USD 368
Curriculum Guide

▲KS Assessment

Curricular Area: Math
Grade/Course: Geometry

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student analyzes functions in a variety of situations.

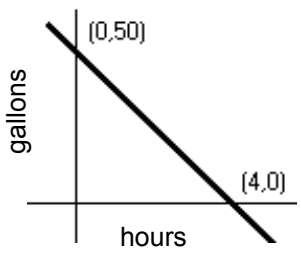
Knowledge Base Indicators

The student…
1. evaluates and analyzes functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology (2.4.K1a,d-f).
2. matches equations and graphs of constant and linear functions and quadratic functions limited to $y = ax^2 + c$ (2.4.K1d,f).
3. determines whether a graph, list of ordered pairs, table of values, or rule represents a function (2.4.K1e-f).
4. determines x- and y-intercepts and maximum and minimum values of the portion of the graph that is shown on a coordinate plane (2.4.K1f).
5. identifies domain and range of:
   a. relationships given the graph or table (2.4.K1e-f),
   a. linear, constant, and quadratic functions given the equation(s) (2.4.K1d).
6. ▲recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph (2.4.K1f) $.
7. uses function notation.
8. evaluates function(s) given a specific domain $.
6. describes the difference between independent and dependent variables and identifies independent and dependent variables $.

Application Indicators

The student…
1. translates between the numerical, graphical, and symbolic representations of functions (2.4.A1c-e) $.
2. ▲ interprets the meaning of the x- and y- intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation (2.4.A1e) $, e.g., the graph below represents a tank full of water being emptied. What does the y-intercept represent? What does the x-intercept represent? What is the rate at which it is emptying? What does the point (2, 25) represent in this situation? What does the point (2,30) represent in this situation?

The Water Tank



3. analyzes (2.4.A1c-e):
   a. the effects of parameter changes (scale changes or restricted domains) on the appearance of a function's graph,
   b. how changes in the constants and/or slope within a linear function affects the appearance of a graph,
   c. how changes in the constants and/or coefficients within a quadratic function in the form of $y = ax^2 + c$ affects the appearance of a graph.

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 4: Models – The student develops and uses mathematical models to represent and justify mathematical relationships found in a variety of situations involving tenth grade knowledge and skills.

Knowledge Base Indicators

The student…

1. knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
   a. equations and inequalities to model numerical and geometric relationships (1.4.K2c, 2.2.K3, 2.3.K1-2, 3.2.K7) **$**;
   b. function tables to model numerical and algebraic relationships (2.1.K1c, 2.2.K2, 2.3.K1, 2.3.K3, 2.3.K5) **$**;
   c. coordinate planes to model relationships between ordered pairs and equations and inequalities and linear and quadratic functions (2.2.K1, 2.3.K1-6, 3.4.K1-8) **$** ;
   d. constructions to model geometric theorems and properties (3.1.K2, 3.1.K6);
   e. two- and three-dimensional geometric models (geoboards, dot paper, coordinate plane, nets, or solids) and real-world objects to model perimeter, area, volume, and surface area, properties of two- and three-dimensional figures, and isometric views of three-dimensional figures (2.1.K1b, 3.1.K1-8, 3.2.K1, 3.2.K4-5, 3.3.K1-4);
   f. scale drawings to model large and small real-world objects;

Application Indicators

The student…

1. recognizes that various mathematical models can be used to represent the same problem situation. Mathematical models include:
   a. coordinate planes to model relationships between ordered pairs and equations and inequalities and linear and quadratic functions (2.2.A1, 2.3.A1-3, 3.4.A1-2, 3.4.A4) **$**;
   b. two- and three-dimensional geometric models (geoboards, dot paper, coordinate plane, nets, or solids) and real-world objects to model perimeter, area, volume, and surface area, properties of two and three-dimensional figures and isometric views of three-dimensional figures (3.3.A1, 4.2.A1c);
   c. scale drawings to model large and small real-world objects (3.3.A3, 3.4.A3);
   h. geometric models (spinners, targets, or number cubes), process models (coins, pictures, or diagrams), and tree diagrams to model probability (1.4.A1c, 4.2.A1, 4.2.A3);

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares and justifies their properties of geometric figures in a variety of situations.

Knowledge Base Indicators

The student…

1. recognizes and compares properties of two-and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology (2.4.K1h).
2. discusses properties of regular polygons related to (2.4.K1g-h):
   a. angle measures,
   b. diagonals.
3. recognizes and describes the symmetries (point, line, plane) that exist in three-dimensional figures (2.4.K1h).
4. recognizes that similar figures have congruent angles, and their corresponding sides are proportional (2.4.K1h).
5. uses the Pythagorean Theorem to (2.4.K1h):
   a. determine if a triangle is a right triangle,
   b. find a missing side of a right triangle.
6. recognizes and describes (2.4.K1g-h):
   a. congruence of triangles using: Side-Side-Side (SSS), Angle-Side-Angle (ASA), Side-Angle-Side (SAS), and Angle-Angle-Side (AAS);
   b. the ratios of the sides in special right triangles: 30°-60°-90° and 45°-45°-90°.
7. recognizes, describes, and compares the relationships of the angles formed when parallel lines are cut by a transversal (2.4.K1h).
8. recognizes and identifies parts of a circle: arcs, chords, sectors of circles, secant and tangent lines, central and inscribed angles (2.4.K1h).

Application Indicators

The student…

1. ▲solves real-world problems by (2.4.A1a):
   a. using the properties of corresponding parts of similar and congruent figures, e.g., scale drawings, map reading, or proportions;
   b. ▲ applying the Pythagorean Theorem, e.g., when checking for square corners on concrete forms for a foundation, determine if a right angle is formed by using the Pythagorean Theorem;
   c. using properties of parallel lines, e.g., street intersections.
2. uses deductive reasoning to justify the relationships between the sides of 30°-60°-90° and 45°-45°-90° triangles using the ratios of sides of similar triangles (2.4.A1a).
3. understands the concepts of and develops a formal or informal proof through understanding of the difference between a statement verified by proof (theorem) and a statement supported by examples (2.4.A1a).

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 2: Measurement and Estimation – The student estimates, measures and uses geometric formulas in a variety of situations.

Knowledge Base Indicators

The Student…

1. determines and uses real number approximations (estimations) for length, width, weight, volume, temperature, time, distance, perimeter area, surface area, and angle measurement using standard and nonstandard units of measure (2.4.K1a)$.
2. selects and uses measurement tools, units of measure, and level of precision appropriate for a given situation to find accurate real number representations for length, weight, volume, temperature, time, distance, area, surface area, mass, midpoint, and angle measurements (2.4.K1a)$.
3. approximates conversions between customary and metric systems given the conversion unit or formula (2.4.K1a).
4. states, recognizes, and applies formulas for (2.4.K1h) $:
   a. perimeter and area of squares, rectangle, and triangles;
   b. circumference and area of circles;
   c. volume of rectangular solids.
5. uses given measurement formulas to find perimeter, area, volume, and surface area of two- and three-dimensional figures (regular and irregular) (2.4.K1h).
6. recognizes and applies properties of corresponding parts of similar and congruent figures to find measurements of missing sides (2.4.K1a).
7. knows, explains, and uses ratios and proportions to describe rates of change (2.4.K1d) $, e.g., miles per gallon, meters per second, calories per ounce, or rise over run.

Application Indicators

The student…

1. solves real-world problems by (2.4.A1a) $:
   a. finding the perimeter and the area of circles, squares, rectangles, triangles, parallelograms, and trapezoids, e.g., a track is made up of a rectangle with dimensions 100 meters by 50 meters with semicircles at each end (having a diameter of 50 meters). What is the distance of one lap around the inside lane of the track?
   b. finding the volume and the surface area of rectangular solids and cylinders, e.g., if a car engine has 6 cylinders and each cylinder has a height of 8.4 cm and a diameter of 8.8 cm, then what is the total volume of the cylinders?
   c. using the Pythagorean theorem, e.g., a baseball diamond is a square with 90 feet between each base. What is the approximate distance from home plate to second base?
2. estimates to check whether or not measurements or calculations for length, weight, volume, temperature, time, distance, perimeter, area, surface area, and angle measurement in real-world problems are reasonable and adjusts original measurement or estimation based on additional information (a frame of reference) (2.4.A1a) $.

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 3: Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.

Knowledge Base Indicators

The student…

1. generates a two-dimensional representation of a three-dimensional figure (2.4.K1a).

Application Indicators

The student…

1. ▲analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders (2.4.A1f), e.g., reducing by a factor of ½ multiplies an area by a factor of ¼ and multiplies the volume by a factor of 1/8, whereas, rotating a geometric figure does not change perimeter or area.
2. describes and draws a simple three-dimensional shape after undergoing one specified transformation without using concrete objects to perform the transformation (2.4.A1a).
3. uses a variety of scales to view and analyze two- and three-dimensional figures (2.4.A1g).
4. analyzes and explains transformations using such things as sketches and coordinate systems (2.4.A1a).

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 4: Geometry from an Algebraic Perspective – The student uses an algebraic perspective to analyze the geometry of two-and three-dimensional figures in a variety of situations.

Knowledge Base Indicators

1. recognizes and examines two- and three-dimensional figures and their attributes including the graphs of functions on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology (2.4.K1f).
2. determines if a given point lies on the graph of a given line or parabola without graphing and justifies the answer (2.4.K1f).
3. calculates the slope of a line from a list of ordered pairs on the line and explains how the graph of the line is related to its slope (2.4.K1f).
4. ▲ finds and explains the relationship between the slopes of parallel and perpendicular lines (2.4.K1f), e.g., the equation of a line 2x + 3y = 12. The slope of this line is 2/3. What is the slope of a line perpendicular to this line? Write an equation for a line perpendicular to 2x + 3y = 12 (or for multiple choice: Which is an equation of a line perpendicular to 2x + 3y = 12?
5. uses the Pythagorean Theorem to find distance (may use the distance formula) (2.4.K1f).
6. ▲recognizes the equation of a line and transforms the equation into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line (2.4.K1f).

7. recognizes the equation $y = ax^2 + c$ as a parabola; represents and identifies characteristics of the parabola including opens upward or opens downward, steepness (wide/narrow), the vertex, maximum and minimum values, and line of symmetry; and sketches the graph of the parabola (2.4.K1f).
8. explains the relationship between the solution(s) to systems of equations and systems of inequalities in two unknowns and their corresponding graphs (2.4.K1f), e.g., for equations, the lines intersect in either one point, no points, or infinite points; and for inequalities, all points in double-shaded areas are solutions for both inequalities.

Applicators Indicators

The student…
1. represents, generates, and/or solves real-world problems that involve distance and two-dimensional geometric figures including parabolas in the form $ax^2 + c$ (2.4.A1e), e.g., compare the heights of 2 different objects whose paths are represented $h_1(t) = 3t^2 + 1$ and $h_2(t) = \frac{1}{2}t^2 + 4$ (where h represents the height in feet and t represents elapsed time in seconds) after 5 seconds.
2. translates between the written, numeric, algebraic, and geometric representations of a real-world problem (2.4.A1a-e) **($)**, e.g., given a situation, write a function rule, make a T-table of the algebraic relationship, and graph the order pairs.
3. recognizes and explains the effects of scale changes on the appearance of the graph of an equation involving a line or parabola (2.4.A1g).
4. analyzes how changes in the constants and/or leading coefficients within the equation of a line or parabola affects the appearance of the graph of the equation (2.4.A1e).