



San Diego Unified School District

Instructional Module to Enhance the Teaching of

HARCOURT

Math

California Edition

Grade 2

Module 5 - Revised

Measurement

- WORK IN PROGRESS -

San Diego City Schools
Instruction and Curriculum Division
MATHEMATICS CURRICULUM MAP – GRADE 2

Working Document

MODULE 5 – MEASUREMENT

Modules represent individual units of study that lead to essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.

Students will:

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts.
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that measurement is accomplished by identifying a unit of measure, iterating that unit, and comparing it to the item being measured.
- Students understand how measurement tools work so that they can be used correctly and meaningfully.
- Students recognize when a measurement estimate is reasonable.
- Students use different units to measure the same object and predict whether the measure will be greater or smaller when a different unit is used.

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- How can I measure length, mass and capacity by using non-standard units?
 - What is perimeter and how is it measured?
 - How do I measure accurately* to the nearest inch? Nearest centimeter?
 - How do I choose the appropriate tool and unit when measuring?
 - How do I estimate and measure?
 - What benchmarks do I use to estimate the weight of common objects?
- * Presented in previous grades

Resources: Van de Walle, Chapter 19 pp., 316-323; Mathematics Source Book, pp. 27-34

Harcourt Math – Grade 2

Measurement

13 Days

Key Mathematical Concepts:

- To solve problems by using an appropriate skill and/or strategy
- To measure length by using nonstandard units
- To measure length by using inches and feet; centimeters and meters
- To measure the perimeter of a shape

Chapter 19 Length Lesson 19.1: Nonstandard Units Lesson 19.2: Measuring in Inches Lesson 19.3: Inches and Feet Lesson 19.4: Measuring in Centimeters Lesson 19.5: Measuring Perimeter Lesson 19.6: Estimate and Measure	Chapter 20 Capacity, Weight, and Temperature Lesson 20.1: Cups, Pints and Quarts Lesson 20.2: Liters Lesson 20.3: Ounces and Pounds Lesson 20.4: Grams and Kilograms Lesson 20.5: Temperature Lesson 20.6: Problem Solving Assessment
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Day 1 Unit 4 Lesson 19.1	Day 2 Unit 4 Lesson 19.2	Day 3 Unit 4 Lesson 19.3	Day 4 Unit 4 Lesson 19.4	Day 5 Unit 4 Lesson 19.5
Day 6 Unit 4 Lesson 19.6	Day 7 Unit 4 Lesson 20.1	Day 8 Unit 4 Lesson 20.2	Day 9 Unit 4 Lesson 20.3	Day 10 Unit 4 Lesson 20.4
Day 11 Unit 4 Lesson 20.5	Day 12 Unit 4 Lesson 20.6	Day 13 Unit 4 Assessment		

DAY 1
 UNIT 4: GEOMETRY AND MEASUREMENT
 Chapter 19: Length
 LESSON 19.1
 TE, Pg. 269A


LESSON FOCUS:	Nonstandard Units						
CALIFORNIA STANDARD:	Measurement and Geometry: 1.1 Measure the length of objects by iterating a nonstandard or standard unit.						
PURPOSE OF LESSON:	To understand how to measure length using nonstandard units						
ROUTINE Materials: <ul style="list-style-type: none"> • Base ten materials (a variety, including commercially available materials, bundles of sticks, beans and cups, and snap cubes) 	Suggestion: Solving Problems <ul style="list-style-type: none"> • Give students a problem to solve: 45 students were playing soccer. 28 are girls and the rest are boys. How many boys are playing soccer? • Discuss: What are ways that you could solve this problem? Ask students to solve the problem using tools and strategies they understand. • Make manipulatives available. Ask students to share their methods for solving the problem with the whole class. • Chart students' strategies. <p>While there is a tendency to teach this part-part-whole/part unknown problem as a subtraction situation, it is important that students use a method that makes sense to them. Some strategies students are likely to use include modeling the problem with materials (separating out the part from the named whole, or beginning with the part and adding on to make the whole) and counting (on from the part or back from the whole). Students may also use knowledge of number relationships (e.g., $28 + 2 = 30$; $30 + 10 = 40$; $40 + 5 = 45$; $2 + 5 + 10 = 17$)</p>						
LAUNCH Materials: <ul style="list-style-type: none"> • Color tiles • Feet Length overhead 	Modeling Measurement: Feet Length <ul style="list-style-type: none"> • Students use color tiles (or other tools) as units of measure to find the length of their own and their classmates' feet. • Demonstrate how to trace your foot on a sheet of paper. Elicit estimates for how many tiles equal the length of the traced foot. • Record estimate: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Name</th> <th style="text-align: center;">Estimate Number of tiles</th> <th style="text-align: center;">Actual Number of tiles</th> </tr> </thead> <tbody> <tr> <td>Mrs. Smith</td> <td style="text-align: center;">7</td> <td></td> </tr> </tbody> </table>	Name	Estimate Number of tiles	Actual Number of tiles	Mrs. Smith	7	
Name	Estimate Number of tiles	Actual Number of tiles					
Mrs. Smith	7						

	<ul style="list-style-type: none"> • Ask: “What do I need to think about when using the tiles to measure the length of my foot?” Possible answers may include: lay them end-to-end, eliminate spaces between tiles, round off to the nearest tile. • Demonstrate how to measure and record.
EXPLORE Materials: <ul style="list-style-type: none"> • Color tiles • Feet Length worksheet 	Measurement: Feet Length <ul style="list-style-type: none"> • Students trace their own foot on a sheet of paper. They record their name and estimate, then measure and record the actual number of tiles equal to the length of their foot. • Students exchange tracings with classmates and repeat the process.
PRACTICE	As time allows: Students find objects of a particular length (e.g., about 3 tiles, 5 tiles, 10 tiles). Students record the names of objects and their lengths.
SUMMARIZE	<ul style="list-style-type: none"> • Students discuss what they noticed about measuring objects. • Closure: Revisit purpose of the lesson with students.
HOMEWORK Materials: <ul style="list-style-type: none"> • Pennies, macaroni or beans. 	Suggestion: <ul style="list-style-type: none"> • Students choose a nonstandard unit of measure available at home (or borrow units from the classroom). • Suggest options such as pennies, macaroni or beans. • Students repeat the Explore activity at home, measuring the length of family members’ feet and recording the name, estimate and actual measurement of each.

Feet Length

Name of Object	Estimate: Number of Units	Actual Number of Units

DAY 2
 UNIT 4: GEOMETRY AND MEASUREMENT
 Chapter 19: Length
 LESSON 19.2
 TE, Pg. 271A

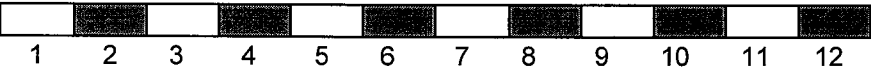
LESSON FOCUS:	Measurement to the Nearest Inch
CALIFORNIA STANDARD:	Measurement and Geometry: 1.1 Measure the length of an object to the nearest inch and/or centimeter.
Purpose of Lesson:	To understand how to measure length using a unit ruler.
Routine	<p>Suggestion: Solving Problems</p> <ul style="list-style-type: none"> • Give students a problem to solve: Students were measuring feet with tiles. Karen’s foot was 33 tiles long. Bobby’s foot was 18 tiles long. • <i>How much longer was Karen’s foot than Bobby’s foot? Discuss: What are ways that you could solve this problem?</i> • Ask students to solve the problem using tools and strategies they understand. Make manipulatives available. Ask students to share their methods for solving the problem with the whole class. Chart students’ strategies. <p>While there is a tendency to teach this compare/difference unknown problem as a subtraction situation, it is important that students use a method that makes sense to them. Some strategies students are likely to use include modeling the problem with materials (building each quantity and counting the difference between the two) and counting (on from the lesser quantity or back from the greater quantity). Students may also use knowledge of number relationships (e.g., $33 - 10 = 23$; $23 - 8 = 15$).</p>
<p>LAUNCH</p> <p>Materials:</p> <ul style="list-style-type: none"> • Pencil • Snap cubes, beans, large paper clips • 2 pieces of construction paper of two different colors, each 8”x 1/2” • strip of tagboard, 1” x 14” • Glue or paste • Color tiles • Classroom objects to measure 	<p>Model: Making Rulers</p> <ul style="list-style-type: none"> • Discuss HOMEWORK: <i>Who used beans to measure the length of family members’ feet? Who used pennies? Macaroni? If I measured my foot with tiles, then beans, then large paper clips, would the number of cubes, beans and paper clips be the same? Why/why not? Demonstrate.</i> • Show students piece of 8” x 1/2” construction paper. Demonstrate how to cut paper into lengths one tile long and arrange 12 of these construction paper strips, in alternating colors, on a piece of tagboard. Paste the small strips to make a homemade ruler of the following arrangement: <div style="text-align: center;">  </div> <ul style="list-style-type: none"> • True rulers often do not have a starting point at the end of the ruler. Gluing this alternating color strip onto a slightly larger piece of tagboard helps students to see the importance of carefully aligning the units on this measuring strip to the object being

<ul style="list-style-type: none"> • Making Rulers and Measuring overhead 	<p>measured.</p> <ul style="list-style-type: none"> • Ask, “<i>What do I need to think about when using the ruler to measure different objects?</i>” Guide the discussion to include aligning the ruler with the object being measured. • Demonstrate how to measure. Elicit estimates for how many units equal the length of a crayon. Record an estimate: <table border="1" data-bbox="540 422 1440 489"> <thead> <tr> <th>Object</th> <th>Estimate: Number of units</th> <th>Actual number of units</th> </tr> </thead> <tbody> <tr> <td>crayon</td> <td>4</td> <td></td> </tr> </tbody> </table> <p>Demonstrate how to measure and record.</p>	Object	Estimate: Number of units	Actual number of units	crayon	4	
Object	Estimate: Number of units	Actual number of units					
crayon	4						
<p>EXPLORE</p> <p>Materials:</p> <ul style="list-style-type: none"> • 8” x 1/2” construction paper, 2 strips of 2 different colors per student • strip of tagboard, 1” x 14” per student • Glue or paste • Classroom objects to measure • Making Rulers and Measuring worksheet 	<p>Making Rulers and Measuring</p> <ul style="list-style-type: none"> • Students make individual rulers. They work in pairs to choose classroom objects to measure, recording the object name, the estimated length in units and the actual measurement. 						
<p>PRACTICE</p>	<p>As time allows: Students measure other objects.</p>						
<p>SUMMARIZE</p>	<p>Discuss:</p> <ul style="list-style-type: none"> • <i>What did you notice when measuring with the rulers?</i> • <i>What would happen if the unit of measure changed to something shorter (e.g., pinto beans) or longer (e.g., large paper clips) than these units?</i> • <i>What have we used that is similar in length to the paper units on the rulers we have made?</i> <p>Closure:</p> <ul style="list-style-type: none"> • Revisit purpose of the lesson with students. 						
<p>HOMEWORK</p>	<p>Suggestion:</p> <ul style="list-style-type: none"> • Students use their rulers at home to measure the length of household objects, recording the name, estimate and actual measurement. 						

Making Rulers and Measuring

Name of Object	Estimate: Number of Units	Actual Number of Units

DAY 3
 UNIT 4: GEOMETRY AND MEASUREMENT
 Chapter 19: Length
 LESSON 19.3
 TE, Pg. 273A

LESSON FOCUS:	Inches and Feet										
CALIFORNIA STANDARD:	Number Sense: 6.1 Recognize when an estimate is reasonable in measurements										
Purpose of Lesson:	Understand how to estimate and measure the length of an object with an inch ruler.										
Routine	Suggestion: Number of the Day Have students brainstorm equations that equal the number of days they have been in school. On the class number line and 10x18 square chart, fill in the numbers since the last time Number of the Day routine.										
LAUNCH Materials: <ul style="list-style-type: none"> • Homemade ruler • Pencil • Inch ruler • Classroom objects to measure • Labeling and Using Rulers overhead 	Labeling and Using Rulers <ul style="list-style-type: none"> • Using the homemade ruler, demonstrate how to label the center of each unit. As the idea of units is being established, it is better to label the center of the unit rather than the end as on a number line. In this way students will think about the whole length of the unit rather than just a mark on a ruler. As the idea of unit is established, children can transition to the traditional markings on a ruler.  <ul style="list-style-type: none"> • Review how to measure. Elicit estimates for how many units equal the length of a classroom object (e.g., a pair of scissors). Record an estimate: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Object</th> <th style="width: 20%;">Estimate: Number of units</th> <th style="width: 20%;">Actual number of units</th> <th style="width: 20%;">Estimate: Number of inches</th> <th style="width: 25%;">Actual number of inches</th> </tr> </thead> <tbody> <tr> <td>scissors</td> <td style="text-align: center;">7</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Review how to measure and record. Introduce inch rulers to students and demonstrate how to use them to measure. Elicit estimates for how many inches equal the length of the object. Record an estimate. Measure and record the actual number of inches equal to the length of the object. 	Object	Estimate: Number of units	Actual number of units	Estimate: Number of inches	Actual number of inches	scissors	7			
Object	Estimate: Number of units	Actual number of units	Estimate: Number of inches	Actual number of inches							
scissors	7										
EXPLORE Materials: <ul style="list-style-type: none"> • Inch rulers per pair of students • Classroom objects to measure • Labeling and Using Rulers worksheet 	Using Rulers <ul style="list-style-type: none"> • Students work in pairs to choose different classroom objects to measure, recording the object name, the estimated length in units and the actual measurement. • Pairs of students then estimate, measure and record the number of inches. 										
PRACTICE	As time allows: Students to check the work of other classmates.										
SUMMARIZE Materials: <ul style="list-style-type: none"> • <u>How Big is a Foot?</u> (optional) 	<ul style="list-style-type: none"> • Students discuss what they noticed about the relationship between their homemade rulers and the inch rulers. • Read <u>How Big is a Foot?</u> Discuss the purpose for standard measurement. (A foot is 12 inches.) Closure: Revisit purpose of the lesson with students.										

HOMEWORK Materials: <ul style="list-style-type: none">• P. FA 79• Tape	Suggestion: Students make their own inch ruler and practice measuring the length of household objects, recording the name, estimate and actual measurement of each.
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Labeling and Using Rulers

Name of Object	Estimate: Number of Units	Actual Number of Units	Estimate: Number of Inches	Number of Inches

DAY 4
 UNIT 4: GEOMETRY AND MEASUREMENT
 Chapter 19: Length
 LESSON 19.4
 TE, Pg. 275A

LESSON FOCUS:	Centimeters						
CALIFORNIA STANDARD:	Measurement and Geometry: 1.0 Students understand that measurement is accomplished by identifying a unit of measure, iterating that unit, and comparing it to the item being measured.						
Purpose of Lesson:	Understand how to estimate and measure length using non-standard tools and connect those to a centimeter ruler.						
Routine Materials: • Timer	Suggestion: Time throughout the Day • Set a timer to ring at thirty-minute intervals at different points throughout the day. Write both the analog and digital times. • Students make observations at the end of the day.						
LAUNCH Materials: • Homemade ruler • Pencil • Centimeter cubes or base ten units • Classroom objects to measure • Measuring with Centimeters overhead	Introducing: Measuring with Centimeters • Elicit estimates for how many centimeter cubes equal the length of a classroom object (e.g., a pair of scissors). Record an estimate: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Object</th> <th style="text-align: center; border-bottom: 1px solid black;">Estimate: Number of Centimeter cubes</th> <th style="text-align: right; border-bottom: 1px solid black;">Actual number of centimeter cubes</th> </tr> </thead> <tbody> <tr> <td>Scissors</td> <td style="text-align: center;">17</td> <td></td> </tr> </tbody> </table> • Review how to measure and record. Measure and record the actual number of cubes equal to the length of the object.	Object	Estimate: Number of Centimeter cubes	Actual number of centimeter cubes	Scissors	17	
Object	Estimate: Number of Centimeter cubes	Actual number of centimeter cubes					
Scissors	17						
EXPLORE Materials: • 20-40 cm cubes per pair of students • Classroom objects to measure • Measuring with Centimeters worksheet	Measuring with Centimeters • Students work in pairs to choose different classroom objects to measure, recording the object name, the estimated length in cubes and the actual measurement.						
PRACTICE	As time allows: Students check the work of other classmates.						
SUMMARIZE Materials: • Centimeter ruler per pair of students	• Students discuss measuring experiences. • Introduce centimeter rulers and ask students to see what they notice about the relationship between the centimeter cubes and the rulers. Introduce “centimeter.” Closure: • Revisit purpose of the lesson with students. • <i>How is measuring with centimeters like measuring with inches?</i> • <i>How is it different?</i>						
HOMEWORK Materials: • Pennies, macaroni or beans	Suggestion: • Students choose a nonstandard unit of measure available at home (or borrow units from the classroom). Suggest options such as pennies, macaroni or beans. • Students repeat the Explore activity at home, measuring the length of household objects and recording the name, estimate and actual measurement of each.						

Measuring with Centimeters

Object	Estimate: Number of Cubes	Actual Number of Cubes

DAY 5
 UNIT 4: GEOMETRY AND MEASUREMENT
 Chapter 19: Length
 LESSON 19.5
 TE, Pg. 277A

LESSON FOCUS:	Perimeter						
CALIFORNIA STANDARD:	Measurement and Geometry: 1.0 Students understand that measurement is accomplished by identifying a unit of measure, iterating that unit, and comparing it to the item being measured.						
Purpose of Lesson:	Understand perimeter and how to measure it.						
Routine Materials: • Timer	Suggestion: Time Throughout the Day • Set a timer to ring at five-minute intervals at different points throughout the day. Write both the analog and digital times. • Students make observations at the end of the day.						
LAUNCH Materials: • Color tiles • Classroom objects to measure • Estimating and Measuring Perimeter overhead	Introducing: Estimating and Measuring Perimeter • Elicit estimates for how many tiles it will take to go around a classroom object. Record estimate: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%; text-align: left;">Object</th> <th style="width: 33%; text-align: center;">Perimeter estimate: Number of tiles</th> <th style="width: 33%; text-align: right;">Actual number of tiles in perimeter</th> </tr> </thead> <tbody> <tr> <td style="border-top: 1px solid black;">reading book</td> <td style="border-top: 1px solid black; text-align: center;">3</td> <td style="border-top: 1px solid black;"></td> </tr> </tbody> </table> • Demonstrate how to measure and record. Measure and record the actual number of tiles equal to the perimeter. Introduce "perimeter."	Object	Perimeter estimate: Number of tiles	Actual number of tiles in perimeter	reading book	3	
Object	Perimeter estimate: Number of tiles	Actual number of tiles in perimeter					
reading book	3						
EXPLORE Materials: • Color tiles • Classroom objects to measure • Estimating and Measuring Perimeter worksheet	Estimating and Measuring Perimeter • Individual students make estimates and record. Students work in pairs to find the perimeter of different classroom objects. Students record the actual number of tiles equal to the perimeter.						
PRACTICE	As time allows: Students check the work of other classmates.						
SUMMARIZE	Closure: • Students discuss measuring experiences. • Revisit purpose of the lesson with students.						
HOMEWORK Materials: • Pennies, macaroni or beans	Suggestion: • Students choose a nonstandard unit of measure available at home (or borrow units from the classroom). Suggest options such as pennies, macaroni or beans. • Students repeat the Explore activity at home, measuring the perimeter of household objects and recording the name, estimate and actual measurement of each.						

Estimating and Measuring Perimeter

Name of Object	Perimeter Estimate: Number of Tiles	Actual Number of Tiles in Perimeter

