

Measurement 2

MSAA Instructional Resource Guide, Revised June 2025 from the NCSC content developed as part of the National Center and State Collaborative under a grant from the US Department of Education.

(K 4) Elementary School Learning Targets

E ME 2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements

(5 8) Middle School Learning Targets

M.ME 2 Apply appropriate techniques, strategies, and formulas to solve problems involving measurements (including derived measurements and rates)

(9 12) High School Learning Targets

H ME 2 Apply and analyze techniques at an appropriate level of precision and use formulas to quantify or interpret abstract events, objects, and situations

Grade Differentiation

Elementary School Progress Indicators

Progress Indicator E ME.2a applying non standard and common standard units to measure (length height weight, time)

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

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 lengths measurement of an object is the number of same size length units that span it with no gaps or overlaps. *Limit to context where the object being measure is spanned by a whole number of length units with no gaps or overlaps*

1.ME.2a2 Use time to sequence up to 3 events, using a digital or analog 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.2b selecting tools and using units of measures appropriately and consistently, with no gaps or overlaps in the technique of measuring

1.ME.2b1 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object end to end

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 lengths measurement of an object is the number of same size length units that span it with no gaps or overlaps *Limit to context where the object being measure is spanned by a whole number of length units with no gaps or overlaps*

Progress Indicator: E ME2c recognizing situations that require precision and those where an estimation or proportional matching is appropriate

Progress Indicator: E ME2d describing a unit as an amount/quantity (rather than an object or a mark on a scale)

Progress Indicator E ME.2a applying non standard and common standard units to measure (length, height, weight, time)

1.ME.2a3 Estimate the length of an object using units of feet and inches

Measurement and Data

2 MD Measure and estimate lengths in standard units

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

2.ME.2a4 Solve one step subtraction problems involving the difference of the lengths of two objects 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.2b selecting tools and using units of measures appropriately and consistently, with no gaps or overlaps in the technique of measuring

2.ME.2b2 Select appropriate tools and demonstrate or identify appropriate measuring techniques

Measurement and Data

2.MD Measure and estimate lengths in standard units.

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

Progress Indicator: E.ME2c recognizing situations that require precision and those where an estimation or proportional matching is appropriate

2.ME.2c1 Determine whether a situation calls for a precise measurement or an estimation

Progress Indicator: E.ME2d describing a unit as an amount/quantity (rather than an object or a mark on a scale)

Progress Indicator: E.ME.2e selecting and applying appropriate customary or metric units and tools to measure or estimate (liquid volume, mass, perimeter, area, time, and angles)

**3.ME.2e1 Select appropriate tool for measurement: liquid volume, area, time, money
Measurement and Data**

2 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.2e2 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch

Measurement and Data

3 MD Represent and interpret data

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

3.ME.2e3 Measure to solve problems using number lines and ruler to 1 inch, $\frac{1}{2}$ inch, or $\frac{1}{4}$ of an inch

Measurement and Data

3 MD Represent and interpret data

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

Progress Indicator E ME.2h using a variety of strategies (decomposing complex shapes using counting strategies, arrays, formulas) to estimate or measure area and perimeter (including irregular shapes/objects)

3.ME.2h1 Use addition to find the perimeter of a rectangle

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 2i selecting and using benchmarks to estimate measurements

3.ME.2i1 Estimate liquid volume

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 2e selecting and applying appropriate customary or metric units and tools to measure or estimate (liquid volume, mass, perimeter, area, time, and angles)

4.ME.2e4 Select appropriate tool for measurement mass, length, angles

Measurement and Data

4 MD Geometric measurement understand concepts of angle and measure angles

4.MD.C.6 Measure angles in whole number degrees using a protractor. Sketch angles of specified measure.

4.ME.2e5 Construct a given angle

Measurement and Data

4 MD Geometric measurement understand concepts of angle and measure angles

4.MD.C.6 Measure angles in whole number degrees using a protractor. Sketch angles of specified measure.

4.ME.2e6 Measure right angles using a tool (e.g., angle ruler, protractor)

Measurement and Data

4 MD Geometric measurement understand concepts of angle and measure angles

4.MD.C.6 Measure angles in whole number degrees using a protractor. Sketch angles of specified measure.

Progress Indicator: E ME 2f recognizing relative sizes of units of measure and making simple conversions within systems when solving problems (e.g., 12 in. = 1 ft)

4.ME.2f1 Complete a conversion table for length and mass within a single system

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 1, 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: E ME 2g recognizing situations that require precision (money, time, distances, fractions, decimals) and those where an estimation is appropriate

4 ME 2g1 Determine whether a situation calls for a precise measurement or an estimation (distance, volume, mass, 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

Progress Indicator E ME.2h using a variety of strategies (decomposing complex shapes using counting strategies, arrays, formulas) to estimate or measure area and perimeter (including irregular shapes/objects)

3.ME.2h1 Apply the formulas for area and perimeter to solve real world problems

Measurement and Data

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

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

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

3.MD.C.7 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.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

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.2a selecting and applying appropriate standard units, tools, and level of precision in real-world measurement problems (e.g., area, surface area, volume rate)

5.ME.2a1 Solve problems involving conversions of standard measurement units when finding area, volume, time lapse, or 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 and use these conversions in solving multi-step, real world 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)

5.ME.2b1 Use filling and multiplication to determine volume

Measurement and Data

5 MD Geometric measurement understand concepts of volume and relate volume to multiplication and to addition

5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units

5.ME.2b2 Apply formula to solve one step problems involving volume

Measurement and Data

5 MD Geometric measurement understand concepts of volume and relate volume to multiplication and to addition

5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume

b) Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems

Middle School Progress Indicators

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

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)

Ratios and Proportional Relationships

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

6.RP.A.3 Use ratio 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.

b) 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?*

6.ME.2a3 Apply the formula to find the area of triangles

Geometry

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

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.

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)

6.ME.2b3 Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles squares triangles) to measure area

Geometry

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

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.ME.2b4 Decompose complex 3-D shapes into simple 3-D shapes to measure volume

Measurement and Data

5 MD Geometric measurement understand concepts of volume and relate volume to multiplication and to addition

5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume

a) Find the volume of a right rectangular prism with whole number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole number products as volumes, e.g., to represent the associative property of multiplication

Progress Indicator M ME.2c selecting and applying appropriate standard units and tools to measure to an appropriate level of precision

7.ME.2c1 Solve one step real world measurement problems involving area, volume, or surface area of two and three dimensional objects

Geometry

7 G Solve real life and mathematical problems involving angle measure, area, surface area, and volume

7.G.B.6 Solve real world and mathematical problems involving area, volume and surface area of two and three dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms

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

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

Geometry

7 G Solve real life and mathematical problems involving angle measure, area, surface area, and volume

7.G.B.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.

Progress Indicator M ME.2e solving simple problems involving scale factors rates, and derived measures

7.ME.2e1 Solve one step real world problems related to scaling

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.

7.ME.2e2 Solve one step problems involving unit rates associated with ratios of fractions Ratios and Proportional Relationships

7 RP Analyze proportional relationships and use them to solve real world and mathematical problems

7 RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour*

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

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

Geometry

8 G Solve real world and mathematical problems involving volume of cylinders, cones, and spheres

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

Progress Indicator: M.ME 2f applying the Pythagorean Theorem to determine lengths/distances in real world situations

8.ME.2f1 Apply the Pythagorean Theorem to determine lengths/distances in real world situations

8 G Understand and apply the Pythagorean Theorem

8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real world and mathematical problems in two and three dimensions

High School Progress Indicators

Progress Indicator H ME.2a analyzing levels of precision, accuracy, and approximate error in measurement situations

H ME 2a1 Describe the accuracy of measurement when reporting quantity (you can lessen your limitations by measuring precisely)

Quantities

N Q Reason quantitatively and use units to solve problems

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

Progress Indicator H ME.2b using techniques of measurement, estimating, or calculating to compare or analyze two and three dimensional figures and their parts

H.ME.2b1 Determine the dimensions of a figure after dilation

Similarity, Right Triangles, and Trigonometry

G SRT Understand similarity in terms of similarity transformations

HSG.SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor

- a) A dilation takes a line not passing through the center of the dilation to a parallel line and leaves a line passing through the center unchanged.
- b) The dilation of a line segment is longer or shorter in the ratio given by the scale factor

H ME 2b2 Determine if two figures are similar

Similarity, Right Triangles, and Trigonometry

G SRT Understand similarity in terms of similarity transformations

HSG SRT A 2 Given two figures use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides

H ME 2b3 Describe or select why two figures are or are not similar

Similarity, Right Triangles, and Trigonometry

G SRT Understand similarity in terms of similarity transformations

HSG SRT A 2 Given two figures use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides

H.ME.2b4 Apply the formula to the area of a sector (e.g., area of a slice of pie)

Circles

G C Find arc lengths and areas of sectors of circles

HSG.C.B.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector

H.ME.2b5 Apply the formula of geometric figures to solve design problems (e.g., designing an object or structure to satisfy physical restraints or minimize cost)

Modeling with Geometry

G MG Apply geometric concepts in modeling situations

HSG.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost working with typographic grid systems based on ratios)