixed numbers, which combine a whole number and a fraction less than 1.
As they measure with greater levels of precision, students revisit the idea of equivalent fractions. They see that the half-inch marks are also two-fourths of an inch, and that each whole number of inches can also be expressed as some number of halves or fourths.

Students then use their understanding of the number line and rulers to interpret and create line plots that represent lengths measured in half inches and quarter inches. They see that all three representations—number lines, rulers, and line plots—have the same structure, which shows whole-number intervals being partitioned into equal parts.

Section B:
In earlier grades, students learned that weight is a measurable attribute and directly compared the weights of two objects. In this section, they learn that weight is a measure of how heavy something is and that grams and kilograms are units for measuring weight.
To establish some benchmarks for weights, they hold objects of different numbers of grams and kilograms. Then, they estimate the weight of other objects relative to those benchmarks.
Next, students learn that liquid volume is the amount of space that a liquid takes up. They first use informal units (such as plastic cups, spoons, and so on) to compare the liquid volume that two containers can hold before learning about liters as a unit for measurement.
Students gain concrete experience with the new unit by filling a large container in 1-liter increments. They also estimate the liquid volume of everyday objects such a sink, a bucket, and a bathtub.
Later, students make sense of fractional units of liquid volume, learn to read the scale on liquid measurement tools (such as beakers), and compare the scales to the marks on rulers.

Section C:
In this section, students learn to tell and write time to the nearest minute and to show given time on an analog clock. They also solve elapsed time problems with an unknown start time, unknown duration, or unknown end time.
To reason about the problems, students can use any representation that makes sense to them, such as tables, words, equations, or marks on a clock. They also examine a variety of reasoning strategies and adjust their approach depending on the problem at hand.
As they solve problems, students continue to build their fluency with multiplication (especially multiples of 5, 10, and 15), addition, and subtraction.

Section D:
The problems prompt students to make sense of the situations and the questions being asked, consider information that might be needed to answer questions. They explain why they need that information and may need to ask different questions if their partner does not have the information requested (MP1). In each situation, students make sense of quantities and their relationships (MP2).

An optional lesson at the end of the section gives students a chance to examine carnival games and design a game that incorporates concepts of measurement and operations.

Differentiated Instruction

Technology Integration

21st Century Skills

Positive Behavior

CASEL

Collaborative for Academic, Social, and Emotional Learning

Resources

Teacher Notes and Reflections