



Sparta Area School District

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Course Outcome Summary

Course Information: **Geometry**

Description: Geometry is a course designed for those who plan to attend college and those who plan a career in industrial occupations. Among the benefits derived from a study of geometry are development of independent thinking and problem solving skills and the appreciation of geometric forms in our environment. Proofs are introduced to stimulate original and logical thought. Students will utilize the computer program Sketchpad to construct and investigate geometric shapes and relationships. Problem solving skills will also be emphasized. Most colleges require Algebra, Geometry and Algebra 2 for admission. A scientific, non-graphing, calculator is **REQUIRED** for this course. Incoming freshmen must have earned a B or better in 8th grade Algebra I in order to take Geometry as a freshman.

Instruction Level: Regular

Total Credits: 2

Prerequisites: Algebra 1 (Grade of C or better strongly recommended)

Textbooks: *Geometry*, Ron Larson, Laurie Boswell, Timothy D. Kanold, Lee Stiff, McDougal Littell, 978-0-6185-9540-2

Course Standards:

- Order fractions
- Find and use the least common multiple
- Work with numerical factors
- Work with squares and square roots of numbers
- Work with cubes and cube roots of numbers
- Build functions and write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions)
- Solve real-world problems by using first-degree equations
- Solve first-degree inequalities when the method does not involve reversing the inequality sign
- Match compound inequalities with their graphs on the number line (e.g., $-10.5 < x \leq 20.3$)
- Identify solutions to simple quadratic equations
- Solve quadratic equations in the form $(x + a)(x + b) = 0$, where a and b are numbers or variables

- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)
- Understand the concept of a function as having a well-defined output value at each valid input value
- Understand the concept of domain and range in terms of valid input and output, and in terms of function graphs
- Interpret statements that use function notation in terms of their context
- Find the domain of polynomial functions and rational functions
- Find the range of polynomial functions
- Find where a rational function's graph has a vertical asymptote
- Evaluate polynomial functions, expressed in function notation, at integer values
- Build functions and use quantitative information to identify graphs for relations that are proportional or linear
- Attend to the difference between a function modeling a situation and the reality of the situation
- Use several angle properties to find an unknown angle measure
- Count the number of lines of symmetry of a geometric figure
- Use symmetry of isosceles triangles to find unknown side lengths or angle measures
- Find the coordinates of a point rotated 180° around a given center point
- Compute the perimeter of simple composite geometric figures with unknown side lengths
- Compute the area of triangles and rectangles when one or more additional simple steps are required
- Compute the area and circumference of circles after identifying necessary information
- Given the length of two sides of a right triangle, find the third when the lengths are Pythagorean triples
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths
- Determine the slope of a line from points or a graph
- Determine the slope of a line from an equation
- Match linear equations with their graphs in the coordinate plane
- Find the midpoint of a line segment
- Calculate the average given the frequency counts of all the data values
- Manipulate data from tables and charts
- Compute straightforward probabilities for common situations
- Use Venn diagrams in counting

Common Career and Technical Core:

1. 4C3: Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
2. CD4: Identify and apply employability skills.
3. GCA2: Assess benefits and challenges of working in diverse settings and on diverse teams.
4. LE1: Apply leadership skills in real-world, family, community and business and industry applications.

Unit

1. **Numbers and Quantity**
2. **Algebra: First Degree Equations and Inequalities**
3. **Algebra: Quadratics**
4. **Algebra: Functions**
5. **Geometry: Symmetry, Area, and Perimeter**
6. **Geometry: Right Triangle Geometry**
7. **Geometry: Lines, Midpoint, and Coordinate Geometry**
8. **Statistics and Probability**

Unit Outlines

1. Numbers and Quantity

The students will be able to order fractions using least common multiples. They will be able to square and cube numbers, as well as find the square root and cube root of numbers.

Standards:

- Order fractions
- Find and use the least common multiple
- Work with numerical factors
- Work with squares and square roots of numbers
- Work with cubes and cube roots of numbers

Essential Questions:

Students will be able to answer the question(s):

- How do I order fractions?
- How do I find squares and square roots of numbers?
- How do I find cubes and cube roots of numbers?

Review (Level 1) – Students can:

- Place decimals in order
- List first five multiples of a given number
- Factor integers less than 50
- Can identify a square root and solve simple square roots

Focus (Level 2 & 3) – Students can:

- Arrange three fractions from low to high (fractions not in lowest terms)
- Find missing number if another number and LCM is given
- Work with numerical factors
- Work with squares and square roots of numbers.

Secondary (Level 4) – Students can:

- Apply ordering of fractions based on real world applications
- Solve story problems that use ordering of fraction to solve the problems
- Solve problems factoring using variables and numbers
- Can apply square roots to real life

2. Algebra: First Degree Equations and Inequalities

The students will be able to solve multi-step equations and inequalities. They will be able to solve and graph compound inequalities.

Standards:

- Build functions and write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions)
- Solve real-world problems by using first-degree equations
- Solve first-degree inequalities when the method does not involve reversing the inequality sign
- Match compound inequalities with their graphs on the number line (e.g., $-10.5 < x \leq 20.3$)

Essential Questions:

Students will be able to answer the question(s):

- How can I create a an equation/inequality to model a real-world situation?
- What is a compound inequality?

Review (Level 1) – Students can:

- Can write a one variable algebraic expression from a written sentence
- Student can complete a one-step equation.
- Student can identify and inequality and compare integers.
- Be able to match inequalities with their graphs.

Focus (Level 2 & 3) – Students can:

- Can write a one variable algebraic expression, equation, or inequality from a written sentence
- Student can complete multiple step first degree equations
- Solve first degree inequalities when the method does not involve reversing the inequality sign.
- Be able to graph an inequality.

Secondary (Level 4) – Students can:

- Given a story problem they can write and solve a multivariable algebraic expression, equation, or inequality
- Given distracting information you will determine what is needed to solve the first-degree equation and solve the equation.
- Set up and solve first degree inequalities in a real world application.
- Set up and solve a compound inequality (with graph) from a real world situation.

3. Algebra: Quadratics

The students will be able to solve quadratic equations through factoring and using the quadratic formula.

Standards:

- Identify solutions to simple quadratic equations
- Solve quadratic equations in the form $(x + a)(x + b) = 0$, where a and b are numbers or variables
- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)

Essential Questions:

Students will be able to answer the question(s):

- How do I factor and solve quadratic equations?

Review (Level 1) – Students can:

- Identify a simple quadratic equations on a graph
- Solve a factored quadratic using whole numbers
- Know multiply and addition tables

Focus (Level 2 & 3) – Students can:

- Identify solutions to simple quadratic equations
- Solve a factored quadratic using decimals/fractions
- Solve quadratic equations in the form $(x + a)(x + b) = 0$, where a and b are numbers or variables
- Factor $x^2 + bx + c$, where c is a smaller number.

Secondary (Level 4) – Students can:

- Set up and solve a quadratic equation to solve real world problem
- Apply quadratic equations in factored form to area/profit problems
- Apply factoring skills to application problems

4. Algebra: Functions

The students will be able to Identify what numbers can be used in an equation that make sense. The students will be able to determine what values make sense coming out of the equation. They will be able to identify and use the graphs of different equations.

Standards:

- Understand the concept of a function as having a well-defined output value at each valid input value
- Understand the concept of domain and range in terms of valid input and output, and in terms of function graphs
- Interpret statements that use function notation in terms of their context
- Find the domain of polynomial functions and rational functions
- Find the range of polynomial functions
- Find where a rational function's graph has a vertical asymptote
- Evaluate polynomial functions, expressed in function notation, at integer values
- Build functions and use quantitative information to identify graphs for relations that are proportional or linear
- Attend to the difference between a function modeling a situation and the reality of the situation

Essential Questions:

Students will be able to answer the question(s):

- What is the domain and range of a function?
- What is a polynomial function?
- How do you find a vertical asymptote?
- What is function notation?
- How to determine the type of a function?

Review (Level 1) – Students can:

- Use ordered pairs to identify the difference between functions and non-functions.
- Understand that domain is input and range is output in problems
- Understand the meaning of the function notation
- Find the domain of linear functions.
- Find the range of linear functions.
- Identify vertical asymptotes from a graph
- Evaluate one-step polynomial functions.
- Given a function, complete a table of values
- Determine a reality of a situation

Focus (Level 2 & 3) – Students can:

- Use vertical line test to determine whether graph represents a function.
- Use domain and a given function to find a new range.
- Use function notations and given domain values to find range values.
- Find the domain of quadratic functions.
- Find the range of quadratic functions.
- Understand what makes vertical asymptotes in an equation
- Evaluate multiple-step polynomial functions.
- Be able to match functions with their graphs
- Use a function to model a situation

Secondary (Level 4) – Students can:

- Understand relationship between input and output of a function modeling a real-life application
- Apply domain and range to real-life situations and describe their meaning.
- Apply statements in function notation to real-life situations
- Find the domain of polynomials functions and rational functions as related to real-life situations.
- Find the range polynomials functions and rational functions as related to real-life situations.
- Apply an equation that uses vertical asymptotes to a real life situation.
- Apply polynomial functions to real-life situations.
- Use real-life information in a table format to identify whether the table represents a proportional or linear function.
- Use a real-life story problem to calculate and compare the values of a real-life situation and the model

5. Geometry: Symmetry, Area, and Perimeter

The students will be able to find angles of different polygons using line and rotational symmetry. After finding angles, the students will be able to use formulas for polygons to find perimeter and area. They will also compute the circumference and area of circles.

Standards:

- Use several angle properties to find an unknown angle measure
- Count the number of lines of symmetry of a geometric figure
- Use symmetry of isosceles triangles to find unknown side lengths or angle measures
- Find the coordinates of a point rotated 180° around a given center point
- Compute the perimeter of simple composite geometric figures with unknown side lengths
- Compute the area of triangles and rectangles when one or more additional simple steps are required
- Compute the area and circumference of circles after identifying necessary information

Essential Questions:

Students will be able to answer the question(s):

- How do I find an angle measurement in a polygon?
- How do I find a line of symmetry of a polygon?
- How do I find perimeter and area of polygons?
- How do I find area and circumference of a circle?
- How do I rotate a point on the coordinate plane 180° ?

Review (Level 1) – Students can:

- Define an angle
- Students can define symmetry and isosceles
- Students can define rotation
- Students can define perimeter
- Students can define area
- Students can define area and circumference

Focus (Level 2 & 3) – Students can:

- Use several angle properties to find an unknown angle measures
- Count the number of lines of symmetry of a geometric figure
- Use symmetry of isosceles triangles to find unknown side lengths or angles measures
- Find the coordinates of a point rotated 180° around a given center point
- Compute the perimeter of simple composite geometric figures with unknown side lengths
- Compute the area of triangles and rectangles when one or more additional simple steps are required
- Compute the area and circumference of circles after identifying necessary information.
- Use algebra properties along with angle properties to find unknown angle measures
- Describe the shape based on the number of lines of symmetry
- Use symmetry of isosceles triangles and algebra properties to find unknown side lengths or angles measures.
- Use algebra properties with rotation to find new points
- Use algebra properties to compute the perimeter of simple composite geometric figures
- Use algebra properties to compute the area of triangles and rectangles
- Use algebra properties to compute the area and circumference of circles after identifying necessary information

Secondary (Level 4) – Students can:

- Use angle properties to solve real-life application problems
- Use line symmetry to solve real-life application problems
- Apply properties of isosceles triangles to solve real-life problems
- Apply 180° rotational properties to real-life application problems
- Find the perimeter of simple composite geometric figure in real-life applications
- Compute the area of triangles and rectangles in real-life applications
- Compute the area and circumference of circles in real-life applications

6. Geometry: Right Triangle Geometry

The students will be able to use the Pythagorean Theorem and its converse and to use special relationships in right triangles. They will also use trigonometric ratios to solve right triangles.

Standards:

- Given the length of two sides of a right triangle, find the third when the lengths are Pythagorean triples
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths

Essential Questions:

Students will be able to answer the question(s):

- How can I use the Pythagorean Theorem to find the side lengths of a right triangle?
- How can I find an angle measurement in a right triangle?
- How can I use sine, cosine, and tangent to solve right triangles?

Review (Level 1) – Students can:

- Define a Pythagorean triple.
- Students can define sine, cosine, and tangent.

Focus (Level 2 & 3) – Students can:

- Use algebra properties to find the third side of a right triangle.
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.
- Use the ratio of the sides to find the angle (inverse of trigonometric functions)

Secondary (Level 4) – Students can:

- Apply the Pythagorean theorem (triple) to real-life applications
- Apply the trigonometric functions to real-life applications.

7. Geometry: Lines, Midpoint, Coordinate Geometry

The students will be able to determine the slope of a line from an equation, graph, or ordered pairs. They will be able to calculate the midpoint from ordered pairs.

Standards:

- Determine the slope of a line from points or a graph
- Determine the slope of a line from an equation
- Match linear equations with their graphs in the coordinate plane
- Find the midpoint of a line segment

Essential Questions:

Students will be able to answer the question(s):

- What is slope?
- How do I determine slope of a line from an equation and graph?
- How is linear equation related to its graph?
- How do I find a midpoint of a line segment?

Review (Level 1) – Students can:

- Students can define slope
- Find slope from slope-intercept form
- Students will be able to identify positive, negative, zero, and undefined slopes from a graph
- Students can define a midpoint

Focus (Level 2 & 3) – Students can:

- Determine the slope of a line from points or a graph
- Find slope from point-slope form
- Students will be able to find slope and y-intercept from a linear graph
- Find the midpoint of a line segment
- Find new points by using the slope and a point
- Determine the slope of a line from an equation
- Can match linear equations with their graphs
- Find endpoint when given an endpoint and a midpoint

Secondary (Level 4) – Students can:

- Use slope and points in real-life application.
- Find slope from an application problem
- Match linear equations with their graphs in real-life applications
- Find the midpoint of a real-life application problem

8. Statistics and Probability

Students will be able to calculate average and compute probabilities through the use of tables, charts, and Venn diagrams.

Standards:

- Calculate the average given the frequency counts of all the data values
- Manipulate data from tables and charts
- Compute straightforward probabilities for common situations
- Use Venn diagrams in counting

Essential Questions:

Students will be able to answer the question(s):

- How do I calculate average from a frequency chart?
- How do I organize data?
- How do I probability of a simple event?

Review (Level 1) – Students can:

- Students can define average
- Students can recognize and define tables and charts
- Understand the relationship of a probability.
- Understand what a Venn diagram is and what it represents

Focus (Level 2 & 3) – Students can:

- Calculate the average given the frequency counts of all the data values.
- Manipulate data from tables and charts
- Compute straightforward probabilities for common situations.
- Use Venn diagrams in counting
- Find a data value when given the average and the rest of the values.
- Understand the flaws or misrepresentation that may come from the data from tables and charts. (bias)
- Understand the differences of experimental and theoretical probability.
- Use Venn diagrams to compute probabilities

Secondary (Level 4) – Students can:

- Apply average given the frequency counts of all the data values in real-life applications
- Be able to manipulate data from tables and charts from real-life applications
- Compute straightforward probabilities of real-life situations
- Represent real-life situations using Venn diagram