Course Resources:

Geometry Concepts - Course Syllabus

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Description:

This course begins with review and introduction of definitions of the building blocks of geometry. Students develop a strong foundation of working with definitions, postulates, and axioms. They will explore logic as it relates to mathematics, reasoning, and proofs. Course content helps the learner cultivate a strong sense of working with figures and shapes of all forms, and expands their ideas into real life problems. Strong spatial reasoning skills are taught as students explore different properties of shapes and figures including congruence, area, perimeter, volume, surface area, and similarity. These new ideas provide learners a place to continually apply their accumulated Algebra knowledge and skills. The course concludes with examining the many properties related to circles, and an introduction to Trigonometry.

Textbook: Geometry Concepts – Joseph G. Williams, B.A. / © Excel Education Systems, Inc. 2019

Course objectives:

Throughout the course, you will meet the following goals:

Understand points, lines and planes - the basic building blocks of geometry
Recognize postulates, theorems and properties, and how they are used in geometry
Identify 2-dimensional and 3-dimensional shapes and their related formulas
Comprehend and apply the Pythagorean Theorem to right triangle problems
Understand the geometry of circles and terms used to identify its parts
Learn the basic tools of Trigonometry and how to apply them to angle measurement

Semester A
1: Foundations of Geometry
2: Logic and Reasoning in Geometry
3: Shapes and Parallel Lines
4: Triangle Congruence
5: Area and Perimeter

Semester B
6: Volume and Surface Area
7: Similarity in Shapes
8: Geometry of Circles
9: Introduction to Trigonometry

Grading Scale
A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
F = under 59%

Grade Weighting
Quizzes..... 70%
Final Exam..... 30%
100%

Unit	Benchmarks	Essential Questions	Learning Objectives	Instructional Strategies	Resources	Assessments
Months 1-12						
Module 1: 1: Foundations of Geometry *(updated 3/12/21)*	MA.9.3.3.6(A) Know and apply properties of congruent and similar figures to solve problems and logically justify results. MA.9.3.4.6(A) Use numeric, graphic and symbolic representations of transformations in two dimensions, such as reflections,	• What are the building blocks of geometry? • How can you describe the attributes of a segment or angle? • What properties do	• Students will identify and apply basic definitions of geometry. • Students will identify and apply postulates. • Students will understand varying units of measure and why units are important. • Students will analyze and apply	direct instruction - textbook direct instruction - interactive video guided practice	1.1: The Building Blocks of Geometry 1.2: Measuring Length 1.3: Measuring Angles 1.4: Triangles and Special Points	Section Exercise Problems Unit 1 Quiz

	translations, scale changes and rotations about the origin by multiples of 90, to solve problems involving figures on a coordinate grid.	• What properties do lines and angles demonstrate in Geometry? • What types of angles exist in Geometry?	• Students will analyze and apply angle relationships (e.g., linear pairs, vertical, complementary, supplementary, corresponding, and alternate interior angles) in real-world or mathematical problems. • Students will identify definitions, axioms, and theorems and understand their role in Geometry.	guided practice independent practice	Special Points 1.5 Motion in Geometry 1.6: Motion on the Coordinate Plane Unit 1: Definitions, Postulates, and Theorems Glossary	
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 2: Logic and Reason *(updated 3/12/21)*	MA.9.3.2.1(A) Understand the roles of axioms, definitions, undefined terms and theorems in logical arguments. MA.9.3.2.2(A) Accurately interpret and use words and phrases such as "if...then," "if and only if," "all," and "not." Recognize the logical relationships between an "if...then" statement and its inverse, converse and contrapositive. MA.9.3.2.3(A) Assess the validity of a logical argument and give counterexamples to disprove a statement. MA.9.3.2.4(A) Construct logical arguments and write proofs of theorems and other results in geometry, including proofs by contradiction. Express proofs in a form that clearly justifies the reasoning, such as two-column proofs, paragraph proofs, flow charts or illustrations.	• How can you make a conjecture and prove that it is true? • How can we use postulates, theorems, and axioms to prove math concepts? • How and why is deductive reasoning used in geometric proof?	• Students will learn how theorems, postulates, and axioms are used in proofs. • Students will complete two-column proofs • Students will explore logic including converse, contrapositive, and negations.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	2.1 Introduction to Proofs 2.2 Introduction to Logic 2.3 Defining Definitions 2.4 Two-Column Proofs 2.5 Theorems and Reasoning Unit 2: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 2 Quiz
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 3: Shapes and Parallel Lines *(updated 3/12/21)*	MA.9.3.3.1(A) Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results. MA.9.3.3.2(A) Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results. MA.9.3.3.7(A) Use properties of polygons—including quadrilaterals and regular polygons—to define them, classify them, solve problems and logically justify results.	• How do you prove that two lines are parallel? • What is the sum of the measures of the angles of a triangle? • How do you write an equation of a line in the coordinate plane? • What algebraic and geometric conditions are sufficient and necessary to prove lines parallel or perpendicular? • What properties make a quadrilateral different from other geometric figures? • What are the properties of quadrilaterals?	• Students will analyze and apply spatial relationships (not using Cartesian coordinates) among points, lines, and planes (e.g., betweenness of points, midpoint, segment length, collinear, parallel, perpendicular.) • Students will Identify relationships between lines • Identify/use relationships of angle pairs formed by lines and a transversal • Prove & use angle relationships involving parallel lines and a transversal • Prove lines are parallel, given angle relationships • Use slopes to identify parallel/perpendicular lines in the coordinate plane • Use properties of lines to prove statements	direct instruction - textbook direct instruction - interactive video guided practice independent practice	3.1: Polygons 3.2: Quadrilaterals 3.3: Parallel Lines and Transversals 3.4: Proving Parallel Lines 3.5: Learning more about Triangles 3.6: The Angles of Polygons 3.7: Midsegments 3.8: Analyzing Polygons in the Coordinate Plane Unit 3: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 3 Quiz

Unit	Benchmarks	Essential Questions	Learning Objectives	Instructional Strategies	Resources	Assessments
Months 1-12						
Module 4: Triangle Congruence *(updated 3/12/21)*	MA.9.3.3.3(A) Know and apply properties of equilateral, isosceles and scalene triangles to solve problems and logically justify results. MA.9.3.3.7(A) Use properties of polygons—including quadrilaterals and regular polygons—to define them, classify them, solve problems and logically justify results.	• How do you identify corresponding parts of congruent triangles? • How do you show that two triangles are congruent? • How can you tell whether a triangle is isosceles or equilateral? • How can we tell different common quadrilateral shapes apart?	• Students will classify triangles by their sides and angles. • Students will prove triangles congruent using SAS, SSS, ASA, AAS Theorems • Students will be able to name corresponding parts of congruent polygons • Students will identify congruent polygons • Students will be able to describe the characteristics of quadrilaterals (parallelograms, rectangles, rhombi, squares, trapezoids).	direct instruction - textbook direct instruction - interactive video guided practice independent practice	4.1: Congruent Polygons 4.2: Triangle Congruence 4.3: Triangle Congruence Continued 4.4: Using the Congruence of Triangles 4.5: Quadrilaterals 2 4.6: Conditions of a Quadrilateral 4.7: Triangle Inequality Theorem Unit 4: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 4 Quiz

Unit	Benchmarks	Essential Questions	Learning Objectives	Instructional Strategies	Resources	Assessments
Months 1-12						
Module 5: Area and Perimeter *(updated 3/16/21)*	MA.9.3.1.2(A) Compose and decompose two- and three-dimensional figures; use decomposition to determine the perimeter, area, surface area and volume of various figures. MA.9.3.1.3(A) Understand that quantities associated with physical measurements must be assigned units; apply such units correctly in expressions, equations and problem solutions that involve measurements; and convert between measurement systems. MA.9.3.1.4(A) Understand and apply the fact that the effect of a scale factor k on length, area and volume is to multiply each by k, k2 and k3, respectively. MA.9.3.3.4(A) Apply the Pythagorean Theorem and its converse to solve problems and logically justify results. MA.9.3.3.5(A) Know and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems and logically justify results. MA.9.3.4.4(A) Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments. MA.9.3.4.7(A) Use algebra to solve geometric problems unrelated to coordinate	• How does the Pythagorean Theorem help solve real world problems? • How does one find the area of a figure? • How does manipulation of a part of a figure affect its area?	• Students will apply formulas for perimeter and area to real-world situations. • Students will identify the area of common shapes. • Students will apply definitions and the Pythagorean theorem to determine area of shapes and to solve real-world and mathematical problems. • Students will apply algebraic concepts, graphing, and the distance formula in the coordinate plane to find perimeter and area of shapes.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	5.1: Perimeter and Area 5.2: Areas of other Common Shapes 5.3: Area and Circumference 5.4: The Pythagorean Theorem 5.5: Using Triangles in Polygons and Special Triangles 5.6: The Distance Formula Unit 5: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 5 Quiz

	geometry, such as solving for an unknown length in a figure involving similar triangles, or using the Pythagorean Theorem to obtain a quadratic equation for a length in a geometric figure.					
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 6: Volume and Surface Area *(updated 3/12/21)*	MA.9.3.1.1(A) Determine the surface area and volume of pyramids, cones and spheres. Use measuring devices or formulas as appropriate. MA.9.3.1.2(A) Compose and decompose two- and three-dimensional figures; use decomposition to determine the perimeter, area, surface area and volume of various figures. MA.9.3.1.4(A) Understand and apply the fact that the effect of a scale factor k on length, area and volume is to multiply each by k, k2 and k3, respectively.	• How can you find the surface area and volume of a solid? • How do the surface areas and volumes of similar solids compare? • How does changing a dimension affect its surface area and volume?	• The student will be able to calculate the volumes and surface areas of solid figures including composite figures. • The student will be able to understand how changing part of the shape or figure affects its surface area and volume. • Students will be able to determine the surface area and volume of right rectangular prisms, pyramids, oblique and right cylinders, cones, and spheres in real-world and mathematical problems.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	6.1: Surface Area 6.2: Volume 6.3: Pyramids 6.4: Cylinders 6.5: Cones 6.6: Spheres Unit 6: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 6 Quiz
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 7: Similarity in Shapes *(updated 3/16/21)*	MA.9.3.1.5(A) Make reasonable estimates and judgments about the accuracy of values resulting from calculations involving measurements. MA.9.3.3.6(A) Know and apply properties of congruent and similar figures to solve problems and logically justify results. MA.9.3.4.1(A) Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine and tangent of an acute angle in a right triangle. MA.9.3.4.4(A) Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments. MA.9.3.4.6(A) Use numeric, graphic and symbolic representations of transformations in two dimensions, such as reflections, translations, scale changes and rotations about the origin by multiples of 90, to solve problems involving figures on a coordinate grid. MA.9.3.4.7(A) Use algebra to solve geometric problems unrelated to coordinate geometry, such as solving for an unknown length in a figure involving similar triangles, or using the Pythagorean Theorem to obtain a	• How do you use proportions to find side lengths in similar polygons? • How do you show two triangles are similar? • How do you identify corresponding parts of similar triangles?	• Set up ratios and solve proportions for given similar geometric shapes. • Determine the similarity of geometric figures by applying appropriate similarity theorems. • Apply ratios and proportions to solve problems using the properties of similar figures.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	7.1: Scale Factors and Dilations 7.2: Similarity 1: Polygons 7.3: Similarity 2: Triangles 7.4: The Side-Spitting Theorem 7.5: Indirect Measurement Unit 7: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 7 Quiz

	quadratic equation for a length in a geometric figure.					
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 8: Geometry of Circles *(updated 3/16/21)*	MA.9.3.1.5(A) Make reasonable estimates and judgments about the accuracy of values resulting from calculations involving measurements. MA.9.3.3.8(A) Know and apply properties of a circle to solve problems and logically justify results. MA.9.3.4.5(A) Know the equation for the graph of a circle with radius r and center (h, k), (x – h)2 + (y – k)2 = r2, and justify this equation using the Pythagorean Theorem and properties of translations.	How can you prove relationships between angles and arcs in a circle? When lines intersect in a circle or within a circle, how do you find the measures of resulting angles, arcs, and segments? How do you find the equation of a circle in the coordinate plane?	• Identify the relationships between the measures of intercepted arcs and inscribed or central angles. • Identify radii, diameters, chords, secants, arcs, sectors, central angles, inscribed angles, and tangents for circles. • Writing the equation for a circle given its graph. • Graphing a circle given the equation in the form $(x – h)^2 + (y – k)^2 = r^2$	direct instruction - textbook direct instruction - interactive video guided practice independent practice	8.1: Arcs and Chords 8.2: Tangent of a Circle 8.3: Inscribed Arcs and Angles 8.4: Secants and Tangents 8.5: Exploring Segment Relationships in Circles 8.6: Equations of Circles Unit 8: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 8 Quiz
Unit	**Benchmarks**	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12						
Module 9: Introduction to Trigonometry *(updated 3/15/21)*	MA.9.3.4.1(A) Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine and tangent of an acute angle in a right triangle. MA.9.3.4.2(A) Apply the trigonometric ratios sine, cosine and tangent to solve problems, such as determining lengths and areas in right triangles and in figures that can be decomposed into right triangles. Know how to use calculators, tables or other technology to evaluate trigonometric ratios. MA.9.3.4.3(A) Use calculators, tables or other technologies in connection with the trigonometric ratios to find angle measures in right triangles in various contexts.	• What is the definition of the basic trig functions in the context of a right triangle? • How can we use trig functions to find angles or side lengths of a right triangle?	• Identify trigonometric relationships (sine, cosine, & tangent) using right triangles, expressing the relationships as fractions or decimals. • Solve problems using the properties of special right triangles. • Find the angle measure in degrees given the trigonometric ratio using a calculator. • Find the trigonometric ratio given the angle measure in degrees using a calculator. • Find the missing measures of right triangles. • Solving real-world problems using trigonometric ratios and properties of congruence and similar figures.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	9.1: Tangent 9.2: Sine 9.3: Cosine 9.4: Combining Sine, Cosine, and Tangent Unit 9: Definitions, Postulates, and Theorems Glossary	Section Exercise Problems Unit 9 Quiz