

Strand III - Geometry, Spatial Sense, And Measurement:

The student demonstrates an understanding of concepts, properties, and relationships of geometry and measurement through experiences with meaningful mathematical problems that focus on identifying, describing, classifying, visualizing, comparing, estimating, and measuring various aspects of shapes and sizes.

Benchmark (K – 5): The student explores and uses two- and three-dimensional shapes and understands their locations and transformations in spatial plane. The student identifies, transforms and builds shapes. The student uses measurement systems, chooses the appropriate unit to measure with, and begins to use formulas to solve measurement problems.

Performance Standards:

Kindergarten:

Geometry

- **Sorts and matches** shapes according to attributes.
- **Uses** spatial vocabulary (e.g., left, right, above, below) to describe relative position.
- **Describes, identifies, models, and draws** circles, squares, rectangles, and triangles.
- **Describes and identifies** spheres, cubes, and cones.
- **Compares** size of plane geometric figures.
- **Identifies and describes** objects in the environment that depict geometric shapes and solids.
- **Builds and takes-apart** pictures, shapes, and structures formed with geometric shapes.

Measurement

- **Measures** using estimation and direct comparison of objects against one another.
- **Describes, records, and reports** comparisons in length, weight, and capacity.
- **Compares and orders** objects by length, weight, and capacity.
- **Represents** mathematical work with manipulatives.

Time

- **Identifies** the calendar as a tool for keeping track of time and events.
- **Names** the days of the week, months, and seasons of the year.
- **Identifies** birthdate.
- **Reads** an analog and digital clock to the hour.

Money

- **Identifies** penny, nickel, dime, and quarter.

First Grade:

Geometry

- **Identifies, describes, and compares two-dimensional** shapes (e.g., rectangles, circles, triangles, squares, hexagons, rhombus, trapezoid).
- **Develops** vocabulary to describe two-dimensional shapes.
- **Constructs and takes apart two-dimensional** shapes.
- **Uses** rotation and reflection to rearrange shapes.
- **Sorts and groups** shapes according to common attributes.
- **Identifies, describes, and compares three-dimensional** shapes (e.g., cubes, cylinders, rectangular solids, and spheres).

- **Develops** vocabulary to describe three-dimensional shapes (e.g., corners, faces, and edges).
- **Describes two-dimensional** shapes found in three-dimensional figures (e.g., a cube has 6 square faces).
- **Identifies three-dimensional** shapes from two-dimensional representations (e.g., nets).
- **Recognizes** geometry as a means of describing the physical world.

Measurement

- **Develops** vocabulary to describe and compare length (e.g., longer, shorter).
- **Estimates and orders** length by directly comparing the length, weight, and capacity of objects.
- **Estimates, measures, and compares** length, weight, and capacity using nonstandard units (e.g., measure an object with your hand).
- **Represents** measurements with numbers, manipulatives, and pictures.

Money

- **Identifies** the value of a penny, nickel, dime and quarter.
- **Models** different combinations of coins that equal the same value up to 25 cents.

Time

- **Tells** time to the nearest hour and half-hour, **using** analog (face) and digital clocks.
- **Sequences** days of the week, months, and events (e.g., classroom schedules, birthdays, and holidays).

Second Grade:

Geometry

- **Sorts, describes, and analyzes** shapes and solids by various attributes (e.g., faces, edges and comers).
- **Describes** the spatial and numerical relationships found among shapes.
- **Defines** circles, triangles, squares, rectangles, hexagons, rhombi, and trapezoids.
- **Compares and builds two-dimensional** (plane) and three-dimensional (solid) geometric shapes.
- **Describes** lines of symmetry in two-dimensional shapes.
- **Recalls and draws** a figure or dot pattern no longer in view, in order to develop visual memory.
- **Explains** how geometry helps describe the physical world.
- **Examines** the concept of area, using common geometric shapes.

Measurement

- **Compares** the length, weight, and capacity of objects using direct and indirect comparisons.
- **Estimates and measures** length, weight, and capacity using nonstandard units.
- **Compares** the effects of using units of different sizes.
- **Explores** the use of standard units and **explains** the need for using standard units.
- **Represents** the results of length, weight, and capacity comparisons.

Time

- **Reads and writes** time to the quarter hour using digital and analog (face) clocks.
- **Describes** the relationship between units of time (e.g., minutes in an hour, hours in a day, days in a week/month and year, months in a year).

Money

- **Identifies** the values and names of half-dollar and dollar.
- **Counts** various coin combinations using quarters, dimes, nickels, and pennies to sums of 50 cents.
- **Uses** the cent symbol, dollar symbol, and decimal point correctly.

Third Grade:

2-D Geometry

- **Demonstrates** transformations of geometric figures (e.g., flips, slides, rotations) and their effects on shapes and objects.
- **Describes and compares** symmetrical and congruent shapes.
- **Builds, sorts, and categorizes** polygons according to their attributes (e.g., sides, angles, etc.).
- **Measures** the areas of common quadrilaterals and **analyzes** the relationship between multiplication arrays and area.
- **Examines** grids and coordinate axes.
- **Represents and solves** problems using geometric models.

3-D Geometry

- **Constructs and describes** three-dimensional shapes (e.g., A cylinder is made of a rectangular face and 2 equal circular bases.).
- **Uses** nets (i.e., patterns) of solids to demonstrate the relationship between two-dimensional and three-dimensional shapes.
- **Builds** open boxes from two-dimensional nets (i.e., patterns) in order to estimate and compare volume.
- **Explains** geometry as a means of describing the physical world with particular attention to combining, subdividing, and changing shapes.
- **Uses** knowledge of geometry to develop spatial visual skills.

Measurement

- **Compares and measures** objects with respect to a given attribute (e.g., length, area, perimeter, volume, weight).
- **Uses** benchmarks (e.g., handspan, length of arm) to gain a sense of size of objects.
- **Selects and uses** standard measurement units in everyday situations.
- **Explains** the reasons for discrepant measurements of the same object in everyday situations.

Money

- **Uses** money concepts in everyday situations and **makes change** for a variety of amounts up to \$1.00.

Fourth Grade:

2-D Geometry

- **Describes** the relationships between points, lines, line segments, rays, and angles and **identifies and draws** their representations.
- **Uses** coordinate axes or a grid to display two-dimensional space and to locate points.
- **Defines** the terms: perpendicular, congruent, symmetrical, parallel, angles, and right angles.

3-D Geometry

- **Describes and constructs** examples of three-dimensional objects when looking at two-dimensional drawings.
- **Describes** how objects look from different views (e.g., top, front, side).
- **Uses** precise terms (e.g., edge, face, and vertex) to communicate effectively about three-dimensional objects.
- **Represents and solves** real-world problems using geometric models.

Measurement

- **Uses** both U.S. and metric tools for linear measurement, volume, and mass.
- **Explains** the relationship between a meter stick and base 10 number system.
- **Selects and uses** the appropriate tool based on the type and size of the unit to be measured and **explains** the selection (e.g., square units are used for finding areas and cubic units are used for finding volume).
- **Solves** problems involving perimeter and area using a variety of techniques.

Money

- **Counts, makes change, and solves** mathematical problems involving money.

Fifth Grade:

2-D Geometry

- **Defines and draws** examples of angles, triangles, and quadrilaterals of various types.
- **Uses** coordinate graphing to locate points, transform geometric figures, and determine similar shapes.
- **Solves** problems that involve perimeter, diameter, base, height, vertices, perpendicular lines, and angles using geometric models of two-dimensional shapes.

3-D Geometry

- **Builds** three-dimensional shapes and **relates** their attributes to two-dimensional shapes.
- **Explains** the changes of volume between different solids in which some dimensions remain constant while others vary.
- **Solves** problems that involve perimeter, diameter, base, height, vertices, perpendicular lines, and angles using geometric models of three-dimensional shapes.

Measurement

- **Uses** measures of money and time, U.S. and metric measures of length, weight, and volume to solve problems and **makes** estimates.
- **Carries out** simple unit conversions, (e.g., from centimeters to meters) within a system of measurement.
- **Practices** telling time and **applies** the concept of time (e.g., time zones, timelines, portions of hours) to solve everyday situations and **explains** when estimation vs. exact measurement is appropriate.

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The student demonstrates an understanding of concepts, properties, and relationships of geometry and measurement through experiences with meaningful mathematical problems that focus on identifying, describing, classifying, visualizing, comparing, estimating, and measuring various aspects of shapes and sizes.

Benchmark (6 – 8): The student understands the relationships between two- and three-dimensional shapes and identifies, builds, and transforms shapes. The student uses inductive and deductive arguments to solve problems. The student uses metric and U.S. measurement systems and selects the appropriate measurement unit for a given situation.

Performance Standards:

Sixth Grade:

2-D Geometry

- **Develops and tests** strategies for finding perimeters and areas.
- **Translates** strategies into formulas for areas and perimeters using appropriate math symbolism (e.g., square feet ft^2).
- **Selects and applies** appropriate formulas to solve problems.
- **Draws and explains** congruent two-dimensional figures using mathematical terminology.
- **Identifies and explains** the reflectional symmetry (mirror image) of familiar objects.

Circles

- **Explains** the properties of circles.
- **Explains** the relationship of pi and the circumference and diameter of a circle.
- **Solves** problems involving the area and circumference of circles.

Measurement

- **Measures** objects using U.S. and metric units for length, volume, mass, and area.
- **Explains** both metric and U.S. systems of measurement.
- **Converts** accurately from one unit to another accurately within the same system (e.g., 36 inches = 3 feet or 2 kilometers = 2000 meters).

Seventh Grade:

Geometric Relationships

- **Identifies and graphs** points on a coordinate plane using correct terminology.
- **Manipulates** coordinates to create reflections (flip), translations (slide), rotations (turn), and dilations (shrink and enlarge) of geometric figures on the coordinate plane.
- **Identifies** rotational (turning) symmetry in a variety of two-dimensional figures.

Angles

- **Draws, labels, measures, and classifies** acute, obtuse, right, and straight angles.
- **Solves** problems involving supplementary angles, complementary angles, vertical angles, and angles formed by the intersection of two parallel lines cut by a transversal.

Polygons

- **Identifies** patterns relating to diagonals, sides, number of angles, and number of degrees of the angles of polygons.
- **Examines** properties and classifications of triangles, quadrilaterals, and circles.
- **Defines** similarity in plane figures.
- **Examines** relationships between similar plane figures using proportions.

3-D Geometry

- **Develops** and **tests** strategies for finding volume and surface area of polyhedra, cylinders, and cones.
- **Translates** problem-solving strategies into formulas for surface area and volume using appropriate mathematical symbols (e.g., cubic feet = ft^3).
- **Selects and applies** appropriate formulas to solve problems.

Measurement

- **Uses** appropriate standard units for estimating measurements.
- **Finds** length, area, volume, and angle measures to appropriate levels of precision selecting appropriate techniques and tools.

Eighth Grade:

Geometric Relationships

- **Examines** the properties of congruence for triangles.
- **Translates** conjectures about triangle congruence into formal triangle congruence statements.
- **Differentiates** similarity and congruence using appropriate statements and vocabulary.
- **Uses** similarity and congruence to solve situational problems.
- **Examines** angle relationships within circles (e.g., central angles, inscribed angles, vertical angles).

The Pythagorean Theorem

- **Describes** the relationship among the three sides of a right triangle to explain the Pythagorean Theorem.
- **Applies** the Pythagorean Theorem in appropriate situations to solve problems involving triangles.