# Unit 5: Domain: Measurement and Data

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Marking Period 4**
Length: **8-9 Weeks**
Status: **Published**

## Unit Overview

In this unit, the children will develop a sense of measurement while exploring time, perimeter, area, and liquid volume and mass. They will solve problems involving addition and subtraction of time intervals in minutes and represent these problems on a number line. Students will solve real world and mathematical problems involving area and perimeter of polygons and relate area to the operations of multiplication and addition. They will measure and estimate liquid volumes and masses of objects using grams, kilograms, and liters. They will also solve word problems involving mass and volume using the four operations. Finally, they will practice representing data on scaled picture graphs, bar graphs and line plots.

## Standards

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| MA.3.OA.A.3 | Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. |
| MA.3.MD.A.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. |
| MA.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. |
| MA.3.MD.B.3 | Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. |
| MA.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. |
| MA.3.MD.C.5a | A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area. |
| MA.3.MD.C.5b | A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. |
| MA.3.MD.C.6 | Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units). |
| MA.3.MD.C.7a | Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. |
| MA.3.MD.C.7b | Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. |
| MA.3.MD.C.7c | Use tiling to show in a concrete case that the area of a rectangle with whole-number side |

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| | lengths $a$ and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. |
| MA.3.MD.C.7d | Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. |
| MA.3.MD.D.8 | Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. |
| MA.3.G.A.2 | Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. |

## Essential Questions

- How can measurements be used to solve problems?
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- How can we use models to represent physical relationships?
- How do mathematical ideas interconnect and build on one another?
- What makes a computational strategy both effective and efficient?
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## Application of Knowledge and Skills...

## Students will know that...

- a.m. and p.m. are used to designate certain time periods.
- area can be found using square units.
- capacity is the measure of the amount of liquid a container can hold.
- data can be represented visually using tables, charts, and graphs.
- different shapes can have the same perimeter.
- mass is the measure of the quantity of matter in an object. Weight and mass are different.
- pictographs, bar graphs, and line plots allow data to be compared more easily than in a list or a table.
- some attributes of objects are measurable using unit amounts.
- some questions can be answered by collecting and analyzing data
- the amount of space inside a shape is its area.
- the area of some irregular shapes can be found by breaking apart the original shape.
- the distance around a figure is its perimeter.
- the key for a pictograph determines the number of pictures needed to represent each number in a set of data.
- the movement of the minute hand on a clock can be counted in 5 or 1 minute intervals.

- the scale for a bar graph determines how long the bar needs to be to represent each number in a set of data.
- there are relationships between the area and perimeter of a polygon.
- time can be expressed using different units that are related to each other.
- to find the perimeter of a polygon, add the lengths of the sides.

## Students will be skilled at...

- estimating and measuring mass using grams and kilograms.
- finding elapsed time.
- finding the area of irregular shapes.
- measuring area by counting square units.
- measuring area by using standard units of area and/or a formula.
- measuring capacity using liters and milliliters.
- representing data on pictographs and bar graphs.
- telling analog and digital time to the nearest half hour, quarter hour and minute.
- using a line plot to organize data.
- using equal areas of parts of figures to model unit fractions.
- using standard units to find the perimeter of a shape.
- using the areas of rectangles to model the Distributive Property.
- using the given sides of a polygon to find the unknown side lengths.
- working with tables, tally charts, pictographs, and bar graphs.

## Assessments

- Benchmark Tests
- End of Year Test-administered after completing program
- Placement Test-administered prior to delivering program
- Task Cards
- Topic Math Projects
- Topic Quick Checks
- Topic Tests

## Activities

**Problem of the Day-**Present a daily problem that serves as a review from the previous day's lesson.

**Vocabulary** - Have students create a chart for each new vocabulary word that includes the word's meaning and an example or use vocabulary cards as flash card game

**Station activities**- Each section has center activities to reinforce skill (leveled)

- Clip and Cover- Students answer questions and try to cover four spaces in a row on a gameboard to win.
- Display the Digits- Students answer the problem and display the tile that represents the answer.
- Quick Questions- Toss number cubes and answer questions.
- Team Work- Students in turn explain the steps in a multi-step process.
- Think Together- Students choose and discuss answers to problems.
- Tic Tac Toe- Students use algebra to compute solutions to problems.
- Toss and Talk- Students toss number cubes and explain how to solve resulting problems.

**STEM** - Certain sections have Going Digital integrating technology and the use of calculators such as:

- Finding Perimeter with a Calculator, p 321
- Factoid Topic Opener Math Project, p 361E

**Interactive Learning** - Problem-Based Interactive learning activities at the beginning of each topic

**Topic Opener Projects** - There is a math project for each topic (Topic 12-16). See Cross-Disciplinary instruction for projects and page numbers.

**Practice work** - Communicator practice can be done using Independent work and problem- solving practice problems in each section.

**Ticket to Leave** - Quick Checks on each sections

## Activities to Differentiate Instruction

**General strategies for modification of this curriculum for students with special needs, ELL, and gifted learners:**

- **General strategies:**
  - preferential seating
  - manipulatives
  - modified workbook pages
  - practice or enrich homework pages

- **Center activities** - There are leveled center activities for each section. There is a separate activity for "Intervention", and then "On-Level" and "Advanced" are in spiral book.
- **Leveled practice pages** - There are three leveled (Reteaching, Practice, and Enrichment) sheets that can be used for practice or homework.
- **Math Concept Readers:** These readers allow the student to read the story at different levels- above level, on level, and below level. (also available on line with audio) Complete the Think and Respond and Write Math questions at the conclusion of each book.
- **Assessment**- Using Quick Check Review can determine differentiated instruction levels using sample answers and using the rubric at the Close/ Assess and Differentiate section in the teacher edition.

**Content specific modification for students with special needs, ELL, and gifted learners:**

- **Topic 12**
    - **Below level students:**
        - Make sure students understand the different parts of an analog clock. These include the hour and minute hands, marks for minutes, and hour numbers. Review and explain the differences between the hour and minute hands of the clock and what their purposes are. Ask students to explain what each mark for minutes on the clock means.
        - Some students may confuse the numbers on an analog clock with the number of minutes that have passed. Explain that when the minute hand moves from one minute mark to the next, one minute has passed. you may want to discuss activities that last for one minute compared to activities that last for one hour.
    - **Students with special needs:**
        - Display digital and analog clocks that show the same time. Have students say the times in different ways.
        - Set an alarm clock for a certain time. When the clock rings, have students say the times aloud in different ways.
    - **ELL**
        - Repeated oral language practice of the terms that are used with time will help English learners understand the concepts.
            - Emphasize times to the hour and half hour by pointing to the classroom clock throughout the day. Have students say the times with you.
            - Call out a time to the hour or half hour. Have students show the time on a demonstration clock.
            - Place both clock hands at 12 on a demonstration clock. Move the minute hand to each number and count by 5s as students count along with you.
    - **Advanced/Gifted:**
        - At different times during the day, point to the clock and have students say the times in different ways, including times to the minute.
        - Challenge students to write descriptions of what they do at certain times of the day.

- **Topic 13**
    - **Below level students:**
        - Students experiencing difficulty in counting units or adding side lengths to find perimeter will benefit from marking their models.
            - Demonstrate how to mark a model as you count units of add sides to find the perimeter of a polygon. Guide students to see that the marks can help them keep track of the units they have counted or the sides they have added.
    - **Students with special needs:**

- Provide students with hands-on experience with measuring perimeters of classroom objects such as desks. Show students how to measure each side, then add the measurements.
- Allow students to work with geoboards to explore the perimeter. Students count the units between pegs around the rubber band to find perimeter.

- **ELL**
  - Repeated oral language practice with perimeter and length concepts will help English language learners remember and understand these concepts.
    - Draw a 4-inch square on an overhead projector. Trace around the square with your finger. Tell students the distance around the square is the perimeter. Have students say the word aloud.
    - Repeat the above activity, using a ruler to measure the sides of the square. Tell students the perimeter is 16 inches.
    - Give students practice finding perimeters of flat objects around the classroom such as pictures or a calendar. have students measure to the nearest inch, then add to find the perimeter. Encourage students to write complete sentences such as "The perimeter is 20 inches."

- **Advanced/Gifted:**
  - Have students explore how perimeter is affected by certain changes in the lengths.
    - Draw pairs of rectangles in which the larger rectangle has sides that are each 2 times the lengths of the sides in the smaller rectangle. Have students determine the perimeters. Ask: How does the perimeter of the larger rectangle in each pair compare to the perimeter of the smaller one in each pair? (The perimeter of the larger rectangle is 2 times the perimeter of the smaller rectangle)
    - Draw new pairs of rectangles. This time the larger rectangle has sides that are each 5 units greater than the lengths of the sides in the smaller rectangle. Have students determine the perimeters, and then ask: How does the perimeter of the larger rectangle compare to the smaller one in each pair? (The perimeter of the larger rectangle is 20 units greater than the perimeter of the smaller rectangle)

- **Topic 14**
  - **Below level students:**
    - Help students understand the formula for the area of a rectangle by relating it to the array model for multiplication. The number of squares in the array can be found by counting, by repeated addition of the number of squares in a row (base), and by multiplying the number of squares in a row (base) times the number of rows (height).
  - **Students with special needs:**
    - Some students may benefit from finding the area of rectangles made up of large squares that cover a real-world region. If possible, have students use masking tape to mark rectangles on the floor of your classroom or other floor area that is covered with square tiles.
    - First have students count squares to find the area. Then move to counting the columns (units in the base) and rows (using the height) and multiplying to find the area.
    - To help students make sure they have counted all the square units in a shape, have them copy the shape on grid paper. As they count the square units in the area of the shape, have them write the numbers they say inside the small squares.

  - **ELL**
    - Students may have difficulty explain the difference between area and perimeter.

- Have students draw a rectangle that is 2 units wide and 3 units long on grid paper. Have them trace the outer edge in blue crayon. Have them color inside the rectangle in red crayon. Tell students the blue is the perimeter and the red is the area.

- **Advanced/Gifted:**
  - Students who have strong number sense may enjoy estimating the area of their handprint or footprint. Have students trace around their hand o foot on grid paper and count the number of squares that are enclosed.
  - Have students cut out a rectangle and trace it onto centimeter rid paper (Teaching Tool 11) and 1-inch grid paper (Teaching Tool 12). Discuss how the size of the square unit affects the area measurement.

- **Topic 15**
  - **Below level students:**
    - Provide students with hands-on practice with mass. Give students gram and kilogram masses. Ask students to find classroom objects that have a mass of about 1 kilogram. Then have them find objects that have a mass of about 1 gram.
    - Have students look through magazines to find pictures of objects that can be measured in grams and kilograms. Have them create a chart of measures.
  - **Students with special needs:**
    - Provide students with opportunities to become more familiar with the liter and milliliter. For example, provide an eyedropper and a liter bottle for students to examine.
    - Provide cards with metric measures of capacity written on them. Have students list on cards objects and containers in the classroom or at home whose capacity can be measured. Then have them group the objects based on which unit would be better used to find their capacity. Then have them order the card under each metric unit from least capacity to greatest capacity.

  - **ELL**
    - Repeated oral language practice with measurement concepts will help English learners remember and understand the terminology.
      - Write the words grams and kilograms on the board. Pick up or point to various objects around the classroom to compare. Say: The book has more mass than one gram. The pencil has less mass than one kilogram.
      - Point to different objects and ask What unit would you use to measure how much mass his object has? Students can respond in sentences and confirm their responses by measuring.

  - **Advanced/Gifted:**
    - Encourage students to use estimation before they measure for all standard units that they study. Challenge them to estimate in metric units.
    - Challenge students to write their own word problems using capacity and mass measurements, and exchange them with a partner to solve.

- **Topic 16**
  - **Below level students:**
    - As students work with graphs, provide opportunities for them to interpret data found on graphs by asking questions. Guide students in understanding the scales used on the bar graphs.
    - Demonstrate the meaning of bar graphs by having students make a "human bar graph." Have students line up according to a visible characteristic, such as hair color. Draw a

bar graph on the chalkboard to represent how the students line up.

- **Students with special needs:**
  - Provide examples of pictographs and bar graphs. Have students classify according to the type of graph.
  - Discuss the different parts that make up pictographs and bar graphs. Ask students how the graphs are similar and how they are different. Students with visual impairments may benefit from comparing a pictograph made with real objects to a bar graph that uses connecting cubes or color tiles to show the bars.

- **ELL**
  - English learners may have difficulty understanding the different parts of a bar graph.
    - Have students choose a bar graph from the lesson. Ask them to point to each section for the graph and name it. For example, have students point to the title, scale, and vertical and horizontal axes and say the words aloud.

- **Advanced/Gifted:**
  - Ask students to select a graph from a lesson and to reproduce it on the computer.
  - Advanced students an extend their understanding of bar graphs by drawing graphs with misleading scales. Have groups of students draw the same graph, but with different scales. Ask students to discuss how each graph is misleading.

## Integrated/Cross-Disciplinary Instruction

**Reading and Writing**: The Worldscapes Readers present math problems to be solved within the context of nonfiction text. Think and Respond and Write Math questions can be found at the conclusion of the books.

**Topic 12: Social Studies: Below Zero**-Students work in groups to plan three charter fishing trips.

**Topic 13: Art: Fiji Facts and Figures**-Students research buildings or structures in NJ and draw the shape of their structure's base. They will label the lengths of the sides and find the perimeter. They will then explain how they found the perimeter.

**Topic 14: Social Studies: Rainforest Math**-Students learn about Lake Placid, FL, known as the "Town of Murals". They learn about depicting symbols and practice using grid paper to create state symbols.

**Topic 15: Science: Keeping Count**-Students learn about mass and create a new metric unit that can be used to measure mass.

**Topic 16: Social Studies: Fiji Facts and Figures**-Students create and use tally charts to track a team's achievements.

## Resources

Topics Categories in book form:

Topic 12: Time

Topic 13: Perimeter

Topic 14: Area

Topic 15: Liquid Volume and Mass

Topic 16: Data

Master Enrichment pages

Master Reteaching pages

Master Practice pages

Student Edition workbook

On line Resources available at www.pearsonrealize.com

- Teacher Edition (TE) Textbook
- Student Edition (SE) Textbook
- Tests on line
- Concepts videos
- Math Tools

## 21st Century Skills

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| CRP.K-12.CRP2.1 | Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation. |
| CRP.K-12.CRP4.1 | Career-ready individuals communicate thoughts, ideas, and action plans with clarity, |

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| | whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome. |
| CRP.K-12.CRP8.1 | Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. |