Elements of the Instructional Families: Measurement

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Teaching Measurement

All the CCCs in this document relate to teaching Measurement. Below are some additional resources that may be helpful:

Math Teaching Ideas

Math Concepts

Math Activities and Games

Math Lessons Virtually

Math Courses

Teaching Children Math

CCC Mathematics | Measurement

CCSS: K.MD.2: Describe and compare measurable attributes. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

CCC: K.ME.1b2 Compare 2 objects with a measurable attribute in common to see which object has more/less of the attribute (length, height, weight).

Strand: Measurement

Family: Sorting and Classifying

Progress Indicator: *E.ME.1b Comparing and ordering objects/events according to their specified attributes (using standard or non-standard units of measure), including indirectly by using a third object, or using common referents to estimate or compare*

Concrete Understandings:

- Use connecting objects, e.g., cubes, to measure attributes of distance (length, height) by counting the number of objects needed to measure.
- Use a scale to compare the weight of two objects.

Representation:

Select representation of more and less, short, and long, heavy and light; tall and short.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*

Least-to-Most prompts (e.g., "Start by putting the shortest item in place like this…")*

Suggested Supports and Scaffolds:

- Graphic organizer with representations to prompt understanding
- Unifix cube wands to compare lengths (same size same color – additional cubes in another color)
- Balance scales
- Weight scales
- Rulers
- Yard sticks

CCSS: 1.MD-1: Measure lengths indirectly and by iterating length units. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

CCC: 1.ME.1b3 Order up to 3 objects based on a measurable attribute (height, weight, length).

Strand: Measurement

Family: Sorting and Classifying

Progress Indicator: *E.ME.1b Comparing and ordering objects/events according to their specified attributes (using standard or non-standard units of measure), including indirectly by using a third object, or using common referents to estimate or compare*

Concrete Understandings:

- Use connecting objects, e.g., cubes, to measure attributes of distance, length, and height
- Use a scale to compare the weight of two objects.

Representation:

- Select representation of more and less, short and long, heavy and light; tall and short.
- Apply understanding that if object 1 is longer/heavier than object 2 and object 2 is longer/heavier than object 3, then object 1 must be longer than object 3.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts (e.g., "Start by putting the shortest item in place like this…")*

Suggested Supports and Scaffolds:

- Sequencing Template for short - tall with graphic representations to prompt understanding
- Number line
- Measuring tools

CCSS: 1.MD.2 Measure lengths indirectly and by iterating length units. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

CCC: 1.ME.1c1 Compare 2 units of measurement and identify which unit would require more or less when measuring a selected object. (I can measure with paper clips or markers. Which unit will require more to measure the table?)

Strand: Measurement

Family: Measuring using Tools

Progress Indicator: *E.ME.1c Recognizing that the smaller the unit, the more units are needed to measure an object; and that units can be decomposed/partitioned into smaller units*

Concrete Understandings:

- Understand that smaller units will require more to measure an object than using larger units to measure the same object.
- Use connecting objects, e.g., cubes, to measure attributes of distance, length, and height.

Representation:

- Select the number that represents the number of units used to measure the length of an item.
- Understand the concept of more and less.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts (e.g., "Start by filling in the first row of the template with paperclips like this…")*
- Teacher uses the measuring template for an object being measured and student counts as each paperclip is added to the template (repeat for markers) until the item has been measured. Student may use an electronic counter. The teacher asks which item required more to measure the object and which required less to measure the object.

Suggested Supports and Scaffolds:

- Measuring template (i.e., length of item being measured: 1st row segmented into sections for paperclips; 2nd row segmented into sections for markers)
- Measuring stick made of Unifix cubes

CCSS: 1.MD.2 Measure lengths indirectly and by iterating length units. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

CCC: 1.ME.2a1 Measure using copies of one object to measure another.

Strand: Measurement

Family: Scaling and Unit Conversions

Progress Indicator: *E.ME.2a Applying nonstandard and common standard units to measure or estimate (length, height, weight, time)*

Concrete Understandings:

- Counting to --- objects
- Identify the beginning and end point that needs to be measured.
- Recognize that an object can be measured by lining up multiple objects of the same size without gaps or overlaps.

Representation:

Select the numeric symbol that represents the number of units used to measure the length of an item.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts (e.g., "Start by placing a paperclip next to the item like this…")*
- Teacher places copies of the original paperclip along the side of an object being measured and student counts as each copy is placed until the item has been measured. Student may use an electronic counter.

Suggested Supports and Scaffolds:

- Measuring template (i.e., length of item being measured –segmented into sections the size of paperclips)
- Measuring stick made of Unifix cubes

CCSS: 2.MD.1: Measure and estimate lengths in standard units. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

CCC: 2.ME.1a3 Select appropriate unit of measurement to measure an object (ruler or yard stick; inches or feet).

Strand: Measurement

Family: Sorting and Classifying

Progress Indicator: *E.ME.1a Recognizing, identifying, and describing the measurable attributes of objects*

Concrete Understandings:

- Understand that smaller units are part of larger units within the same system (12 inches = 1 foot).
- Identify the smaller and/or larger unit (e.g., inches are smaller than feet).
- Understand that they should use the unit of measure that will require fewer units to measure objects.

Representation:

- Select the numeric symbol that represents the number of units that make up a larger unit of measure.
- Select representation of larger units of measure within a system of measurement.

Suggested Instructional Strategies:

** This should be to "nearest whole unit" – in grade 2 we do not measure fractions/parts of a unit*

- Model-Lead-Test ("Watch me…do together….you try")
- Least-to-Most Prompts*
- Teacher identifies an object to be measured. "I can measure with inches or feet, which unit will require less to measure the table?" "Which unit would I use to measure the room?"
- Use collapsible ruler to show how smaller units make up a larger unit.

Suggested Supports and Scaffolds:

- Foldable ruler
- Measuring stick made of Unifix cubes
- Talking ruler
- Ruler
- Color coded units (inches=red, feet=blue, yards=green)

CCSS: 2.MD.2: Measure and estimate lengths in standard units. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

CCC: 2.ME.1c3 Recognize that standard units can be decomposed into smaller units.

Strand: Measurement

Family: Measuring using Tools

Progress Indicator: *E.ME.1c Recognizing that the smaller the unit, the more units are needed to measure an object; and that units can be decomposed/partitioned into smaller units*

Concrete Understandings:

- Understand that smaller numbers are part of larger numbers (e.g., 5 can be made of 4 and 1 or 3 and 2, etc.).
- Within the same system of measurement identify the smaller or larger unit—inches are shorter than feet, feet are shorter than yards, etc.

Representation:

- Select the numeric symbol that represents the number of units that make up a larger unit of measure.
- Understand that multiple units make up a larger unit of measure (12 inches in 1 foot).

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts (e.g., "Put an inch on the ruler like this…")*
- Teacher places inches on the ruler, student counts as inches are added to the ruler, may use an electronic counter.
- Use collapsible ruler to show how smaller units make up a larger unit

Suggested Supports and Scaffolds:

- Foldable ruler
- Measuring stick made of Unifix cubes
- Interactive whiteboard or other technology

CCSS: 2.MD.4: Measure and estimate lengths in standard units. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard-length unit.

CCC: 2.ME.2a4 Solve one step subtraction problems involving the difference of the lengths of 2 objects in standard length units

Strand: Measurement

Family: Problem Solving using Measurement Process

Progress Indicator: *E.ME.2a Applying nonstandard and common standard units to measure or estimate (length, height, weight, time)*

Concrete Understandings:

- Understand that smaller numbers are part of larger numbers (e.g., 5 can be made of 4 and 1 or 3 and 2, etc.).
- Identify the smaller unit (e.g., inches are smaller than feet).
- Count to 20 objects.
- Recognize that when we compare lengths, we want to answer "How much longer is object 1 than object 2?"
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Representation:

- Represent the numeric symbol by breaking the whole into the corresponding number of parts.
- Select the numeric symbol that represents the differences.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts to use the foldable ruler*
- Teacher represents the problem using Unifix cubes (measuring stick) taken away from the whole. Student counts as cubes are removed from the stick. Student may use an electronic counter.

Suggested Supports and Scaffolds:

- Foldable ruler
- Measuring stick made of Unifix cubes (use two colors to reflect those taken away)
- Talking ruler

CCSS: 3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

CCC: 3.ME.1d2 Measure area of rectilinear figures by counting squares.

Strand: Measurement

Family: Measuring Using Tools

Progress Indicator: *E.ME.1d Describing and demonstrating unit attributes, iterating, tiling, identical units, number line intervals, standardization, proportionality, additivity, and origin*

Concrete Understandings:

- Count up to 20 objects.
- Identify the area on a surface (e.g., piece of paper).
- Recognize that area can be determined by covering a rectangular area with square tiles that have no gaps or overlaps.
- Use square tiles to cover a rectangle.
- Count the number of tiles to determine the area.
- Decompose rectangles within a rectilinear figure.

Representation:

- Select the numeric symbol that represents the number of squares used to find area of a figure.
- Count to find the area of a rectangle when given a picture or array.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Use Least Intrusive Prompts (e.g., "Put a tile on like this…")*
- Teacher does the tiling. Student counts as tiles are taken off. Student may use an electronic counter.

Suggested Supports and Scaffolds:

- 1-inch tiles
- 1-inch tiles that are numbered
- Raised grid with numbered squares
- Raised frame and raised grid
- Hand tally counter or software that counts
- Interactive whiteboard or other software that allows the student to move tiles on or off the figure
- Counting sheet that allows students to mark the tiles that have been counted

CCSS: 4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.MD.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

CCC: 4.ME.1g2 Solve word problems using perimeter and area where changes occur to the deminsions of a rectilinear figure.

Strand: Measurement

Family: Perimeter, Area, and Volume Problems

Progress Indicator: *E.ME.1g Exploring what happens to 2-dimensional measurements (perimeter or area) when the dimensions of the figure are changed*

Concrete Understandings:

- Decompose a rectilinear figure into rectangles
- Identify the perimeter of a rectilinear figure
- Identify the area of a rectilinear figure

Representation:

Understand the following concepts and vocabulary (pictures/symbols): area, perimeter, length, width, side, +, -, X, ÷

Suggested Instructional Strategies:

- Task analysis (solving problems using formulas); isolate each step of the solution process
- Model-Lead-Test (“Watch me…do together….you try”)*
- Least-to-Most prompts*
- Relate a story problem to everyday life/relevant context

Suggested Supports and Scaffolds:

- Premade formula worksheets
- Calculator
- Foldable ruler
- Conversion charts (inches to feet, feet to yards)
- 1 inch tiles
- Raised grid with squares numbered
- Graph paper or Grid paper (virtual or with raised lines, on overhead transparencies, etc.)

- Graphic representation of square and rectangle
- Interactive whiteboard, PowerPoint, or other visual demonstrating how squares change to rectangles when 2 sides are elongated

Additional Resource:
Math Resources

CCSS: 5.MD.1 Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real-world problems.

CCC: 5.ME.2a1 Solve problems involving conversions of standard measurement units of area, volume, time, mass in the same system.

Strand: Measurement

Family: Scaling and Unit Conversions

Progress Indicator: *M.ME.2a Selecting and applying appropriate standard units, tools,and level of precision in real-world measurment problems (e.g., area, surface area, volume, rate)*

Concrete Understandings:
Match like units of measurement within a measurement system (e.g., hours to minutes, inches to feet).

Representation:

- Use various strategies to add, subtract, multiply, and divide.
- Use a pictorial representation of a ratio to make conversions.

Suggested Instructional Strategies:

- Task analysis for problem solving
- Model-Lead-Test*
- Least-to-Most prompts*
- Provide a calendar. The teacher says there are seven days in one week and counts out each day (1-7) and points to the calendar. Say, “Show me one week.” Say, “There are seven days in one week for a ratio of 7:1 (days: week). So, how many days are in three weeks?” “If you have to write two book reports per week, how many book reports will you write in four weeks?”
- Use plastic fraction bars to make equivalent measurements. For example, shade a picture a ruler into twelve portions and use the fraction bars to visually illustrate the equivalent of 6 inches (6/12) and one foot (12/12).
- Students can solve a one-step problem by using manipulatives and/or incorporating symbolic numeral cards to correspond to a concrete model. For example, the teacher can give a problem such as “The bookshelf is 2 feet long. There are 12 inches in one foot. How many inches is the bookshelf altogether?” Then have students solve this problem by using objects. The students count out 24 objects.

Suggested Supports and Scaffolds:

- Calendar
- Calculator
- Counters and graphic representation of ratios and fractions
- Worksheet with partially completed formula
- Interactive whiteboard or PowerPoint
- Balance or scale
- Clock

- Counting tiles
- Cups and buckets to measure volume

CCSS: 5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.

CCC: 5.ME.1b2 Convert standard measurements of length.

Strand: Measurement

Family: Scaling and Unit Conversions

Progress Indicator: *M.ME.1b Recognizing relationships among units and using proportional reasoning to convert measurements from one unit to another within the same system*

Concrete Understandings:
Recognize that in the same system, I can measure the same object with 2 different units (e.g., I can measure the height of a desk in both inches and feet).

Representation:

- Understand the following concepts and vocabulary: conversion, inch, foot, yard
- Understand standard units and abbreviations (e.g., feet=ft)

Suggested Instructional Strategies:

- Multiple exemplar training (e.g., "This is an inch, this is an inch…this is not an inch, show me an inch.")*
- Task analysis steps to convert from inches to feet using a table
- Teach student to use proportions (e.g., 12:1, 12 inches = 1 foot) to convert the same measurement from one unit to another.
- Measure length using one inch increments (how many) and one foot increments (how many).
- Have students place the U.S. unit cards/representations in order from smallest to largest.

Suggested Supports and Scaffolds:

- Conversion table, adapted or un-adapted measuring tools
- Calculator
- Counting blocks or manipulatives
- Counting mechanism (e.g., number line)
- Match measuring tool to unit (e.g., "Identify the tool to measure inches.")
- Software
- Rulers with limited measurement (e.g., only 1 inch and ½ inch tabs)

CCSS: 6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

CCC: 6.ME.2b2 Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles, squares, triangles) to measure area.

Strand: Measurement

Family: Perimeter, Area, and Volume Problems

Progress Indicator: *M.ME.2b Using a variety of strategies (decomposing complex shapes, using formulas and models) to measure area (triangles, quadrilaterals, polygons) and volume (rectangular prisms)*

Concrete Understandings:

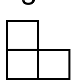
- Recognize simple shapes within a larger shape.
- Identify the dimensions (base, height, length, width, etc.) of smaller shapes.
- Multiply fractions and whole numbers.

Representation:

- Given a picture identify the dimensions of 2-D and 3-D shapes.
- Understand the following concepts and vocabulary: polygon, trapezoid, pentagon, rectangles, squares, triangles, area.

Suggested Instructional Strategies:

- Task analysis to apply strategies for taking apart shapes
- Model-Lead-Test ("Watch me…do together…you try")*
- Least-to-Most prompts*
- Multiple exemplar training*
- Remind students how to find the area of an entire figure using their measurements. Demonstrate how they could break the figure into smaller rectangles and add the areas of the smaller rectangles.
- Ask student to use the squares from pattern blocks or color tiles (the side of the square should equal 1 inch). Ask the student, "What is the area of the square?" *(1 sq. inch)* Put 1 square to the right of the original square, and 1 square above it. The figure will look like this:



- Ask the student to find the area of the new figure. *(3 sq. inches)*

Suggested Supports and Scaffolds:

- 1-inch tiles
- Raised grid with numbered squares
- Grid paper

- 2-dimensional shapes (polygon, trapezoid, pentagon, rectangles, squares, and triangles)
- PowerPoint showing how simple shapes are combined to make complex shapes
- Interactive whiteboard
- Graphic representation of simple and complex shapes
- Use real-world examples (cutting a magazine clipping to fit onto a card that is a simple shape)

CCSS: 6.RP.3b Use ratio and rate reasoning to solve real-world and mathematical problems, (e.g., by reasoning about tables of equivalent rations, tape diagrams, double number line diagrams, or equations). Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

CCC: 6.ME.2a2 Solve one step real-world measurement problems involving unit rates with ratios of whole numbers when given the unit rate (3 inches of snow falls per hour, how much in 6 hours)

Strand: Measurement

Family: Scaling and Unit Conversions

Progress Indicator: *M.ME.2a Selecting and applying appropriate standard units, tools,and level of precision in real-world measurment problems (e.g., area, surface area, volume, rate)*

Concrete Understandings:
- Multiply using concrete objects.
- Divide using concrete objects.
- Use a ratio to solve a measurement conversion problem.

Representation:
- Multiply whole numbers.
- Divide whole numbers.
- Use a pictorial representation of a ratio to solve problem.

Suggested Instructional Strategies:
- Task analysis for problem solving (formula)
- Model-Lead-Test*
- Least-to-Most prompts*
- Provide a calendar. The teacher says there are seven days in one week and counts out each day (1-7) and points to the calendar. Say, “Show me one week.” Say, “There are seven days in one week for a ratio of 7:1 (days: week). So, how many days are in 3 weeks?”
- Rates such as miles per hour, ounces per gallon and students per bus should be reinforced. Using ratio tables develops the concept of proportion. Compare equivalent ratios; present real-life problems involving measurement units that need to be converted; represent measurement conversions with models such as ratio tables, T-charts, or double number line diagrams.

Suggested Supports and Scaffolds:
- Premade function table
- Conversion chart
- Calendar
- Calculator

• Counters and graphic representation of ratios

CCSS: 7.G.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

CCC: 7.ME.2d1 Apply formula to measure area and circumference of circles.

Strand: Measurement

Family: Perimeter, Area, and Volume Problems

Progress Indicator: *M.ME.2d Using various strategies (decomposing complex shapes, using formulas) to measure volume (cones, cylinders, spheres) and area and circumference of circles*

Concrete Understandings:

- Identify the radius and diameter of a circle.
- Multiply decimals and whole numbers.

Representation:

- Recognize the meaning of terms used in formulas as labeled representations related to circles.
- Understand the following concepts and vocabulary: circumference, area, pi, and radius.

Suggested Instructional Strategies:

- Task analysis with formula
- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts*
- Say, "Here is a circle. Here is the circumference." Trace the circumference with your finger. Ask the student, "Show me circumference."
- Use picture cards and number sentences with formulas.

Suggested Supports and Scaffolds:

- Calculator
- Graphic of circle
- Tiles to place inside of circle to represent area
- Interactive whiteboard or other software
- Rolling counter, string, or yarn to measure circumference
- Assistive Technology
- Real-world materials

CCSS: 8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

CCC: 8.ME.2d2 Apply the formula to find the volume of 3-dimensional shapes (i.e., cubes, spheres, and cylinders)

Strand: Measurement

Family: Perimeter, Area, and Volume Problems

Progress Indicator: *M.ME.2d Using various strategies (decomposing complex shapes, using formulas) to measure volume (cones, cylinders, spheres) and area and circumference of circles*

Concrete Understandings:

- Recognize attributes of a 3-dimensional shape.
- Multiply whole numbers, fractions, and decimals.

Representation:

- Recognize that volume of 3-D shapes can be found by finding the area of the base and multiplying that by the height.
- Understand the following concepts and vocabulary: volume, cylinder, cone, height, radius, circumference, cube, sphere, side, pi

Suggested Instructional Strategies:

- Task analysis for applying formula
- Model-Lead-Test*
- Least-to-Most prompts*
- Fill cylinders and cones with water or rice to illustrate volume. Describe volume as what is “inside.”
- Provide relevant, real-world examples and uses.

Suggested Supports and Scaffolds:

- Cones, cylinders, cubes, and spheres in differing sizes and textures
- Cardboard models that can be folded to make 3-dimensional shapes
- Partially completed formula
- Calculator

CCSS: 8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two dimensional figures, describe a sequence that exhibits the similarity between them.

CCC: 8.ME.1e1 Describe the changes in surface area, area, and volume when the figure is changed in some way (e.g., scale drawings).

Strand: Measurement

Family: Scaling and Unit Conversions

Progress Indicator: *M.ME.1e Exploring what happens to 2- and 3- dimensional measurements (such as surface area, area, and volume) when the figure is changed in some way (e.g., scale drawings)*

Concrete Understandings:

- Recognize how the space inside a figure increases when the sides are lengthened.
- Multiply whole numbers, fractions, and decimals.
- Apply formulas to find surface area, area, volume of figures.

Representation:

- Given a picture, identify dimensions needed to calculate surface area, area, and volume.
- Compare greater than, less than, equal/same squares and rectangles in 2 and 3 dimensions.
- Understand the following concepts and vocabulary: similar, area, length, width, volume, square, rectangle, prism.

Suggested Instructional Strategies:

- Model-Lead-Test ("Watch me…do together….you try")*
- Least-to-Most prompts *
- Teacher does the tiling. Student counts as tiles are taken off. Student may use an electronic counter.
- Use scale drawings of geometric figures to connect understandings of proportionality and similarity and congruence

Suggested Supports and Scaffolds:

- Hollow square and rectangular boxes
- Blocks or tiles to place in the boxes
- 1-inch tiles
- Raised grid with numbered squares
- Interactive whiteboard that allows for student to move tiles on or off the figure
- Graph paper
- Dot paper
- Real-world materials

CCSS: N.Q.1 Use units to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCC: H.ME.1a2 Solve real-world problems involving units of measurement.

Strand: Measurement

Family: Problem Solving Using Measurement Processes

Progress Indicator: *H.ME.1a Making decisions about units and scales that are appropriate for problem-solving situations within or across mathematics disciplines or real-world contexts*

Concrete Understandings:

- Determine what units are used in problem (e.g., money, time, units of measurement, etc.).
- Match the action of combining with vocabulary (i.e., in all; altogether) or the action of decomposing with vocabulary (i.e., have left; take away, difference) in a word problem.

Representation:

- Apply conversions of units while solving problems (e.g., Recognize that monetary units can be combined to equal other monetary units).
- Translate wording into numeric equation.

Suggested Instructional Strategies:

- Task analysis
- Model-Lead-Test *
- Least-to-Most prompts*
- Create relevant, story-based problems. For example, the story may be used to solve a problem about money and shopping at the grocery store. Use graphic organizers to provide students a means for organizing their work. Break down and isolate each step in solving the math task.

Suggested Supports and Scaffolds:

- $1, $5, and $10 bills
- Number line labeled with $1/unit, $5/unit, and $10/unit
- Calculator, software that counts, or other means of hand tallying
- Graph paper where each square equals a unit

CCSS: A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

CCC: H.ME.1b2 Solve a linear equation to find a missing attribute given the area, surface area, or volume and the other attribute.

Strand: Measurement

Family: Perimeter, Area, and Volume Problems

Progress Indicator: *H.ME.1b Investigating the results when linear dimensions of objects change by some factor (e.g., area and volume change disproportionately: area in proportion to the square of the factor and volume in proportion to its cube)*

Concrete Understandings:

- Understand concepts of area, volume, width, length, height, equals.
- Identify the unknown quantity when given an equation and labeled figure. (E.g., Provide a labeled prism and the equation V=L×H. Ask the student to draw/indicate the label on the prism to the letter in the equation.)
- Identify the unknown quantity when given an equation and labeled figure.
- Multiply and divide to find measurement.

Representation:

- Given a picture, identify dimensions needed to calculate surface area, area, and volume.
- Understand formula representation (e.g., “h” in the equation means height).
- Use letters to represent numbers.
- Use letters to represent variables.
- Recognize symbols for equals, addition (+), and multiplication (×).

Suggested Instructional Strategies:

- Tiling/fill-in space and count
- Sequence: 1. Area 2. Volume 3. Missing attribute
- “If the area of a rectangle is 24cm² and it has a base of 6cm, what would the height be?”
- Task analysis with Least Intrusive Prompts
- Replace a letter (variable representing an unknown quantity) with a number or representation of a number (symbols, manipulatives).
- Provide a labeled prism and the equation V = L x W x H. Ask the student to draw/indicate the label on the prism to the letter in the equation. Break down and isolate each step in solving the math task.
- Provide nets to be taken apart (unfolding) to illustrate three-dimensional objects. This process can also be used for the study of the surface area of prisms.

Suggested Supports and Scaffolds:

- Pre-made formula

- Use of calculator
- Manipulatives (2-D shapes, prism, cube (e.g., box))
- Counters (e.g., tally counter) and counting mechanism (e.g., number line)