

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Geometry

Curriculum writing committee:

Joel Davis

Grade Level: 9,10

Date of Board Approval: _____2020_____

Geometry Grading Policy Target Points

Gradebook Policy for Geometry

	Quiz	Test	Graded Assignments	HW/Part	Total
MP1 points	90	180	40	30	340 points
MP2 points	90	200	40	30	360 points
MP3 points	120	200	40	30	390 points
MP4 points	90	300	40	30	460 points
Total points	390	880	160	120	1550 points
Total percentages	25%	57%	10%	8%	100%

Curriculum Map

Overview:

This course follows Algebra 1. It introduces the theorem-proof structure of mathematics. Logical deductive thinking is stressed in the writing of formal proofs and in the solution of geometric problems. Topics include parallel lines, congruent and similar triangles, and the properties of higher polygons.

Time/Credit for the Course: 2 semesters 1 credit, 180 days, meeting 1 period per day

Goals:

1. Students will learn data analysis techniques as well as apply probability rules to tables and Venn diagrams.
2. Students will apply algebraic processes to determine segment lengths, congruence, and angles measures.
3. Students will develop an initial understanding of logical reasoning and proof.
4. Students will be able to prove and apply geometric theorems involving congruent triangles.
5. Students will prove theorems involving parallel lines cut by a transversal.
6. Students will apply theorems involving parallel lines.
7. Students will identify, prove, and apply properties of parallelograms.
8. Students will apply geometric theorems involving special relationships within triangles algebraically.
9. Students will prove and apply theorems involving similar triangles.

10. Students will use the Pythagorean Theorem, special right triangles, or trigonometry to “solve” right triangles.
11. Students will determine the measurements of angles, arcs and segments within circles.
12. Students will calculate the perimeter, area, surface area, and volume of two and three-dimensional objects

Unit #1:

- Finding Probability and Simulating data.
- Independent events.
- Probability models and sample space.
- Using Venn Diagrams, Two-way Tables, and Tree Diagrams for Probability.
- Rules for mutually exclusive events and conditional probability.
- Basic geometric terms and concepts: points, lines and planes
- Congruence (segments and angles)
- Midpoint and distance formulas
- Measuring and classifying angles, including special angle pair relationships
- Inductive versus deductive reasoning
- Logically equivalent statements (conditional, converse, inverse, contrapositive)
- Postulates versus theorems
- Formal proof (construct or validate arguments)

Unit #2:

- Congruent triangles
- Proofs involving congruent triangles
- Isosceles and equilateral triangles
- Parallel lines and angles
- Proving lines parallel
- Theorems involving perpendicular lines

Unit #3:

- Properties of polygons
- Properties of parallelograms
- Properties of special parallelograms (rectangles, rhombuses, squares)
- Properties of trapezoids and kites
- Proofs involving parallelograms
- Special segments within triangles
- Triangle inequality theorem
- Similar polygons, focusing on similar triangles
- Proofs involving similar triangles
- Applications involving similarity
- Right triangles and the Pythagorean Theorem
- Special right triangles
- Trigonometric ratios (sine, cosine, and tangent ratios)
- Applications involving trigonometry

Unit #4:

- Circles (center-radius form of a circle)
- Circles (Specific terms, special segments, special angles)
- Coordinate geometry with circles, specifically using the distance and midpoint Formulas
- Equation of a circle
- Area versus perimeter of polygons
- Area and circumference of circles, including arc length and area of sectors
- Area of regular polygons
- Surface area of solids
- Volume of solids

Big Ideas:

- Big Idea #1: There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities.
- Big Idea #2: Mathematical statements can be justified through deductive and inductive t=reason and proof.
- Big Idea #3: Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools
- Big Idea #4: Euclid's fifth postulate, known as the parallel postulate, is an essential axiom in Euclidean Geometry. Angle measurements are derived from the relationships of parallel and perpendicular lines. The parallel postulate allows these fundamental relationships to hold true.
- Big Idea #5: Patterns exhibit relationships that can be extended, described, and generalized.
- Big Idea #6: Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization

Textbook and Supplemental Resources:

Glencoe Geometry, 2018, McGraw-Hill Education, 978-0-07-903994-1

Kuta Software: Geometry

Geometer Sketchpad

GeoGebra

Desmos

Curriculum Plan

Unit #1

Time/Days: 45

- **Standards (by number):** http://static.pdesas.org/content/documents/CF-Math_Geo_2016.pdf
CC.2.3.HS.A.2, CC.2.3.HS.A.3, CC.2.3.HS.A.6, CC.2.3.HS.A.11, CC.2.2.HS.D.1, CC.2.2.HS.D.8, CC.2.2.HS.D.9, 2.3.G.C, 2.4.G.A, 2.8.G.B, 2.2.A1.C, CC.2.4.HS.B, CC.2.4.HS.B.6 , C.2.4.HS.B.4
- **Anchors:** A1.1.1.3.1, A1.1.1.5.1, G.1.2.1.1, G.1.2.1.4, G.1.3.1.1, G.1.3.2.1, G.2.1.2.1, G.2.1.2.3, G.2.2.1.1, G.2.2.1.2
- **Eligible Content:**
Finding Probability and Simulating data.
Independent events.
Probability models and sample space.
Rules for mutually exclusive events and conditional probability.
Basic geometric terms and concepts: points, lines and planes
Congruence (segments and angles)
Midpoint and distance formulas
Measuring and classifying angles, including special angle pair relationships
Inductive versus deductive reasoning
Logically equivalent statements (conditional, converse, inverse, contrapositive)
Postulates versus theorems
Formal proof (construct or validate arguments)

Objectives:

1. Recognize that some phenomena are random. Predict the long-run regularity of random phenomena (DOK - 1,2)
2. Understand that the probability of an event as the proportion of times the event occurs in very many repetitions of a random phenomenon. (DOK – 1)
3. Recognize that the short runs of random phenomena do not display the regularity described by probability. Accept that randomness is unpredictable in the short run, and avoid seeking cause and effect explanations for random occurrences. (DOK – 1,2)
4. Design a survey to collect data to calculate probabilities for the students in the class. (DOK – 4)
5. Estimate a probability by repeating a simulation many times. (DOK – 2)
6. Collect and display probability of an event by adding the probabilities of the outcomes that make it up. (DOK – 1)

7. Use probability rules to find the probabilities of events that are formed from other events, including unions, intersections, complements, and conditional probabilities. (DOK – 1)
8. Construct Venn Diagrams, two-way tables, and tree diagrams to model chance behavior and draw conclusions from each diagram. (DOK – 2,3)
9. Compute probabilities using information provided from Venn diagrams, two-way tables, and tree diagrams. (DOK – 2) Students will be able to name and sketch geometric figures as well as name, measure, and classify angles. (DOK Level One, DOK – Level Two)
10. Students will be able to use segment postulates to identify congruent segments and find lengths of segments in the coordinate plane. (DOK – Level one)
11. Students will be able to use special angle relationships (vertical angles, linear pairs, complementary angles, supplementary angles) to determine angle measures. (DOK – Level One)
12. Students will be able to use inductive reasoning to discern and describe patterns. (DOK – Level Three)
13. Students will be able to re-write statements as conditional statements as well as transform statements to the converse, inverse and contrapositive, recognizing which statements are logically equivalent. (DOK – Level one)
14. Students will be able to use deductive reasoning to construct a logical argument, including algebraic properties when appropriate. (DOK – Level Three)
15. Students will be able to use postulates involving points, lines, and planes. (DOK – Level Three)
16. Students will be able to apply properties of special pairs of angles. (DOK – Level Four)
17. Students will be able to write elementary proofs of geometric theorems by stating the given, using postulates, properties, or other theorems to arrive at the desired conclusion. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

1. Opening day activity for the class to get to know each other. Students will play a game of 2 truths and 1 lie. Data will be collected on how many lies a student guessed correctly. This will give an example of quantitative variables.
2. Students will create a short survey of 10 questions that they want to know about their classmates. Have a list of possible questions but allow the students to create their own. Oversee the survey so the students are asking for quantitative and categorical variables.
3. Students will perform various simulations with cards, dice, and coins to experience probability as long-term relative frequency. Simulations can include “The Office Secret Santa”, Landing on orange in Monopoly, a family of 3 children all being boys, being dealt a royal flush in poker.
4. Create a human box-and-whisker plot by having the students line up from shortest to tallest. Talk through the procedures for finding median and the quartiles. Add a

- teacher and remove random students to the data set to discuss differences in the median and quartiles.
5. Students will create and describe histograms from a large set of data (Presidents age at Inauguration)
 6. Students will analyze graphs that have been found in the news media that are incorrect and comment on the bias and ways the graphs were made misleading.
 7. Students will analyze two-way tables created by collecting data to predict the chance of a randomly selected person would be in that category.
 8. Students use SAT problems found from College Board practice tests to answer higher level questions regarding probability and statistics.
 9. Students will perform various logic puzzles to learn higher order thinking/reasoning skills to draw a specific conclusion
 10. Students will use Geometer's sketchpad to identify properties of points, lines, and planes and discover theorems on terms such as complementary, supplementary, vertical angles, and linear pairs.
 11. Use Geometer's Sketchpad to show the idea of betweenness of points or segment addition postulate. That only A, B, and C are collinear does $AB + BC = AC$
 12. Students will derive the distance formula from the Pythagorean Theorem.
 13. SAT Problems involving lines and angles from College Board practice tests
 14. Warm-ups: Algebra Keystone review problems and SAT problems to reinforce key algebra 1 topics including equations of a line, systems of equations, and factoring.

Assessments:

- **Diagnostic:**
 - Glencoe Geometry Support File Chapter 1, 2, and 12
 - Teacher prepared pre-test/diagnostic test
 - Teacher questioning and observation
 - Keystone Benchmark Assessment
- **Formative:**
 - Teacher observations, questions, discussions
 - Teacher assigned homework
 - Teacher prepared assessments (quizzes and graded assignments)
 - Warm Ups
- **Summative:**
 - Probability Unit Common Assessment (Chapter 12 Sections 12.2, 12.5-12.8)
 - Tools of Geometry Common Assessment (Chapter 1 Sections 1.1-1.5)
 - Logic Common Assessment (Chapter 2 Sections 2.1-2.5)

Unit #2

Time/Days: 45

- **Standards (by number):**
http://static.pdesas.org/content/documents/CF-Math_Geo_2016.pdf
CC.2.3.HS.A.1, CC.2.3.HS.A.2, CC.2.3.HS.A.3, CC.2.3.HS.A.4, CC.2.3.HS.A.5, CC.2.3.HS.A.6, CC.2.3.HS.A.11, CC.2.3.HS.A.13, CC.2.2.HS.D.1, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10, 2.3.G.C, 2.4.G.A, 2.8.G.B, 2.9.G.A, 2.9.G.B, 2.9.G.C, 2.2.A1.C
- **Anchors:** A1.1.1.3.1, A1.1.1.5.1, G.1.2.1.1, G.1.2.1.3, G.1.3.1.1, G.1.3.1.2, G.1.3.2.1, G.2.1.2.1, G.2.1.2.2, G.2.1.2.3, G.2.2.1.1
- **Eligible Content:**
Congruent triangles
Proofs involving congruent triangles
Isosceles and equilateral triangles
Parallel lines and angles
Proving lines parallel
Theorems involving perpendicular lines

Objectives:

1. Students will be able to classify triangles and find measures of their angles. (DOK – Level Two)
2. Students will be able to identify congruent figures, accurately stating the congruence relationship. (DOK – Level Three)
3. Students will be able to use sides and angles to prove triangles congruent. (DOK – Level Four)
4. Students will be able to use congruent triangles to prove corresponding parts congruent. (DOK – Level Four)
5. Students will be able to prove and use theorems involving isosceles and equilateral triangles. (DOK – Level Four)
6. Students will be able to identify angle pairs formed by two lines cut by a transversal. (DOK – Level One)
7. Students will be able to use angles formed by parallel lines and transversals. (DOK – Level Two)
8. Students will be able to use angle relationships to prove that lines are parallel. (DOK – Level Four)
9. Students will be able to apply theorems involving perpendicular lines. (DOK – Level Two)

Core Activities and Corresponding Instructional Methods:

1. Students will investigate What We Know Problems to identify conclusions from knowing the given information
2. Students will connect the idea of conditional statement to proof writing, where the hypothesis is the given and the conclusion is the prove statement. Students will diagram various proof set ups.
3. Students will practice SAT problems involving triangles found from the College Board practice tests
4. Students will solve algebra applications with triangle properties, including ratio, systems, and linear equations.
5. Demonstrate that HL only works for Right Triangles via Geometer's Sketchpad activities.
6. Prove that the sum of the interior angles in a triangle are 180 degrees by having the students "rip" the angles of a triangle and making the angles adjacent.
7. Prove how angle relationships involving alternate interior, alternate exterior, same side interior, and same side exterior angles imply parallel.
8. SAT problems with parallel and perpendicular lines from College Board practice exams.
9. Algebra applications with parallel and perpendicular lines, including ratios, systems of equations, and linear equations.
10. Warm-ups: Algebra Keystone review problems and SAT problems to reinforce key algebra 1 topics including equations of a line, systems of equations, and factoring.

Assessments:

- **Diagnostic:**
 - Glencoe Geometry Support File Chapter 2 and 4
 - Teacher prepared pre-test/diagnostic test
 - Teacher questioning and observation
 - Keystone Benchmark Assessment
- **Formative:**
 - Teacher observations, questions, discussions
 - Teacher assigned homework
 - Teacher prepared assessments (quizzes and graded assignments)
 - Warm Ups
- **Summative:**
 - Congruent Triangles Common Assessment (Chapter 4 Sections 4.1-4.7)
 - Parallel Lines Common Assessment (Chapter 2 Sections 2.6-2.9)

Unit #3

Time/Days: 45

- **Standards (by number):** http://static.pdesas.org/content/documents/CF-Math_Geo_2016.pdf
CC.2.3.HS.A.1, CC.2.3.HS.A.3, CC.2.3.HS.A.4, CC.2.3.HS.A.7, CC.2.3.HS.A.11, CC.2.3.HS.A.13, CC.2.2.HS.D.1, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D., CC.2.2.HS.D.10, 2.3.G.C, 2.4.G.A, 2.8.G.B, 2.9.G.A, 2.9.G.B, 2.9.G.C, 2.10.G.A, 2.11.G.A, 2.2.A1.C
- **Anchors:** A1.1.1.3.1, A1.1.1.5.1, G.1.2.1.1, G.1.2.1.2, G.1.2.1.3, G.1.3.2.1, G.2.1.1.1, G.2.1.1.2, G.2.2.1.1, G.2.2.1.2
- **Eligible Content:**
Properties of polygons
Properties of parallelograms
Properties of special parallelograms (rectangles, rhombuses, squares)
Properties of trapezoids and kites
Proofs involving parallelograms
Special segments within triangles
Triangle inequality theorem
Similar polygons, focusing on similar triangles
Proofs involving similar triangles
Applications involving similarity
Right triangles and the Pythagorean Theorem
Special right triangles
Trigonometric ratios (sine, cosine, and tangent ratios)
Applications involving trigonometry

Objectives: (Include DOK Levels, see Attached DOK Wheel and refer to the definition of the DOK levels)

1. Students will be able to calculate interior and exterior angle measures in polygons, including angles in regular polygons. (DOK – Level One)
2. Students will be able to identify, prove, and then apply properties of parallelograms to determine angle and side measures. (DOK – Level One)
3. Students will be able to use properties to identify special parallelograms. (DOK – Level Two)
4. Students will be able to identify, prove, and then apply properties of rhombuses, rectangles, and squares. (DOK – Level Four)
5. Students will be able to identify and apply properties of trapezoids and kites. (DOK – Level Four)
6. Students will be able to identify special quadrilaterals, given specific properties. (DOK – Level Two)
7. Students will be able to identify similar polygons. (DOK – Level Three)

8. Students will be able to prove that triangles are similar. (DOK – Level Three)
9. Students will be able to use proportions to solve geometry problems (applications of similarity). (DOK – Level Three)
10. Students will be able to find and compare slopes of lines as well as write equations of a line. (DOK – Level Three)
11. Students will be able to find the distance between a point and a line. (DOK – Level One)
12. Students will be able to use properties of midsegments and write coordinate geometry proofs. (DOK – Level Four)
13. Students will be able to use perpendicular bisectors, angle bisectors, medians and altitudes to solve problems. (DOK – Level Three)
14. Students will be able to find possible side lengths of a triangle (Triangle Inequality Theorem). (DOK – Level Three)
15. Students will be able to apply the Pythagorean Theorem to find side lengths in right triangles. (DOK – Level Four)
16. Students will be able to classify a triangle by applying the converse of the Pythagorean Theorem. (DOK – Level Four)
17. Students will be able to use the relationships between the sides of special right triangles. (DOK – Level Two)
18. Students will be able to apply the sine, cosine, and tangent ratios to find the side lengths in right triangles. (DOK – Level Four)
19. Students will be able to apply the inverse sine, cosine, and tangent ratios to find angle measures. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

1. Discover the formulas for polygons (number of diagonals, interior, and exterior angles) through examples and deductive reasoning.
2. Problem solving activities with polygons that challenge students to apply the formulas to solve.
3. Students discover the relationships of quadrilaterals via Geometer’s Sketchpad
4. Students will work in teams to prove the relationships they discovered about quadrilaterals and present them to the class.
5. SAT problems with quadrilaterals from College Board practice exams
6. Algebra applications with quadrilaterals including ratio, systems of equations, and factoring.
7. SAT problems with area from College Board practice exams
8. Discover methods to prove polygons similar via Geometer’s Sketchpad
9. Applications with Angle-Angle similarity to use with similar triangles.
10. Algebra applications with similarity.
11. SAT problems with similarity from College Board practice tests
12. Investigate the rules for special right triangles. Use the Pythagorean theorem to show that for similar triangles the relationship between angles and sides are always the same.

13. Tell the story of Soh-Cah-Toa to build the trigonometric ratios in right triangles. Build off previous knowledge of special right triangles.
14. Apply trigonometric functions to real-world scenarios that require the calculation of a specific distance or angle measure.
15. SAT right triangle problems from College Board practice tests
16. Warm-ups: Algebra Keystone review problems and SAT problems to reinforce key algebra 1 topics including equations of a line, systems of equations, and factoring.

Assessments:

- **Diagnostic:**
 - Glencoe Geometry Support File Chapter 5, 6, 7, and 8
 - Teacher prepared pre-test/diagnostic test
 - Teacher questioning and observation
 - Keystone Benchmark Assessment
- **Formative:**
 - Teacher observations, questions, discussions
 - Teacher assigned homework
 - Teacher prepared assessments (quizzes and graded assignments)
 - Warm Ups
- **Summative:**
 - Quadrilaterals Common Assessment (Chapter 6 Sections 6.1-6.6)
 - Relationships in Triangles Common Assessment (Chapter 5 Sections 5.1-5.3, 5.5-5.6)
 - Similarity Common Assessment (Chapter 7 Sections 7.2-7.6)
 - Right Triangle Common Assessment (Chapter 8 Sections 8.2-8.5)

Unit #4

Time/Days: 45

- **Standards (by number):** **mber):** http://static.pdesas.org/content/documents/CF-Math_Geo_2016.pdf
CC.2.3.HS.A.3, CC.2.3.HS.A.7, CC.2.3.HS.A.8, CC.2.3.HS.A.9, CC.2.3.HS.A.13, CC.2.3.HS.A.14, CC.2.2.HS.D.1, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10, 2.3.G.C, 2.3.G.E, 2.4.G.A, 2.7.G.A, 2.8.G.B, 2.9.G.A, 2.9.G.B, 2.9.G.C, 2.10.G.A, 2.11.G.A, 2.11.G.C, 2.2.A1.C
- **Anchors:** A1.1.1.3.1, A1.1.1.5.1, G.1.1.1.1, G.1.1.1.2, G.1.1.1.3, G.1.1.1.4, G.1.2.1.1, G.1.2.1.2, G.1.2.1.3, G.1.2.1.4, G.1.2.1.5, G.1.3.2.1, G.2.1.1.1, G.2.1.1.2, G.2.2.1.1, G.2.2.1.2, G.2.2.2.1, G.2.2.2.2, G.2.2.2.3, G.2.2.2.24, G.2.2.2.5, G.2.3.1.1, G.2.3.1.2, G.2.3.1.3
- **Eligible Content:**
Circles (center-radius form of a circle)
Circles (Specific terms, special segments, special angles)
Proofs involving circles
Coordinate geometry with circles, specifically using the distance and midpoint formulas
Area versus perimeter of polygons
Area and circumference of circles, including arc length and area of sectors
Area of regular polygons
Surface area of solids
Volume of solids

Objectives:

1. Students will be able to apply the properties of a tangent within a circle. (DOK – Level Four)
2. Students will be able to use the measures of central angles to calculate arc measures. (DOK – Level One)
3. Students will be able to apply the relationships between arcs and chords in a circle. (DOK – Level Four)
4. Students will be able to calculate the measure of an arc or an angle using inscribed angles of a circle. (DOK – Level One)
5. Students will be able to calculate segment length in circles. (DOK – Level One)
6. Students will be able to calculate the area of triangles and parallelograms. (DOK – Level One)
7. Students will be able to calculate the areas of other types of quadrilaterals. (DOK – Level Two)
8. Students will be able to calculate the arc lengths and circumference of a circle. (DOK – Level Two)

9. Students will be able to calculate the area of circles and sectors. (DOK – Level Two)
10. Students will be able to calculate the area of regular polygons inscribed in circles. (DOK – Level Four)
11. Students will be able to identify solids. (DOK – Level Two)
12. Students will be able to calculate the surface areas of prisms, cylinders, pyramids, cones, and spheres. (DOK – Level One)
13. Students will be able to calculate the volume of prisms, cylinders, pyramids, cones, and spheres. (DOK – Level One)

Core Activities and Corresponding Instructional Methods:

1. Use Geometer’s Sketchpad to discover relationships between angles and segments in circles.
2. Algebra applications with circles including writing the equation of a circle.
3. SAT problems with circles from College Board practice tests
4. Use Geometer’s Sketchpad to show how regular polygons get closer to a circle as the number of sides increases. Make the connection to limits for the future.
5. Discover the formulas for regular polygons area and perimeter.
6. Discover formulas for arc length, area of a sector, and segment of a circle.
7. Discover formulas for volume and surface area of solids
8. Real world applications with solids.
9. SAT problems with solids from College Board practice exams
10. Warm-ups: Algebra Keystone review problems and SAT problems to reinforce key algebra 1 topics including equations of a line, systems of equations, and factoring.

Assessments:

- **Diagnostic:**
 - Glencoe Geometry Support File Chapter 1, 9, 10, and 11
 - Teacher prepared pre-test/diagnostic test
 - Teacher questioning and observation
 - Keystone Benchmark Assessment
- **Formative:**
 - Teacher observations, questions, discussions
 - Teacher assigned homework
 - Teacher prepared assessments (quizzes and chapter tests)
 - Warm Ups
- **Summative:**
 - Circle Common Assessment (Chapter 9 Sections 9.2 – 9.1)
 - Area and Perimeter Common Assessment (Sections 1.6, 9.1, 10.1-10.5)
 - Surface Area and Volume Common Assessment (Sections 1.8-1.9, 10.6, 11.2-11.4)
 - Final Exam Common Assessment

Please Go to Human Resources page on the Delaware Valley School District website for updated Payment form to be submitted.

<https://pa01001022.schoolwires.net/site/handlers/filedownload.ashx?moduleinstanceid=7055&dataid=16708&FileName=AUTHORIZATION%20FOR%20PAYMENT%20-%20SECURED.pdf>