Verona Public School District
Curriculum Overview

Geometry

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Curriculum Developed:
February 2012
August 2012
May 2016

Board Approval Date:
March 27, 2012
September 25, 2012
June 14, 2016

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Verona Public Schools Mission Statement:

The mission of the Verona Public Schools, the center of an engaged and supportive community, is to empower students to achieve their potential as active learners and productive citizens through rigorous curricula and meaningful, enriching experiences.

Course Description:

The Geometry curriculum is designed to enhance students' prior knowledge of geometric topics. This course will deepen student understanding of geometric concepts leading to the ability to prove geometric theorems. Topics for this course include: Congruence, Proofs, Constructions, Similarity, Right Triangles and Trigonometry, Circles, Expressing Geometric Properties with Equations, Geometric Measurement and Dimension, and Geometric Modeling. The course is designed to promote inquiry learning in which students have the ability to discover geometric concepts.

Prerequisite(s):

Algebra 1

Standard 8: Technology Standards

8.1: Educational Technology: *All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*	**8.2: Technology Education, Engineering, Design, and Computational Thinking - Programming:** *All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.*
A. Technology Operations and Concepts B. Creativity and Innovation C. Communication and Collaboration D. Digital Citizenship E. Research and Information Fluency **X** F. Critical thinking, problem solving, and decision making	A. The Nature of Technology: Creativity and Innovation B. Technology and Society **X** C. Design D. Abilities for a Technological World E. Computational Thinking: Programming

SEL Competencies and Career Ready Practices

Social and Emotional Learning Core Competencies: *These competencies are identified as five interrelated sets of cognitive, affective, and behavioral capabilities*	**Career Ready Practices:** *These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.*
Self-awareness: The ability to accurately recognize one's emotions and thoughts and their influence on behavior. This includes accurately assessing one's strengths and limitations and possessing a well-grounded sense of confidence and optimism.	**X** CRP2. Apply appropriate academic and technical skills. CRP9. Model integrity, ethical leadership, and effective management. CRP10. Plan education and career paths aligned to personal goals.
Self-management: The ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals.	CRP3. Attend to personal health and financial well-being. CRP6. Demonstrate creativity and innovation. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity.
Social awareness: The ability to take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.	**X** CRP1. Act as a responsible and contributing citizen and employee. CRP9. Model integrity, ethical leadership, and effective management.
Relationship skills: The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups. This includes communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	**X** CRP4. Communicate clearly and effectively and with reason. CRP9. Model integrity, ethical leadership, and effective management. CRP12. Work productively in teams while using cultural global competence.
Responsible decision making: The ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.	CRP5. Consider the environmental, social, and economic impact of decisions. CRP7. Employ valid and reliable research strategies. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership, and effective management.

Standard 9: 21st Century Life and Careers

9.1: Personal Financial Literacy: *This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.*	**9.2: Career Awareness, Exploration & Preparation:** *This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.*	**9.3: Career and Technical Education:** *This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.*
A. Income and Careers B. Money Management C. Credit and Debt Management D. Planning, Saving, and Investing **X** E. Becoming a Critical Consumer F. Civic Financial Responsibility G. Insuring and Protecting	A. Career Awareness (K-4) B. Career Exploration (5-8) **X** C. Career Preparation (9-12)	A. Agriculture, Food & Natural Res. B. Architecture & Construction C. Arts, A/V Technology & Comm. D. Business Management & Admin. E. Education & Training F. Finance G. Government & Public Admin. H. Health Science I. Hospital & Tourism J. Human Services K. Information Technology L. Law, Public, Safety, Corrections & Security M. Manufacturing N. Marketing **X** O. Science, Technology, Engineering & Math P. Transportation, Distribution & Log.

Course Materials

Core Instructional Materials: *These are the board adopted and approved materials to support the curriculum, instruction, and assessment of this course.*	**Differentiated Resources**: *These are teacher and department found materials, and also approved support materials that facilitate differentiation of curriculum, instruction, and assessment of this course.*
● Pearson Geometry 2012 Ed.	● Delta Math ● NJCTL ● Pearson Sample PARCC items ● MAP Project ● Eureka Math Geometry ● Khan Academy Geometry

Verona High School/H.B. Whitehorne Geometry

Unit 1: Geometry Basics, Proofs & Lines	Unit Duration: 40 days

Stage 1: Desired Results

Established Goals:

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
G.CO.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas.

Transfer Goal:

Students will be able to <u>independently</u> use their learning to apply geometric properties and relationships to solve problems and correctly select valid reasons to justify their arguments

Students will understand that:

- Geometry is a field of study that analyzes spatial relationships which are developed by reasoning from the known to the unknown. All conclusions must have clear mathematical justification.
- You can use number operations to find and compare the lengths of segments and the measures of angles.
- Special angle pairs can help you identify geometric relationships.
- You can use formulas to find the midpoint, length, perimeter, and area of any figure in the coordinate plane.
- You can use given information, definitions, properties, postulates and previously proven theorems as a justification in a proof.
- You can use a straightedge and a compass to construct segments, bisectors, angles, parallel, and perpendicular lines.
- You can determine whether two lines are parallel or perpendicular by comparing their slopes.

Essential Questions:

- What are the building blocks of geometry?
- How can geometric representations and relationships apply to real world situations?
- What is proof?
- How is visualization of lines and angles essential to the study of the physical world?

Students will be skilled at:

- Point
- Line
- Plane
- Collinear points
- Coplanar
- Segment
- Ray
- Opposite rays
- Postulate
- Intersection
- Coordinate
- Distance
- Congruent segments and angles
- Midpoint
- Segment bisector
- Angles (Acute, Straight, Right, Obtuse)
- Vertex
- Sides
- Complementary angles
- Supplementary angles
- Vertical angles
- Adjacent angles
- Linear pairs
- Angle bisector
- Straightedge
- Compass
- Construction
- Perpendicular lines
- Perpendicular bisector
- Perimeter
- Area
- Circumference
- Reflexive Property
- Symmetric Property
- Transitive Property
- Algebraic Properties of Equality
- Theorem
- Polygon
- Convex
- Concave
- Equiangular
- Equilateral
- Parallel lines
- Skew lines
- Parallel planes
- Transversal
- Alternate Interior Angles
- Alternate Exterior Angles
- Corresponding Angles
- Consecutive Interior Angles
- Right Angles Congruence Theorem
- Congruent Supplements Theorem
- Congruent Complements Theorem
- Linear Pair Postulate
- Vertical Angles Congruence Theorem
- Slope

Students will be able to:

- find and compare lengths of segments
- find and compare measures of angles
- identify special angle pairs and use their relationships to find angle measures
- make basic constructions using a compass and straightedge
- find the midpoint of a segment
- find the distance between two points on a coordinate plane
- find the perimeter, circumference and area of basic shapes
- connect reasoning in algebra and geometry
- prove and apply theorems about segments and angles
- identify angles formed by two lines and a transversal
- prove theorems about parallel lines
- use properties of parallel lines to find angle measures
- determine whether two lines are parallel
- construct parallel and perpendicular lines
- relate slope to parallel and perpendicular lines

Stage 2: Acceptable Evidence

Transfer Task

The student will demonstrate the ability to solve mathematical and real-world problems using measurement and geometric models and will justify solutions and explain processes used.

Verona High School — Geometry

Unit 2: Triangle Theorems and Polygon Properties	Unit Duration: 35 days

Stage 1: Desired Results

Established Goals:

G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.CO.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.4 Use coordinates to use simple geometric theorems algebraically
G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula

Transfer Goal:

Students will be able to <u>independently</u> use their learning to connect the properties of triangles and quadrilaterals to real world situations.

Students will understand that:

- You can prove that two triangles are congruent.
- The angles and sides of isosceles and equilateral triangles have special relationships.
- You can sometimes use the congruent corresponding parts of one pair of congruent triangles to prove another pair of triangles congruent. (H)
- The measures of the angles of a triangle are related to the lengths of the opposite sides.
- In triangles that have two pairs of congruent sides, there is a relationship between the included angles and the third pair of sides. (H)
- Parallelograms have special properties regarding their sides, angles, and diagonals.
- The special parallelograms, rhombus, rectangle, and square, along with trapezoids and kites have basic properties about their sides, angles, and diagonals that help identify them. (H)
- You can classify figures in the coordinate plane using the formulas for slope, distance, and midpoint
- You can prove geometric relationships using variable coordinates for figures in the coordinate plane.

Essential Questions:

- Why prove triangles congruent?
- How can you use coordinate geometry to find and verify relationships within triangles and quadrilaterals?
- How can you solve problems that involve measurements of triangles and quadrilaterals in various situations?
- What are the criteria for triangles to be similar?
- How does this relate to transformations? How can a line drawn parallel to one of the sides of a triangle be used to solve problems involving triangles? How can the median be used?
- How does the perpendicular bisector of a segment relate to isosceles triangles? How can constructions be used to verify this?
- What are the properties of isosceles triangles and how can they be used to solve problems?
- How can the side of a triangle be partitioned into segments of a given ratio? How can this information be used to solve problems involving similar triangles?
- What are the criteria for triangles to be congruent? How does this relate to transformations?
- How does congruency relate to similarity?
- How can similarity and congruence be used to solve problems and/or prove statements about or properties of triangles?

Students will be know:

- Triangle Angle-Sum Theorem
- Triangle Exterior Angle Theorem
- Congruent polygons
- Congruent triangles
- Side-Side-SIde (SSS) Postulate
- Side-Angle-Side (SAS) Postulate
- Angle-Side-Angle (ASA) Postulate
- Angle-Angle-Side (AAS) Postulate
- Hypotenuse Leg (HL) Theorem
- Corresponding Parts of Congruent Triangles are Congruent (CPCTC)
- Scalene triangle
- Right triangle
- Acute triangle
- Obtuse triangle
- Equiangular Triangle
- Isosceles triangle
- Legs
- Base
- Vertex angle
- Base angles
- Isosceles Triangle Theorem
- Converse of the Isosceles Triangle Theorem
- Equilateral triangle
- Midsegment of a triangle
- Triangle Midsegment Theorem
- Triangle Inequality Theorem
- Hinge Theorem
- Parallelogram
- Parallelogram Properties
- Consecutive angles
- Rhombus
- Rectangle
- Square
- Trapezoid
- Kite
- Isosceles trapezoid
- Midsegment of a trapezoid
- Trapezoid Midsegment Theorem
- Distance formula
- Midpoint formula
- Slope formula
- Coordinate proof

Students will be able to:

- Find measures of angles of triangles
- Recognize congruent figures and their corresponding parts
- Prove two triangles congruent using SSS, SAS, ASA, AAS Postulates and HL Theorem
- Use triangle congruence and corresponding parts of congruent triangles to prove that parts of two triangles are congruent
- Use and apply properties of isosceles and equilateral triangles
- Identify congruent overlapping triangles (H)
- Prove two triangles are congruent using other congruent triangles (H)
- Use properties of midsegments to solve problems
- Use inequalities involving angles and sides of triangles
- Apply inequalities in two triangles (H)
- Use relationships among sides, angles and diagonals of parallelograms
- Determine whether a quadrilateral is a parallelogram
- Define and classify special types of parallelograms (rhombus, rectangle, squares) (H)
- Verify and use properties of trapezoids and kites (H)
- Classify polygons in the coordinate plane
- Name coordinates of special figures by using their properties
- Prove theorems using figures in the coordinate plane

Stage 2: Acceptable Evidence

Transfer Task

Students will be able to illustrate a variety of ways to prove two triangles are congruent given specific conditions. They will also be able to use triangle relationships and parallelograms to interpret and solve real world problems.

Verona High School — Geometry

Unit 3: Similarity	Unit Duration: 10 days

Stage 1: Desired Results

Established Goals:

G.SRT.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.
G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.4 Use coordinates to use simple geometric theorems algebraically

Transfer Goal:

Students will be able to independently use their learning of similar figures and scale drawings to model the properties of real objects using two-dimensional drawings.

Students will understand that:

- You can write a ratio to compare two quantities.
- You can use ratios and proportions to decide whether two polygons are similar and to find unknown side lengths of similar figures.
- You can show that two triangles are similar when you know the relationships between only two or three pairs of corresponding parts
- When you draw the altitude to the hypotenuse of a right triangle, you form three pairs of similar right triangles (H)
- When two or more parallel lines intersect other lines, proportional segments are formed

Essential Questions:

- What does it mean to be similar?
- How are similar figures useful in finding indirect measurement?

Students will be skilled at:

- Ratio
- Extended ratio
- Proportion
- Cross Products Property
- Properties of Proportions
- Similar figures
- Similar polygons
- Scale factor
- Scale drawing
- Scale
- Angle-Angle Similarity (AA ~) Postulate
- Side-Angle-Side (SAS ~) Theorem
- Side-Side-Side (SSS ~) Theorem
- Geometric mean
- Side-Splitter Theorem
- Triangle-Angle-Bisector Theorem

Students will be able to:

- Write ratios and solve proportions
- Identify and apply the properties of similar polygons
- Use the AA~ Postulate and the SAS~ and SSS~ Theorems
- Use similarity to find indirect measurements
- Find and use relationships in similar right triangles (H)
- Use the Side-Splitter Theorem and the Triangle-Angle-Bisector Theorem

Stage 2: Acceptable Evidence

Transfer Task

Students will be able to use their knowledge to illustrate multiple ways to prove triangles similar and use scale drawings to find distance in real world problems.

Verona High School — Geometry

Unit 4: Right Triangle Trigonometry	Unit Duration: 20 days

Stage 1: Desired Results

Established Goals:

G.SRT.4 – Prove theorems about triangles

G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.

G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G.SRT.10 Prove the Laws of Sines and Cosines and use them to solve problems. (H)

G.SRT.11 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). (H)

G.MG.1 Use geometric shape, their measures and their properties to describe objects

G.GPE.4 Use coordinates to use simple geometric theorems algebraically

Transfer Goal:

Students will be able to <u>independently</u> use their learning of right triangles and trigonometry to identify where these ideas occur in the real world.

Students will understand that:

- If you know the lengths of any two sides of right triangle, you can find the length of the third side by using the Pythagorean Theorem.
- Certain right triangles have properties that allow you to use shortcuts to determine side lengths without using Pythagorean Theorem.
- If you know certain combinations of side lengths and angle measures of a right triangle, you can use ratios to find other side lengths and angle measures.
- You can use the angles of elevation and depression as the acute angles of right triangles formed by a horizontal distance and a vertical height.
- If you know the measures of two angles and the length of a side (AAS or ASA), or two side lengths and the measure of a non-included obtuse angle (SSA), then you can find all the other measures of the triangle. (H)
- If you know the measures of two side lengths and the measure of the included angle (SAS), or all three side lengths (SSS), then you can find all the other measures of the triangle. (H)

Essential Questions:

- What is the purpose of learning about the properties of right triangles?
- Why is learning trigonometry useful?
- How can right triangle trigonometry be used outside of the classroom?

Students will be skilled at:

- Pythagorean Theorem
- Pythagorean Triple
- 45-45-90 Triangle Theorem
- 30-60-90 Triangle Theorem
- Trigonometric ratios (sine, cosine, tangent)
- Inverse trigonometric ratios
- Angle of elevation
- Angle of depression
- Law of Sines
- Law of Cosines

Students will be able to:

- Use the Pythagorean Theorem and its converse
- Use the properties of 45-45-90 and 30-60-90 triangles
- Use the sine, cosine and tangent ratios to determine side lengths and angle measures
- Use angles of elevation and depression to solve problems
- Apply the Law of Sines and Law of Cosines (H)

Stage 2: Acceptable Evidence

Transfer Task

Students will be able to use the properties of right triangles to analyze and model a situation in order to solve real world problems.

Verona High School — Geometry

Unit 5: Transformations	Unit Duration: 8 days

Stage 1: Desired Results

Established Goals:

G.CO.2 Represent transformations in the plane using transparencies and geometric software; describe transformations as functions that take points in the plane as inputs and give other points as outpoints. Compare transformations that preserve distance and angle to those that do not.

G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

G.SRT.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.

Transfer Goal:

Students will be able to <u>independently</u> use their learning to convey the importance of points, lines, and planes in the coordinate plane to transformations so that they will be able to see visual representations of changes to objects.

Students will understand that:

- You can change the position of a geometric figure so that the angle measures and the distance between any two points of a figure stays the same
- When you reflect a figure across a line, each point of the figure maps to another point the same distance from the line but on the other side. The orientation of the figure reverses.
- Rotations preserve distance, angle measures, and orientation of figures.
- You can express all isometries as compositions of reflections. (H)
- You can use compositions of rigid motions to understand congruence. (H)
- You can use a scale factor to make a larger or smaller copy of a figure that is also similar to the original figure.

Essential Questions:

- What are transformations and how are they used in real life?
- How can similarity be related to transformations?
- What is the difference between congruence and similarity while performing transformations?

Students will be skilled at:

- Transformation
- Preimage
- Image
- Rigid motion
- Translation
- Reflection
- Line of reflection
- Rotation
- Center of rotation
- Angle of rotation
- Glide reflection
- Isometry
- Dilation
- Center of dilation
- Scale factor
- Enlargement
- Reduction

Students will be able to:

- Identify isometries
- Find translation images of figures
- Find reflection images of figures
- Draw and identify rotation images of figures
- Find compositions of isometries, including glide reflections (H)
- Identify congruence transformations
- Understand dilation images of figures

Stage 2: Acceptable Evidence

Transfer Task

Student will be able to draw conclusions after performing a variety of transformations on a coordinate plane and on paper with and without measurement tools.

Verona High School — Geometry

Unit 6: 3D Calculations	Unit Duration: 12 days

Stage 1: Desired Results

Established Goals:

G.GMD.4 Identify the shapes of two-dimensional cross-sections of three dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
G.GMD.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
G.GMD.2 Give an informal argument using Cavalieri's Principle for the formulas for the volume of a sphere and other solid figures.
G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
G.MG.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).

Transfer Goal:

Students will be able to independently use their learning of three dimensional figures to model real objects and solve problems using formulas for volume and surface area.

Students will understand that:

- You can analyze a three dimensional figure by using the relationships among its vertices, edges, and faces.
- To find the surface area of a three dimensional figure, find the sum of the areas of all the surfaces of the figure.
- You can find the volume of a prism or a cylinder when you know its height and the area of its base.
- The volume of a pyramid is related to the volume of a prism with the same base and height.
- You can find the surface area and the volume of a sphere when you know its radius.

Essential Questions:

- Why do you need to know how to find the surface area and volume of a three dimensional figure?
- What is the difference between a two dimensional figure and a three dimensional figure?
- Why is visualization important when studying three dimensional figures?

Students will be skilled at:

- Polyhedra
- Face
- Edge
- Vertex
- Cross section
- Euler's Formula
- Prism
- Base
- Lateral face
- Altitude
- Height
- Lateral area
- Surface area
- Right prism
- Oblique prism
- Cylinder
- Right cylinder
- Oblique cylinder
- Pyramid
- Slant height
- Regular pyramid
- Cone
- Right cone
- Surface area formulas
- Lateral area formulas
- Volume formulas
- Volume
- Sphere
- Center of a sphere
- Radius of a sphere
- Diameter of a sphere
- Hemisphere
- Great circle

Students will be able to:

- Recognize polyhedra and their parts
- Visualize cross sections of space figures
- Find the surface area of a prism and a cylinder
- Find the surface area of a pyramid and a cone
- Find the volume of a prism and a cylinder
- Find the volume of a pyramid and a cone
- Find the surface area and volume of a sphere

Stage 2: Acceptable Evidence

Transfer Task

Student will be able to use their knowledge of three dimensional figures to analyze real world problems, calculate volume of composite solids and apply their solutions to real life.

Verona High School — Geometry

Unit 7: Circles	Unit Duration: 10 days

Stage 1: Desired Results

Established Goals:

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
G.C.1 Prove that all circles are similar.
G.C.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
G.C.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.
G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
G.C.4 Construct a tangent line from a point outside a given circle to the circle.
G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0, 2).

Transfer Goal:

Students will be able to <u>independently</u> use their learning to apply the special properties of circles and the relationship that other shapes have with/within circles in order to use these concepts in further math courses and other disciples.

Students will understand that:

- You can find the length of part of a circle's circumference by relating it to an angle in the circle.
- You can use the area of a circle to find the area of part of a circle formed by two radii and the arc the radii form when they intersect with the circle.
- A radius of a circle and the tangent that intersects the endpoint of the radius on the circle have a special relationship.
- You can use information about congruent parts of a circle to find information about other parts of the circle.
- Angles formed by intersecting lines have a special relationship to the arcs the intersecting lines intersect.
- Angles formed by intersecting lines have a special relationship to the related arcs formed when the lines intersect inside or outside the circle.
- You can write the equation of a circle if you know its center and radius.
- The information in the equation of a circle allows you to graph the circle.

Essential Questions:

- How can circles be studied algebraically and geometrically?
- How can we find the measurements of unknown angles, arcs, and segments of a circle?
- How can you prove relationships between angles and arcs in a circle?

Students will be skilled at:

- Circle
- Center
- Diameter
- Radius
- Congruent circles
- Central angle
- Semi circle
- Minor arc
- Major arc
- Circumference
- Pi
- Concentric circles
- Arc length
- Sector of a circle
- Segment of a circle
- Tangent to a circle
- Point of tangency
- Chord
- Inscribed angle
- Intercepted arc
- Secant
- Standard form of an equation of a circle

Students will be able to:

- Find the measures of central angles and arcs
- Find the circumference and arc length
- Find the areas of circles, sectors, and segments of circles
- Use properties of a tangent to a circle
- Use congruent chords, arcs, and central angles
- Use perpendicular bisectors to chords of a circle
- Find the measure of an inscribed angle
- Find the measure of an angle formed by a tangent and a chord
- Find measures of angles formed by chords, secants, and tangents
- Find the lengths of segments associated with circles
- Write the equation of a circle
- Find the center and radius of a circle

Stage 2: Acceptable Evidence

Transfer Task

Students will use their knowledge of the relationships between arcs, angles, and segments of circles to interpret diagrams and find unknown measures in real world problems.