DELAWARE VALLEY SCHOOL DISTRICT

<u>PLANNED INSTRUCTION</u>

A PLANNED COURSE FOR:

<u>Honors Geometry</u>

Curriculum Writing Committee:

Jeff Krasulski

Grade Level: 9

Date of Board Approval: _____2020_____

Grade Distribution:

Honors Geometry Grading Policy Target Points

Gradebook Policy for Honors Geometry

	Quiz	Test	Homework	Total
MP1 points	90	300	20	410
MP2 points	97	300	20	417
MP3 points	85	500	20	605
MP4 points	67	400	20	487
Total points	339	1600	80	2019
Total percentages	16%	80%	4%	100%

Curriculum Map

Overview: This course is written to follow Honors Algebra One. Significantly more material is covered at a faster pace than in the regular sections of Geometry. In addition, a more abstract approach is followed, emphasizing proof and the solution of non-routine problems using critical reasoning. The course covers the foundations of Euclidean Geometry, triangles and relationships, proofs of congruence and similarity and applications, triangle centers, parallelism, properties of quadrilaterals, applications of proportion and similarity, right triangle relationships and trigonometry, circles, and solid geometry. This course is designed for highly motivated students of exceptional ability who have a strong interest in mathematics. Technology is integrated whenever appropriate to support and challenge the learning of the students, serving to facilitate student discovery as they conjecture, test, and synthesize ideas. Such technological instruction will be through the use of Geometer's Sketchpad, graphing calculators, etc. Attention will be given to the history and development of Euclidean Geometry where appropriate. Transformations and coordinate geometry will be woven throughout the course.

Time/Credit for the Course: FULL YEAR, 1 CREDIT, 180 days, meeting 1 period per day

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Goals:

Unit 1 45 days

Understanding of:
- summarizing and classifying data, categorical and quantifiable, and with appropriate graphs and statistical summaries.
- Comparing and describing distributions, and recognize association between variables.
- Understand probability as long run relative frequency and apply it in problem solving and simulation and in justifying inference-based conclusions.
- Applying Venn Diagrams and two-way tables to calculate conditional probabilities
- Beginnings of geometry via inductive reasoning, and the need for a deductive approach
- Logic, basics of Boolean algebra and proof, syllogisms
- Deductive structure: postulates, theorems, basis of Euclidean Geometry
- Relationships between points, lines, and planes

Unit 2 45 days
Understanding of:
- Triangle classification, congruence and proof;
- Applications of congruent triangles.
- Basic relationships among a triangle's sides and angles;
- Triangles and centers: points of concurrence;
- Parallel lines and angles; indirect and direct proof, extension to triangle angle-sum

Unit 3 45 days
Understanding of:
- Transformations and symmetries.
- Polygons, diagonals, interior and exterior angles, and measurement
- Quadrilaterals, definitions and properties
- Area, development of formulas for polygons and application in problem solving
- Proportion and use in similar figures
- Modeling real-world problems with proportion
- Justification of similarity of polygons
- Fibonacci and the Golden Ratio

Unit 4 45 days
Understanding of:

- Right triangles and similarity
- The Pythagorean Theorem and proofs
- Pythagorean triples and special right triangles
- Right-triangle trigonometry, relationships, and problem-solving
- Circles, chords, radii, and relationships
- Arcs, and angles
- Tangents and secants, common tangents
- Circles, circumference, and area
- Sectors, arc length and area
- Geometric solids and characteristics: vertices, edges, faces, classification
- Volume and surface area: rectangular solids, prisms, pyramids, spheres
- Ratio of similitude, area, volume in similar figures

Big Ideas:

Big Idea # 1:
Data can be described and summarized using both graphical and statistical summaries. Probability theory gives us the tools to analyze random behavior. Inference, the process of making a general conclusion from a finite data subset, can be done by measuring statistics and comparing them to known patterns of behavior using probability.

Big Idea # 2:
Valid conclusions can be made using Inductive reasoning (using data and probability) or deductive reasoning, the former sometimes providing good evidence while the latter can provide certainty.

Big Idea # 3:
Patterns exhibit relationships that can be extended, described, and generalized. Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization.

Textbook and Supplemental Resources:

Glencoe Geometry, 2018
Authors: Carter, Cuevas, Day, Malloy, Cummins
ISBN: 978-0-07-903994-1
Textbook Publisher &Year of Publication: McGraw Hill 2018

Supplemental Resources:

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- Geometer's Sketchpad

- Teacher prepared packets

- Mathbits Worksheets

- Kuta Geometry Worksheets

- Jacobs Geometry Textbook

- Graphing Calculators

- SAT Practice Problems

  https://collegereadiness.collegeboard.org/sat/practice/full-length-practice-tests

Curriculum Plan

Unit: 1   **Time Range in Days:** 45 days

Standard(s): PA Academic Standards and Anchors; PACCS Math
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf
http://static.pdesas.org/content/documents/Geometry%20Assessment%20Anchors%20and%20Eligible%20Content%20April%202014.pdf

Standards Addressed: 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
College Board AP Stats I and IV.

Anchors: G.1.3.2, G.2.1.2, G.2.2.4

Eligible Content:
- Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction).
- Use the Pythagorean theorem to write and/or solve problems involving right triangles
- Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane
- Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape
- Use properties of angles formed by intersecting lines to find the measures of missing angles
- Use area models to find probabilities.
- Justify a claim using a decision based on significance tests.
- Interpret statistical calculations and findings to assign meaning or assess a claim
- Calculate a test statistic and find a p-value, provided conditions for inference are met
- Describe probability distributions
- Determine relative frequencies, proportions, or probabilities using simulation or calculations.
- Compare distributions or relative positions of points within a distribution.
- Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response
- Construct numerical or graphical representations of distributions.
- Describe data presented numerically or graphically

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Objectives:

- Identify and distinguish between categorical and quantifiable data, and construct appropriate displays to summarize the data. (DOK – Level 1,2,3)
- Estimate probabilities using simulation and construct models to evaluate/analyze probabilities. (DOK – Level 2,3,4)
- Construct a null and alternative hypothesis Chi Square-statistic from observed categorical data, such as the scores on a multiple-choice test subject only to blind-guessing, or the distribution of candy colors compared with name brand statements of distribution. Compare the result with simulated data to make and justify a conclusion. (DOK – Level 2,3,4)
- Construct Venn-Diagrams and two-way tables to calculate a conditional probability. (DOK – Level 2,3,4)
- Classify triangles and make observations about points that minimize distance sums to vertices and sides, hypothesizing how these points are to be found. (DOK – Level 1,2,3)
- Make observations about angle bisectors, parallel lines, and apply conjectures to solve problems. (DOK – Level 1,4)
- Identify and use the postulates of Euclidean Geometry. (DOK – Level 1)
- Assess the validity of a statement/formula generated inductively and justify the need for a deductive approach. (DOK – Level 3)
- Represent logical arguments using Boolean Algebra symbols. (DOK – Level 2)
- Evaluate the equivalence of logical statements using truth tables. (DOK – Level 2)
- Model conditional statements symbolically and identify converse, inverse, contrapositive. (DOK – Level 2)
- Assess logical statements using Venn Diagrams. (DOK – Level 3)
- Analyze/prove syllogisms using symbolic logic. (DOK – Level 4)
- Identify and apply properties of equivalence relations and equality. (DOK – Level 1)
- Apply betweenness of points and rays to solve problems related to segments and angles. (DOK – Level 2)
- Compare the distance formula and the Pythagorean Theorem and apply it to find distance between points. (DOK – Level 2,3)
- Discover the relationships between angles of intersecting lines (DOK - Level 3,4)
- Compare problems involving supplementary and complementary angles. (DOK - Level 2,3)

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Core Activities and Corresponding Instructional Methods:

1. Opening day pop quiz on how well students 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 correct. This test will be used to do a significance test to show if the students actually know each other.

2. Students will collect variables of interest from the class to use to identify as categorical and quantitative variables. The variables collected will also be used to create two-way tables and Venn diagrams to answer conditional probability questions. Variables will also be used to discover which graphs can be used 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.

4. Have the students line up from shortest to tallest. Create a human boxplot. Discuss rules for finding median and the quartiles. Add a teacher to the data set to discuss differences in an odd or even data set.

5. Students will create and describe histograms from a large set of data (Presidents age at Inauguration)

6. Students will use a sample of M & M's candy to perform and interpret chi-square goodness of fit test to test claims of the color distribution.

7. 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.

8. Students use SAT problems found from College Board practice tests to answer higher level questions regarding probability and statistics.

9. Students will read and answer questions from an article about Euclid. The article describes ways geometry was performed in early civilizations and how the Greeks with Euclid formalized geometry with theorems and postulates to prove how it worked.

10. Students will prove De Morgan's law using truth tables to show that if the truth tables give the same results they are logically equivalent.

11. Students will perform various logic problems to learn higher order thinking/reasoning skills (Examples: Truth Tellers and Liars / Man with the red hats / Wason Test)

12. 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.

13. 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

14. Students will derive the distance formula from the Pythagorean Theorem.
15. SAT Problems involving lines and angles from College Board practice tests
16. Warm-up problems from SAT problems reviewing key algebra 1 topics including equations of a line, systems of equations, and factoring.
17. Questions based on past AMC Grade 10 tests

Assessments:

Diagnostic:

- Teacher prepared diagnostic test, teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook/worksheets for each section.
- Common Assessment Quizzes

Summative:

- Common Assessment on Statistics (all free response)
- Common Assessment on Tools of Geometry (all free response)
- Common Assessment on Logic and Reasoning (all free response)

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Unit: 2   **Time Range in Days:** 45 days

Standard(s): PA Academic Standards and Anchors; PACCS Math

Standards Addressed: 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
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-
12%20March%202014.pdf
http://static.pdesas.org/content/documents/Geometry%20Assessment%20Anchors%20and%20Eligible
%20Content%20April%202014.pdf

Anchors: G.1.2.1, G.1.3.1, G.1.3.2, G.2.1.1, G.2.1.2, G.2.2.1

Eligible Content:
- Identify and/or use properties of triangles.
- Identify and/or use properties of isosceles and equilateral triangles
- Identify and/or use properties of congruent and similar polygons or solids.
- Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction).
- Use the Pythagorean theorem to write and/or solve problems involving right triangles
- Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape
- Relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations).
- Use properties of angles formed by intersecting lines to find the measures of missing angles
- Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles.

Objectives:
- Prove relationships between lines and angles. (DOK - Level 3,4)
- Identify the meaning of various definitions, postulates, and theorems (DOK-Level 1)
- Synthesize methods/sets of conditions that guarantee that triangles are congruent and apply them in proving triangles congruent. (DOK – Level 3,4)
- Apply properties of isosceles triangles in problem solving. (DOK – Level 2)

- Investigate the points of concurrency / triangle centers for medians, altitudes, perpendicular bisectors, and angle bisectors and identify their properties, justifying each. (DOK – Level 3,4)
- Identify a point of concurrency from angle and segment markings (DOK - Level 1,2)
- Apply properties of triangle centers to solve problems. (DOK – Level 2)
- Use coordinate geometry formulas (distance, midpoint, slopes of parallel and perpendicular lines) and linear systems to locate points of concurrence. (DOK – Level 2,3)
- Apply the Triangle Inequality Theorem and Triangle Angle-Side Theorem in problem solving. (DOK – Level 2,3,4)
- Find images of plane figures under reflection in a line, and identify lines of symmetry for various figures. (DOK – Level 2,3,4)
- Identify conditions necessary to prove lines are parallel and use them in justifying/proving other statements about plane figures. (DOK – Level 1,2,3,4)
- Prove through contradiction the parallelism of lines. (DOK – Level 3,4)

- Prove angles congruent or supplementary when parallel lines are crossed by a transversal. (DOK – Level 3,4)
- Prove that the interior angle sum of a triangle is 180° and analyze the role of the Parallel Postulate in this proof and its consequences. (DOK – Level 3,4)
- Solve problems related to angle measures in figures and justify solutions by applying concepts of parallelism. (DOK – Level 2,3,4)
- Prove right triangles congruent using the Hypotenuse-Leg Postulate, and critique the role of HL in proving triangles congruent relative to other triangle postulates. (DOK – Level 2,4)

Core Activities and Corresponding Instructional Methods:

1. Students will investigate fact 1, fact 2 problems to determine how they know a statement is true. This will be the foundation of proof writing.
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. Show students the idea of a center of a triangle is vague via the Steiner Point and soap film. The teacher will use premade pieces of glass with screws attached forming various polygons. The teacher will insert into a container of water and dish soap. The film from the soap will discover the Steiner Point which is the shortest combined distance to all three vertices of the triangle.
7. Geometer's Sketchpad activities with identifying the points of concurrency within triangles.
8. Geometer's Sketchpad activities with the Euler Line and special relationships with the points of concurrency.
9. Geometer's Sketchpad activity to determine where to build a new high school so it is equidistant to all three elementary schools.
10. Construct Voronoi Diagrams to solve problems using the perpendicular bisector theorem.
11. Discover the Triangle Inequality Theorem and Triangle Angle Side Theorem using Geometer's Sketchpad.
12. Prove Indirectly why corresponding angles being congruent implies lines are parallel.
13. Prove that the sum of the interior angles in a triangle are 180 degrees.
14. Prove how angle relationships involving alternate interior, alternate exterior, same side interior, and same side exterior angles imply parallel.
15. SAT problems with parallel and perpendicular lines from College Board practice exams.
16. Algebra applications with parallel and perpendicular lines, including ratios, systems of equations, and linear equations.

17. Warm-up problems reviewing Unit 1 ideas and parallel/perpendicular equation of line problems.

18. Questions based on past AMC Grade 10 tests

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Assessments:

Diagnostic:

- Teacher prepared diagnostic test, teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook/worksheets for each section.
- Common Assessment Quizzes

Summative:

- Common Assessment on Segment and Line Relationships (all free response)
- Common Assessment on Chapter Triangles and Congruence (all free response)
- Common Assessment on Relationships within Triangles (al free response)
- Common Assessment on Parallel Lines (all free response)

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Unit: 3   **Time Range in Days:** 45 days

Standard(s): PA Academic Standards and Anchors; PACCS Math

Standards Addressed: 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.7, CC.2.3.HS.A.11

http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

http://static.pdesas.org/content/documents/Geometry%20Assessment%20Anchors%20and%20Eligible%20Content%20April%202014.pdf

Anchors: G.1.2.1, G.1.3.1, G.1.3.2, G.2.1.1, G.2.1.2, G.2.2.2, G.2.2.3

Eligible Content:
- Identify and/or use properties of quadrilaterals
- Identify and/or use properties of regular polygons
- Identify and/or use properties of congruent and similar polygons or solids.
- Identify and/or use proportional relationships in similar figures.
- Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction).
- Estimate area, perimeter, or circumference of an irregular figure.
- Find the measurement of a missing length, given the perimeter, circumference, or area.
- Find the side lengths of a polygon with a given perimeter to maximize the area of the polygon
- Develop and/or use strategies to estimate the area of a compound/composite figure

Objectives:
- Identify the image of a figure through rotational transformation, and identify rotational symmetries in plane figures. (DOK – Level 1,2)
- Identify all of the symmetries of the equilateral triangle and find their compositions and analyze how the symmetries relate to each other in a functional sense. (DOK – Level 2,3,4)
- For a given polygon, find its number of diagonals, interior angle sum, and the measures of interior and exterior angles if equiangular. Given values of any of those quantities, identify the polygon by number of sides. (DOK – Level 1,2)
- Define quadrilateral types and represent them in a Venn Diagram to show relationships between classifications. (DOK – Level 1,2)

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- Prove relationships in a parallelogram and use them in comparing angles and side lengths. (DOK – Level 1,2,3,4)
- Prove relationships in rectangles, rhombuses, and squares, and use them in comparing angles and side lengths. (DOK – Level 1,2,3,4)
- Prove relationships in trapezoids and isosceles trapezoids, and define and use medians and midsegments in solving problems. (DOK – Level 1,2,3)
- Apply formulas in finding areas of plane figures, documenting and justifying methods of solution. (DOK – Level 1,2,3)
- Model real world problems with ratios and proportions and use them in problem solving. (DOK – Level 3,4)
- Establish correspondence and prove figures similar. (DOK – Level 2,3,4)
- Apply proportion-based theorems in solving triangles. (DOK – Level 1,2,3)
- Compute ratios of similitude (scaling factor) and area in similar figures and apply in solving real world problems. (DOK – Level 1,2,3)

Core Activities and Corresponding Instructional Methods:

1. Show that an equilateral triangle has 6 symmetries, 3 rotational and 3 reflections. Show that the composition of each of those symmetries creates one of the 6 symmetries. Apply this process to squares and other regular polygons
2. Discover the formulas for polygons (number of diagonals, interior, and exterior angles) through examples and deductive reasoning.
3. Problem solving activities with polygons that challenge students to apply the formulas to solve.
4. Students discover the relationships of quadrilaterals via Geometer's Sketchpad
5. Students will work in teams to prove the relationships they discovered about quadrilaterals and present them to the class.
6. Students will use transformations to create quadrilaterals in Geometer's Sketchpad.
7. SAT problems with quadrilaterals from College Board practice exams
8. Algebra applications with quadrilaterals including ratio, systems of equations, and factoring.
9. Generalize formulas for areas in polygons using deductive reasoning and coordinate planes or Geometer's Sketchpad.
10. Solve area problems involving complex shapes where students need to break a complex shape down to smaller known shapes.

11. Algebra applications with area involving ratios, systemens, and factoring.
12. SAT problems with area from College Board practice exams
13. Discover methods to prove polygons similar via Geometer's Sketchpad
14. Applications with Angle-Angle similarity to use with similar triangles.
15. Algebra applications with similarity
16. SAT problems with similarity from College Board practice tests
17. Barbie similarity to show that if Barbie was the height of a human her proportions would be impossible.
18. Golden Ratio activities involving www.goldennumber.net
19. Geometer's Sketchpad Golden Faces activity to find ratios in human faces that follow along the same principles of the phi.

20. Warm-ups review Unit 2 ideas and algebra review involving radicals.

21. Questions based on past AMC Grade 10 tests

Assessments:

Diagnostic:

● Teacher prepared diagnostic test, teacher questioning and observation

Formative:

● Teacher observations, questioning techniques
● Group activities
● Homework – example problems from the textbook/worksheets for each section.
● Common Assessment Quizzes

Summative:

● Common Assessment on Regular Polygons (all free response)
● Common Assessment on Quadrilaterals (all free response)
● Common Assessment on Similarity (all free response)
● Common Assessment on Area (all free response)

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Unit: 4   **Time Range in Days:** 45 days

Standard(s): PA Academic Standards and Anchors; PACCS Math

Standards Addresses: 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.7, CC.2.3.HS.A.8, CC.2.3.HS.A.9, CC.2.3.HS.A.11, CC.2.3.HS.A.12, CC.2.3.HS.A.5 CC.2.13.HS.A.6, CC.2.3.HS.A.14
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf
http://static.pdesas.org/content/documents/Geometry%20Assessment%20Anchors%20and%20Eligible%20Content%20April%202014.pdf

Anchors: G.1.1.1, G.1.2.1, G.1.3.1, G.1.3.2, G.2.1.1, G.2.1.2, G.2.2.2, G.2.2.3, G.2.3.1, G.2.3.2

Eligible Content:
- Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle
- Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle.
- Use chords, tangents, and secants to find missing arc measures or missing segment measures
- Identify and/or use the properties of a sphere or cylinder
- Identify and/or use properties of regular polygons
- Identify and/or use properties of pyramids and prisms
- Identify and/or use properties of congruent and similar polygons or solids.
- Identify and/or use proportional relationships in similar figures.
- Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction).
- Use trigonometric ratios to write and/or solve problems involving right triangles.
- Estimate area, perimeter, or circumference of an irregular figure.
- Find the measurement of a missing length, given the perimeter, circumference, or area
- Describe how a change in the linear dimension of a figure affects its surface area or volume (e.g., How does changing the length of the edge of a cube affect the volume of the cube?).
- Find the area of a sector of a circle

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- Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet
- Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?).
- Calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet
- Find the measurement of a missing length given the surface area or volume.

Objectives:
- Synthesize the relationships in special right triangles. (DOK 3,4)
- Apply rules of similarity within right triangles to complete a right triangle or problem solving (DOK 3,4)
- Apply rules of right triangle trigonometry to complete a right triangle or problem solving (DOK 3,4)
- Use the Law of Sines and Cosines to find a missing side or angle. (DOK 2)
- Identify, name, and use relationships between radii, diameters, chords, arcs, tangent lines. (DOK – Level 1,2)
- Synthesize, prove, and apply rules for angles in a circle and apply them in problems involving arcs and angles, including central, inscribed, inside, and outside angles. (DOK – Level 1, 2, 3, 4)
- Formalize an equation for circles and use it to write an equation from a graph or vice-versa. (DOK - Level 1,2,3)
- Synthesize, prove, and apply rules for intersecting chords, secants and tangents in circles, and two tangent segments from the same external point. (DOK – Level 3,4)
- Analyze parts of the regular polygon and synthesize formula for finding perimeter and area given only the radius and the number of sides, and apply these formulae in measuring regular polygons. (DOK – Level 1, 2, 4)
- Apply concepts from regular polygons to create rules for the perimeter and area of a circle, and apply these rules in measurement of circles. (DOK – Level 1,2,3,4)
- Revise the formulas for full circles to apply to arc lengths and areas. Compute arc lengths and areas of sectors. (DOK – Level 2,3)
- Define and identify Platonic Solids and identify duals and the relationship between vertices, edges and faces. Use these to construct the Platonic Solids (DOK – Level 1,2,3)

- Revise the Pythagorean equation to apply to rectangular solids' diagonals and apply it in finding distance in three-space. (DOK – Level 2,4)
- Identify prisms and cylinders and find their volumes and surface areas using formulas. (DOK – Level 1,2)
- Identify pyramids and cones, revise volume formulas to apply to these, and and find their volumes and surface areas using formulas. (DOK – 1,2,3)
- Decompose a sphere into an infinite number of pyramids and synthesize a formula for volume. Find volumes and surface areas of spheres. (DOK – 1,2,4)

Core Activities and Corresponding Instructional Methods:

1. 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.
2. Explore the similarities within a right triangle when an altitude is dropped from the right angle. Discover geometric mean formulas and use them to complete the right triangle.
3. Tell the story of Soh-Cah-Toa to build the trigonometric equations in right triangles. Build off previous knowledge of special right triangles.
4. Algebra applications with right triangles. Review rules for radicals
5. SAT right triangle problems from College Board practice tests
6. Explain how to solve triangle problems that are not right triangles with the law of Sines and Cosines.
7. Use Geometer's Sketchpad to discover relationships between angles and segments in circles.
8. Formalize proofs for circle angle and segment relationships.
9. Algebra applications with circles including writing the equation of a line.
10. SAT problems with circles from College Board practice tests
11. 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.
12. Discover the formulas for regular polygons area and perimeter.
13. Discover formulas for arc length, area of a sector, and segment of a circle.
14. Show the film, Platonic Solids, to discover the relationship between edges, sides, and vertices in solids.
15. Discover formulas for volume and surface area of solids
16. Real world applications with solids.
17. SAT problems with solids from College Board practice exams

18. Show movie "Flatland" to discuss dimensions and perspective
19. Use Geometer's Sketchpad to investigate fractal geometry and determine how many dimensions are in each figure.
20. Warm-up problems involving SAT problems with algebra review and Unit 3 and 4 ideas
21. Questions based on past AMC Grade 10 tests

Assessments:

Diagnostic:

● Teacher prepared diagnostic test, teacher questioning and observation

Formative:

● Teacher observations, questioning techniques
● Group activities
● Homework – example problems from the textbook/worksheets for each section.
● Common Assessment Quizzes

Summative:

● Common Assessment on Right Triangles and Trigonometry (all free response)
● Common Assessment on Circles (all free response)
● Common Assessment on Area of Regular Polygons and Circles (all free response)
● Common Assessment on Volume and Surface Area (all free response)
● Common Assessment Final Exam (multiple choice and free response)