

Measurement 1

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(K-4) Elementary School Learning Targets

ME-1 Explore relationships among units, attributes, and measures within a system of measurement:

- Identify measurement attributes and units.
- Use measurement attributes to describe and compare objects, situations, or events.

(5-8) Middle School Learning Targets

ME-1 Extend understanding of attributes and units:

- Make conversions within measurement systems.
- Relate measurement attributes, measures, models, and formulas.

(9-12) High School Learning Targets

ME-1 Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.

Grade Differentiation

Elementary School Progress Indicators

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

K.ME.1a1 Describe objects in terms of measurable attributes (longer, shorter, heavier, lighter...)

Measurement and Data

K MD Describe and compare measurable attributes.

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

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

K.ME.1b1 Sort objects by characteristics (e.g., big/little, colors, shapes, etc.)

Measurement and Data

K MD Classify objects and count the number of objects in each category.

K. MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

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)

Measurement and Data

K MD Describe and compare measurable attributes.

K.MD.A.2 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.*

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

1.ME.1a2 Identify minutes and hours on a digital clock

Measurement and Data

1 MD Tell and write time.

1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.

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

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

Measurement and Data

1 MD Measure lengths indirectly and by iterating length units.

1. MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.ME.1b4 Compare the lengths of two objects indirectly by using a third object

Measurement and Data

1 MD Measure lengths indirectly and by iterating length units.

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

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

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

Measurement and Data

1 MD Measure lengths indirectly and by iterating length units.

1.MD.A.2 Express length of an object as a whole number of lengths unit 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.*

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

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

Measurement and Data

2 MD Measure and estimate lengths in standard units.

1.MD.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.ME.1a4 Solve word problems using dollar bills, quarters, dimes, nickels, or pennies
Measurement and Data

2 MD Work with time and money.

2.MD.C.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies using \$ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

2.ME.1a5 Tell time to the nearest ½ hour using digital clocks

Measurement and Data

1 MD Tell and write time.

1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.

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

1.ME.1b5 Solve word problems involving the difference in standard length units

Measurement and Data

2 MD Measure and estimate lengths in standard units.

2.MD.A.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard-length unit.

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

2.ME.1c2 Measure the attributes (length, width, height) of an object using 2 different size units

Measurement and Data

2 MD Measure and estimate lengths in standard units.

2.MD.A.2 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.

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

Measurement and Data

1 MD Measure and estimate lengths in standard units.

2.MD.A.3. Estimate lengths using units of inches, feet, centimeters, and meters.

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

2.ME.1a1 Tell time to the nearest 5 minutes using a digital clock

Measurement and Data

2 MD Work with time and money.

2.MD.C.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

3.ME.1a2 Solve word problems involving the addition and subtraction of time intervals of whole hours or within an hour (e.g., whole hours: 5:00 to 8:00, within hours: 7:15 to 7:45)

Measurement and Data

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

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.

Progress Indicator: E.ME.1d describing and demonstrating unit attributes, iterating, tiling, identical units, number line intervals, standardization, proportionality, additivity, and origin
3.ME.1d1 Use tiling and addition to determine area

Measurement and Data

3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD.C.7a Relate area to the operations of multiplication and addition.

a) 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.

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

Measurement and Data

3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

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

Progress Indicator: E.ME.1e justifying the need for measuring with standard units as compared to non-standard units

Progress Indicator: E.ME.1f selecting the appropriate unit for measuring a given attribute (length, area, mass, liquid volume, size of angle), recognizing that a unit must have the same attributes as the object (e.g., unit of length must measure an object that has length)

3.ME.1f1 Select appropriate units for measurement (liquid volume, area, time, money)

Measurement and Data

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

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

3.ME.1f2 Add to solve 1 step word problems

Measurement and Data

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

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.

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

3.ME.1g1 Identify a figure as getting larger or smaller when the dimensions of the figure change

Measurement and Data

3 MD Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

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.

Progress Indicator: E.ME.1f selecting the appropriate unit for measuring a given attribute (length, area, mass, liquid volume, size of angle), recognizing that a unit must have the same attributes as the object (e.g., unit of length must measure an object that has length)

4.ME.1f3 Select appropriate units for measurement: mass, length, angles

4.ME.1f4 Select appropriate units for the value of a set of coins or dollars

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

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

Measurement and Data

4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

4.MD.A.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.A.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.*

Progress Indicator: M.ME.1a identifying and describing measurable attributes (including area, surface area, volume, fractional units, absolute value with temperature), and selecting appropriate customary or metric units of measure when solving problems

5.ME.1a1 Identify the appropriate units of measurement for different purposes in a real-life context (e.g., measure a wall using feet, not inches)

Measurement and Data

4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

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

5.ME.1b1 Convert standard measurements of time

Measurement and Data

5 MD Convert like measurement units within a given measurement system.

5.MD.A.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.

5.ME.1b2 Convert standard measurements of length

Measurement and Data

5 MD Convert like measurement units within a given measurement system.

5.MD.A.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.

5.ME.1b3 Convert standard measurements of mass

Measurement and Data

5 MD Convert like measurement units within a given measurement system.

5.MD.A.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.

Middle School Progress Indicators

Progress Indicator: M.ME.1a identifying and describing measurable attributes (including area, surface area, volume, fractional units, absolute value with temperature), and selecting appropriate customary or metric units of measure when solving problems

6.ME.1a2 Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real-life situation.

Geometry

6 G Solve real-world and mathematical problems involving area, surface area, and volume. context

6.G.A.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

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l w h$ and $V = b h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

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

6.ME.1b4 Complete a conversion table for length, mass, time, volume

Ratios and Proportional Relationships

6 RP Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.3d Use ratios and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

6.ME.1b5 Analyze table to answer questions

Ratios and Proportional Relationships

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6.RP.A.3d Use ratios and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Progress Indicator: M.ME.1c recognizing how the formulas for area and volume for a variety of shapes and solids are related

6.ME.1c1 Find the area of a 2-dimensional figure and the volume of a 3-dimensional figure

Geometry

6 G Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l w h$ and $V = b h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Progress Indicator: M.ME.1d applying proportional reasoning to problems with ratios of length, area, and quantities measured in like or different units

7.ME.1d1 Solve problems that use proportional reasoning with ratios of length and area

Geometry

7 G Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.A.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

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)

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

Geometry

8 G Understand congruence and similarity using physical models, transparencies, or geometry software.

8.G.A.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.

8.ME.1e1 Compare area and volume of similar figures

Geometry

8 G Understand congruence and similarity using physical models, transparencies, or geometry software.

8.G.A.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.

High School Progress Indicators

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

H.ME.1a1 Determine the necessary unit(s) to use to solve real world problems

Quantities

N Q Reason quantitatively and use units to solve problems.

HSN.Q.A.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.

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

Quantities

N Q Reason quantitatively and use units to solve problems.

HSN.Q.A.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.

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)

H.ME.1b1 Describe the relationship between the attributes of a figure and the changes in the area or volume when 1 attribute is changed

Expressing Geometric Properties with Equations

G MG Explain volume formulas and use them to solve problems.

HSG.MG.A.1 Use geometric shapes and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

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

Reasoning with Equations and Inequalities

A REI Solve equations and inequalities in one variable.

HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.