Unit A - *A Introduction to Geometry*

Overview

This unit introduces students to the majority of terminology used in Geometry. Transformations, logical thinking and proofs are all part of the unit and will be referred to throughout the course. Students will be able to complete a two-column geometric proof by the end of the unit. Geometric software, along with compass and straightedge, will be used for constructions.

21st Century Capacities: Analyzing and Collective Intelligence

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.1
Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.CONTENT.HSA.REI.B.3
Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

CCSS.MATH.CONTENT.HSG.CO.A.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

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects.(Analyzing)
2. Justify reasoning using clear and appropriate mathematical language.
3. Work respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective (Collective Intelligence)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.
2. Mathematicians compare the effectiveness of various arguments, by analyzing and critiquing solution pathways.
3. Mathematicians flexibly use different tools, strategies, symbols, and operations to build conceptual knowledge or solve problems.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can I use symbols to communicate?
B. How does classifying bring clarity?
C. How can I use what I know to help me find what is missing?
D. What do I need to support my answer?

	Acquisition:	
arc. CCSS.MATH.CONTENT.HSG.CO.C.9 Prove theorems about lines and angles. CCSS.MATH.CONTENT.HSG.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). CCSS.MATH.CONTENT.HSG.GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. CCSS.MATH.CONTENT.HSS.CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). CCSS.MATH.CONTENT.HSS.CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. CCSS.MATH.CONTENT.HSS.CP.B.6 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. CCSS.MATH.CONTENT.HSS.CP.B.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model	*Students will know….* 1. In Euclidian Geometry points, lines and planes are undefined 2. that lines and planes are sets of points 3. how to identify congruent segments and angles on a diagram with tic marks 4. what can be assumed from a diagram and what cannot 5. the sum of the lengths of any two sides of a triangle is greater than the length of the third side 6. the definition of congruence in terms of transformations 7. that a counterexample can show that a conclusion is false 8. postulate and theorems are not always reversible 9. definitions are always reversible 10. that if a conditional statement is true, then the contrapositive of the statement of the statement is also true 11. the Addition, Subtraction, Multiplication and Division Property for Angles and Segments 12. that vertical angles are congruent 13. which assumptions we can and cannot make from a diagram 14. **Vocabulary:** point, line, segment, ray, endpoints, angles, sides, vertex, union, intersection, acute, right, obtuse, straight, collinear, noncollinear, theorem, proof, bisector, midpoint, trisect, trisection point, postulate, definition, conditional statement, implication, hypothesis, conclusion, converse, negation, contrapositive, perpendicular, probability, opposite rays,	*Students will be skilled at…* 1. naming and recognizing points, lines, rays, angles, line segment, triangles 2. finding the distance between two points on number lines using subtraction and absolute values 3. correctly interpreting geometric diagrams 4. converting between degrees, minutes and seconds and decimal degrees 5. If two angles are straight(right) angles, then they are congruent. 6. writing the converse, negation, inverse and contrapositive of a conditional statement 7. using the chain rule to draw conclusions 8. finding the complement or supplement of an angle given in degrees, minutes, seconds 9. solving algebraic problems involving angles 10. using theorems about angles and segments to solve basic proofs 11. using transitive and substitution property in basic proofs 12. constructing the copy of a segment 13. constructing the copy of an angle

Unit B - *Congruent Triangles*

Overview

This unit focuses on triangle classifications and proving triangles congruent. Proof is a very important concept throughout the unit. Students should become fluent in completing proofs by the end of this unit by seeing the patterns and structure within proofs.

21st Century Capacities: Analyzing and Presentation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSG.CO.B.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.

CCSS.MATH.CONTENT.HSG.CO.B.8
Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing)
2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)
3. Justify reasoning using clear and appropriate mathematical language**.** (Presentation)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Effective problem solvers work to make sense of the problem before trying to solve it
2. Mathematicians compare the effectiveness of various arguments, by analyzing and critiquing solution pathways.
3. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. What strategies can I use to solve the problem?
B. What do I need to support my answer?
C. How does classifying bring clarity?
D. What makes these shapes the same? Different?

CCSS.MATH.CONTENT.HSG.SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	***Acquisition:***	
	Students will know… 1. That two points determine a line 2. how the lengths of the sides of a triangle relate to the size of the angles opposite them 3. that corresponding parts of congruent triangles are congruent 4. The relationship between slope and a pair of parallel or perpendicular lines 5. Vocabulary: congruent, included, median, altitude, obtuse, acute, right, equiangular, isosceles, scalene, equilateral	*Students will be skilled at…* 1. Using SSS, SAS, AAS and HL to prove that triangles are congruent 2. Using congruence of triangles to find congruent parts (CPCTC) 3. Drawing auxiliary lines to help in proofs 4. Using overlapping triangles in proofs 5. Applying characteristics of triangles (ex; isosceles) to solve problems 6. Applying theorems relating to triangle angle measures and side lengths 7. Transforming shapes on the coordinate plane (reflect, translate, rotate, dilate) 8. Reflecting over any vertical or horizontal line or point

Unit C - *Lines in a Plane*

Overview

In this unit students develop proofs to fairly complex problems. Along with two column proofs students are encouraged to give verbal and/or paragraph arguments always with the idea of a clear, logical argument with mathematical justification as a priority.

A major focus in this unit is on quadrilaterals. Properties of quadrilaterals are introduced through various discovery activities in order to build a quadrilateral tree and to be able to classify the special quadrilaterals. Parallelograms are explored in further detail as students learn about sufficient conditions for parallelograms. Coordinate plane geometry is used to classify quadrilaterals.

Finally, the students mover beyond two dimensional shapes and study lines and planes in three dimensional space.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS	***Transfer:***	
MP 1 Make sense of problems and persevere in solving them **MP3** Construct viable arguments and critique the reasoning of others	*Students will be able to independently use their learning in new situations to...* 1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing) 2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing) 3. Justify reasoning using clear and appropriate mathematical language.	
CCSS.MATH.CONTENT.HSG.CO.A.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. CCSS.MATH.CONTENT.HSG.CO.C.9 Prove theorems about lines and angles. CCSS.MATH.CONTENT.HSG.CO.C.11	***Meaning:***	
	UNDERSTANDINGS: *Students will understand that:* 1. Effective problem solvers work to make sense of the problem before trying to solve it 2. Mathematicians compare the effectiveness of various arguments, by analyzing and critiquing solution pathways. 3. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:* A. What strategies can I use to solve the problem? B. What do I need to support my answer? C. How does classifying bring clarity? D. What makes these shapes the same? Different?

	Acquisition:	
Prove theorems about parallelograms. CCSS.MATH.CONTENT.HSG.GPE.B.4 Use coordinates to prove simple geometric theorems algebraically. CCSS.MATH.CONTENT.HSG.GPE.B.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). CCSS.MATH.CONTENT.HSG.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*	*Students will know…* 1. If two angles are both supp and comp, then they are both right angles 2. The perpendicular bisector theorem and its converse 3. The formula for slope 4. Horizontal lines have zero slope while vertical lines have no slope 5. Parallel lines have equal slope 6. The slope of perpendicular lines are negative reciprocals 7. The exterior angle inequality theorem 8. alt. int (alt, ext. or corr) angles congruent ⇒‖ lines 9. If 2 int (ext) angles are supplementary⇒‖ lines 10. If two coplanar lines are perp. to a third line, they are parallel 11. Five ways to prove a quadrilateral is a parallelogram 12. The definition of each quadrilateral 13. Properties of special quadrilaterals and applications of those props 14. The properties of parallelograms in depth 15. A trapezoid is a quadrilateral with exactly one pair of parallel sides 16. Four ways to determine a plane 17. Vocabulary: midpoint, distance, equidistance, plane, coplanar, noncoplanar, interior, exterior, alternate, corresponding, transversal, polygon, convex polygon, diagonals, base angles of a trapezoid, foot of a line, skew	*Students will be skilled at…* 1. Applying the midpoint formula 2. Creating a diagram for a proof when none is given 3. Using indirect proofs 4. Recognizing special angles pairs formed by transversals 5. Identifying visually whether a slope is positive, negative, zero or if there is no slope 6. Use the relationships of the slopes of parallel and perpendicular lines to solve problems and proofs 7. Identifying the exterior angle, adjacent interior angle and remote interior angles of a triangle 8. Using various methods to prove lines parallel 9. Applying parallel lines and the angles formed by the transversal to solve problems and proofs 10. Identifying polygons and non polygons 11. Naming polygons via their vertices 12. Identifying properties of specific quadrilaterals relating to their diagonals, sides and angles 13. Prove that a quadrilateral is a parallelogram. 14. Classifying quadrilaterals based on definitions and properties 15. Applying the properties of parallelograms and of special quadrilaterals to solve problems and proofs 16. Proving info about special quadrilaterals on the coordinate plane 17. Determining intersections within the 3D world 18. Visualizing 3D scenarios given in written form

Unit D - *Polygons*

Overview

We move from quadrilaterals to this unit which explores triangles and polygons and the measures of their interior and exterior angles, including "regular" polygons. Students are encouraged to see diagrams and shapes as compositions of smaller, often repeated, shapes. Students will learn the concept of "similar" polygons and the ratios of their corresponding sides, perimeters and areas.

21st Century Capacities: Analyzing and Presentation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.CONTENT.HSG.SRT.A.1.B The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

CCSS.MATH.CONTENT.HSG.SRT.A.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.

CCSS.MATH.CONTENT.HSG.SRT.A.3 Use the properties of similarity transformations to establish

Transfer:

Students will be able to independently use their learning in new situations to...

1. Manipulate equations/expressions or objects to create order and establish relationships.(Analyzing)
2. Draw conclusions about shapes and diagram.s (Analyzing)(Presentation)
3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
2. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
3. Mathematicians understand that placing a problem in a category gives one a familiar approach to solving it.
4. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can understanding a pattern help me?
B. How does classifying bring clarity?
C. How can constructing and deconstructing help me?
D. Does this solution make sense?

the AA criterion for two triangles to be similar. CCSS.MATH.CONTENT.HSG.SRT.B.4 Prove theorems about triangles. *CCSS.MATH.CONTENT.HSG.SRT.B.5* Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. CCSS.MATH.CONTENT.HSG.CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). CCSS.MATH.CONTENT.HSG.CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. CCSS.MATH.CONTENT.HSG.CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. CCSS.MATH.CONTENT.HSG.CO.A.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.	***Acquisition:***	
	Students will know… 1. the sum of the measures of the angles of a triangle is 180 2. the measure of an exterior angle of a triangle is equal to the sum of the remote interior angles 3. the Midline Theorem for triangles 4. the No Choice Theorem for triangles 5. the sum of the interior angles of a polygon with n sides = (n-2)180 6. the sum of the exterior angles of a polygon with n sides = 360 (regardless of n) 7. the number of diagonals in a polygon with n sides = n(n-3)/2 8. the corresponding sides of similar polygons are proportional and the corresponding angles are congruent 9. AA~ for triangles 10. the ratio of the perimeter of two similar polygons equals the ratio of any pair of corresponding sides 11. if a line is parallel to one side of a triangle and intersects the other two sides, it divides those sides proportionally 12. if three or more parallel lines are intersected by two transversals, the parallel lines divide the transversals proportionally 13. if a ray bisects an angle of a triangle, it divides the opposite side into segments that are proportional to the adjacent sides 14. Vocabulary: exterior angle, interior angle, pentagon, hexagon, heptagon, octagon, nonagon, decagon, dodecagon, pentadecagon, n-gon, regular polygon, concave, convex, exterior angle, interior angle, diagonal, similar, dilation, reduction, apothem	*Students will be skilled at…* 1. using interior and exterior angles measures of a polygon to solve problems 2. solving regular polygon problems involving angles 3. applying the Midline Theorem 4. using AAS to find triangles congruent 5. solving problems involving the number of diagonals in a polygon 6. identifying whether a pair of polygons is similar 7. using proportional reasoning and congruent corresponding angles to find missing dimensions of similar polygons and solve proofs 8. applying theorems involving proportionality to problems and proofs

Unit E - *Right Triangles*

Overview

This unit is an exploration of families of right triangles, the Pythagorean theorem, and right triangle trigonometry. It includes the 30-60-90 and 45-45-90 right triangles and the relationship between the lengths of their sides. Word problems focus on angles of elevation and angles of depression.

21st Century Capacities: Analyzing and Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others

CCSS.MATH.CONTENT.HSN.RN.A.2
Rewrite expressions involving radicals and rational exponents using the properties of exponents.

CCSS.MATH.CONTENT.HSA.CED.A.1
Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.CONTENT.HSA.REI.A.2
Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

CCSS.MATH.CONTENT.HSA.REI.B.4

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects.(Analyzing)
2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)
3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem. (Synthesizing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
2. Mathematicians apply the mathematics they know to solve problems occurring in everyday life.
3. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
4. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can understanding a pattern help me?
B. How can I use what I know to help me find what is missing?
C. How can constructing and deconstructing help me?

	Acquisition:	
Solve quadratic equations in one variable. CCSS.MATH.CONTENT.HSA.REI.B.4.B Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. CCSS.MATH.CONTENT.HSG.CO.A.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. CCSS.MATH.CONTENT.HSG.SRT.B.4 Prove theorems about triangles. CCSS.MATH.CONTENT.HSG.SRT.C.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. CCSS.MATH.CONTENT.HSG.SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles. CCSS.MATH.CONTENT.HSG.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems	*Students will know…* 1. The Pythagorean Theorem 2. The distance formula 3. Some Pythagorean Triplets (3,4,5)(5,12,13) 4. The ratio (and location) of the sides of 30-60-90 and 45-45-90 triangles 5. The three trigonometric ratios (sine = opp/hyp and cosine = adj/opp and tangent = opp/adj) 6. The relationship between the sine and the cosine of complementary angles 7. Vocabulary: faces, edges, diagonals solids, base, vertex, altitude, slant height, trigonometry, opposite, adjacent, angle of elevation, angle of depression,	*Students will be skilled at…* 1. Simplifying rational numbers 2. Multiplying rational numbers 3. Solving quadratic equations 4. Applying the Pythagorean Theorem to 2D and 3D problems 5. Using the converse of the Pythagorean Theorem to classify triangles as acute, right or obtuse 6. Applying the distance formula to solve problems 7. Using Pythagorean triplets to solve triangles 8. Solving problems involving 30-60-90 and 45-45-90 triangles 9. Solving angle of elevation (depression) problems 10. Solving problems using right triangle trigonometry (find a side, find an angle) 11. Using a table or technology to find the inverse of a trigonometric function

Unit F - *Circles*

Overview

During this unit students use many concepts learned throughout the course to solve problems involving circles. Segments and angles associated with circles are examined. Problems on the coordinate plane again bridge Algebra and Geometry skills and concepts.

21st Century Capacities: Analyzing and Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSG.CO.A.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.

CCSS.MATH.CONTENT.HSG.C.A.1
Prove that all circles are similar.

CCSS.MATH.CONTENT.HSG.C.A.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*

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Synthesizing)
2. Demonstrate fluency with math facts, computation and concepts.
3. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians flexibly use different tools, strategies, symbols, and operations to build conceptual knowledge or solve problems.
2. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
3. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. What math strategies can I use to solve the problem?
B. Does this solution make sense?
C. How does classifying bring clarity?

Acquisition:

a circle is perpendicular to the tangent where the radius intersects the circle. CCSS.MATH.CONTENT.HSG.C.B.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. CCSS.MATH.CONTENT.HSG.GPE.A.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.	*Students will know…* 1. How to identify a major or minor arc 2. The formula for the area and circumference of a circle 3. If a radius is perp to a chord, then it bisects the chord (and the converse) 4. The perp. bisector of a chord passes through the center of the circle 5. Vocabulary: sector, circle, center, radius, concentric, interior, exterior, diameter, chord, arc, central angle, minor arc, major arc, semicircle	*Students will be skilled at…* 1. Identifying if a point is located in the interior, exterior or on the circle 2. Identifying chords, radii, diameters, tangents of circles 3. Applying circle area and circumference formulas to find the area of a sector or length of an arc 4. Solving a wide variety of problems, including proofs, involving circles

Unit G - *Area, Surface Area, Volume*

Overview

This short unit on area, surface area and volume gives students an opportunity to apply the Geometry they have learned throughout the year. The goal for students is to understand the formulas involved through deriving the formulas rather than simply memorize the formulas.

21st Century Capacities: Analyzing and Presentation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.1
Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.CONTENT.HSA.CED.A.4
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

CCSS.MATH.CONTENT.HSG.GMD.A.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.

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Presentation)
2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. Analyzing
3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
2. Mathematicians apply the mathematics they know to solve problems occurring in everyday life.
3. Mathematicians use geometric models, and spatial sense to interpret and make sense of the physical environment.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can I break a problem down into manageable parts?
B. Does this solution make sense? If not, what do I do?
C. How can I use what I know in the world?

	Acquisition:	
CCSS.MATH.CONTENT.HSG.MG.A.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).* CCSS.MATH.CONTENT.HSG.MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* CCSS.MATH.CONTENT.HSG.MG.A.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).*	*Students will know…* 1. The formulas for the area of a rectangle, parallelogram, triangle, trapezoid, circle 2. That the volume of a cone (or pyramid) with an equal base and height of a cylinder (or prism) is ⅓ the volume of the cylinder (or prism) 3. Changing the length of a side by k changes the area by k^2 and the volume by k^3 4. Vocabulary: bases, faces, edges, lateral faces, slant height, lateral edges	*Students will be skilled at…* 1. Applying formulas to solve problems about surface area, area and volume 2. Using nets to find surface area of 3D objects 3. Converting between cubic inches and cubic feet, square inches and square feet or other similar conversions

Unit H - *Advanced Coordinate Geometry*

Overview

In this final unit, students link what they have learned in Algebra I about graphing equations to the concepts they have learned throughout this Geometry course. The work in this unit will create a smooth bridge to the work done in Algebra II. There is no PBA for this unit and topics are covered as time allows.

21st Century Capacities: Synthesizing and Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.MATH.CONTENT.HSA.CED.A.3
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

CCSS.MATH.CONTENT.HSA.REI.C.5
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing)
2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)
3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem. (Synthesizing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Effective problem solvers work to make sense of the problem before trying to solve it.
2. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. What does the solution tell me?
B. What is the most efficient way to solve this problem?

with the same solutions. CCSS.MATH.CONTENT.HSA.REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. CCSS.MATH.CONTENT.HSA.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. CCSS.MATH.CONTENT.HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). CCSS.MATH.CONTENT.HSA.REI.D.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. CCSS.MATH.CONTENT.HSG.GPE.B.4 Use coordinates to prove simple geometric theorems algebraically. CCSS.MATH.CONTENT.HSG.GPE.B.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).	***Acquisition:***	
	Students will know… 1. Slope intercept, point slope and general linear form of lines and how to fluently use the form to get information about the line 2. A system of equations has either one, no or an infinite number of solutions 3. That the graph of a system of inequalities represents the points that are a solution to all the inequalities in the system 4. Vocabulary: system	*Students will be skilled at…* 1. Verifying if a point is a solution to an equation 2. Graphing an equation, inequality or a system of equations or inequalities 3. Using geometric properties learned throughout the course to solve problems on the coordinate plane including those involving slope, distance, area 4. Writing equations of lines from given information 5. Solving a system of equations by substitution, addition algorithm, graphing 6. Identifying the center and radius of a circle given in standard form and graph it 7. Writing the equation of the graph of a circle