Orange Board of Education _____ Geometry

Unit I:

Topic: Congruence, Proof, and Construction	Skills: * Use the three building blocks of geometry, point, line, and plane, to write precise geometric definitions. * Learn how to label points, lines, segments, rays, and planes to name geometric figures. * Find lengths of segments to understand congruent segments. * Use the distance and midpoint formulas to find the distance and midpoint between two points in the coordinate plane. * Find angle measures using the definitions of acute, right, obtuse, and straight angles. * Investigate what happens when you slide or flip a triangle using graph paper. * Use graph paper to construct a similar figure. * Use coordinate rules for reflections to reflect a figure in the line $y=x$. * Use coordinate rules for rotations about the origin to rotate a figure about the origin. * Use compositions of two or more transformations to understand a glide reflection. * Draw symmetry lines to determine if a figure has line symmetry. * Use ratios to determine dilations of figures. * Use triangle congruence postulates and theorems to prove triangles congruent. * Use geometric theorems and algebraic properties to write a geometric proof to prove statements about segments and angles, angle pair relationships, and triangle sum properties. * Study theorems about parallelograms to prove properties of parallelograms and quadrilaterals. * Use paper folding and a compass and straight edge to make constructions without measurement.	Projected # of days: 18

Unit 2:

Orange Board of Education _____ Geometry

Topic: Similarity and Proof	Skills: * Use the definition of dilation to prove circles are similar. * Set up and solve proportions to calculate actual distance from a scale drawing to solve geometric problems. * Solve proportions using the lengths of corresponding sides to find the length of a missing side in similar polygons. * Use inductive reasoning to make and test conjectures by writing converse, inverse, and contrapositive statements. * Explore how conditional and biconditional statements are used to state definitions. * Develop simple logical arguments by using deductive reasoning to learn what can and cannot be assumed from a diagram. * Prove basic theorems about congruence, supplementary angles, complementary angles, and vertical angles using properties of equality and the laws of logic. * Show that two pairs of angles are congruent to prove that two triangles are similar using the Triangle Similarity Postulate and Theorems. * Use the Midsegment Theorem to write a proportion if a line is parallel to one side of a triangle? * Use the Base Angles Theorem and its converse to find the relationship between the sides and angles of a triangle and the relationship of two or more congruent sides or angles. * Place a figure in the coordinate plane, assign coordinates to the vertices, and use the midpoint, distance, and/or slope formulas to write a coordinate proof.	Projected # of days: 21

Unit 3:

Orange Board of Education _____ Geometry

Topic: Trigonometry	Skills: * Use the Pythagorean Theorem to find the length of the third side of a right triangle given the lengths of two sides of a right triangle. * Use the Converse of the Pythagorean Theorem to use the sides of a triangle to determine if the triangle is a right triangle. * Use the Midsegment Theorem and properties of triangles to write a coordinate proof. * Find the point where the medians of a triangle intersect to find the centroid of a triangle to find the balancing point of a triangle. * Use the slope formula to find the slope of parallel and perpendicular lines given two points on the line. * Use the slope formula to determine if quadrilaterals are parallelograms and to find the coordinates of diagonals. * Use proportions to identify similar polygons. * Use properties of the altitude of a right triangle to find the length of the altitude to the hypotenuse of a right triangle. * Use the tangent ratio to find a leg of a right triangle when you know the other leg and one acute angle. * Use the sine and cosine ratios to find the lengths of the sides of a right triangle when you are given the length of the hypotenuse and one acute angle. * "Solve a triangle" using trig ratios to find all the sides and angles of the triangle. * Use the Law of Sines and Law of Cosines to find angle and side measures in any triangle.	Projected # of days: 18

Unit 4:

Orange Board of Education _____ Geometry

Topic: Circles and Expressing Geometric Properties through Equations	Skills: * Verify that a segment is tangent to a circle by using the Converse of the Pythagorean Theorem. * Find the measure of an arc of a circle by relating arc measure to the central angle of the arc. * Use the unit circle to convert arc and angle measures from degrees to radians and radians to degrees. * Find the measure of an inscribed angle by relating the inscribed angle to its intercepted arc. * Write the equation for a circle using the distance formula, the Pythagorean Theorem, and by completing the square. * Write equations of lines passing through two points using point-slope form. * Find the distance between a point and a line to prove theorems about perpendicular lines. * Study three special kinds of parallelograms to prove that a quadrilateral is a rhombus, rectangle, or square. * Use Heron's Formula to find the area of any triangle given the side lengths of the triangle.	Projected # of days: 17

Unit 5:

Orange Board of Education _____ Geometry

Topic: Extending to Three Dimensions	Skills: * Classify prisms and pyramids using the shape of the base. * Describe the shape formed by the intersection of a plane and solid using cross sections. * Derive volume formulas to understand the relationship between the formulas of pyramids and cubes, cones and cylinders, and cylinders and spheres. * Use Cavalieri's Principle to explain that volume formulas for right prisms or cylinders also work for oblique prisms and cylinders. * Use solids to identify composite solids that occur in real life. * Use volume formulas to find the volume of prisms, pyramids, cones, cylinders, and spheres. * Use volume formulas to find the volume of composite solids by comparing the bases and heights of each solid. * Use area and volume formulas to solve density and population problems. * Describe two dimensional shapes that could be used to form three dimensional figures as in wood carving. * Describe the solid formed by rotating a two dimensional figure.	Projected # of days: 12

Unit 1: Congruence, Proof, and Construction

Orange Board of Education _____ Geometry

Goal(s)(NJCCCS and CCSS):

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.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).

G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

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

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

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

G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

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

G.CO.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

G.CO.11 Prove theorems about parallelograms. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Orange Board of Education _____ Geometry

Essential Questions:

- How are points and lines related to each other?
- How does the knowledge of transformations assist with graphic design?
- How does angle measure relate to reflections and rotations of objects?
- What is the relationship between translations and other forms of geometric measurement and expression?
- How are translations interrelated?
- What is the relationship between congruence and rigid motion?
- How do corresponding sides and angles relate to congruence?
- How are triangle congruence theorems interrelated?
- How are alternate interior angle, vertical angles, and corresponding angles related?
- How is knowledge of angle measure in a triangle related to determining the total number of degrees in a regular polygon?
- What is the relationship between quadrilaterals, parallelograms, squares, and rectangles?
- How are various tools utilized in constructing geometric objects?
- How does knowledge of angle measure relate to the ability to draw geometric constructions?

Skills/Knowledge/Understandings:

- Students will define basic geometric figures and use visual representations to understand undefined terms such as point, line, and plane.
- To describe the attributes of a segment, segments will be measured with and without a coordinate grid and by using the Midpoint and Distance Formulas.
- To describe the attributes of angles, protractors will be used to measure angles.
- Students will solve equations giving their reasons for each step and connect this to simple proofs.
- Geometric relationships will be proven using given information, definitions, properties, postulates, and theorems.

Objectives:

- Using the undefined notion of a point, line, and distance along a line and distance around a circular arc SWBAT define angles, circles, parallel lines, perpendicular lines and line segments.
- By using geometric software, graph paper, tracing paper, and geometric tools, SWBAT develop and perform rigid transformations that include reflections, rotations, translations, and dilations and compare them to non-rigid transformations.
- Using rigid transformations SWBAT determine, explain, and prove congruence of geometric figures.
- Using definitions, postulates, and theorems, SWBAT create proofs of theorems involving lines, angles, triangles, and parallelograms.
- By using paper folding, geometric software and geometric tools, SWBAT generate formal constructions to include, but not limited to, the construction of regular polygons inscribed in a circle.

Orange Board of Education _____ Geometry

Assessments:

Formative:

observations, questioning, discussions, learning response logs, graphic organizers, peer or self-assessments, practice presentation, visual presentation, individual whiteboards, think pair share, kinesthetic assessments, constructive quizzes, SMART responders

Summative:

Teacher created chapter assessments, Unit 1 Benchmark assessment

Authentic:

https://sites.google.com/site/commoncoremathcurriculum/geometry/congruence

Literacy Connections:

Write an essay or a report on the solution to a problem with mathematical justification.
Present an oral presentation with or without graphics or other media
Complete a written and oral presentation using graphic displays, 2D or 3D models, proofs, and/or spreadsheets.

Interdisciplinary Connections:

Students will learn about patterns in math related to laying cable, stenciling a border, the Taj Mahal floor plan, sink drains, and flashlight images.

Technology Integration:

All: http://www.ixl.com/math/geometry, https://sites.google.com/site/emilou2010/high-school-links/geometry, www.classzone.com, http://www.learner.org/interactives/?grade_levels[]=9-12&disciplines[]=MATH
Constructions: http://www.mathsisfun.com/geometry/constructions.html, http://www.mathopenref.com/tocs/constructionstoc.html
Definitions, Postulates, & Theorems: http://www.wyzant.com/help/math/geometry/lines_and_angles/angle_theorems
Proofs: www.ehow.com/how_2314091_do-stepbystep-geometry-proof.html
Transformations: http://www.mathsisfun.com/geometry/transformations.html, https://sites.google.com/site/emilou2010/high-school-links/geometry
Mnemonics: http://www.onlinemathlearning.com/mnemonics-for-geometry.html

Key Vocabulary:

point, line, plane, collinear, coplanar, line segment, endpoints, ray, opposite rays, intersection, postulate, coordinate, distance, between, congruent, midpoint, bisector, angle, construction, complementary, supplementary, adjacent, linear pair, vertical angles, polygon,, side, vertex, measure, equilateral, equiangular, regular, circle, perpendicular, parallel, proof, two-column proof, informal proof, theorem, image, pre-image, transformation, translation, reflection, rotation, rigid, non-rigid, composition, symmetry, scalar, similar, inscribed

Orange Board of Education _____ Geometry

Useful Sites:

- www.njctl.org
- www.kendallhunt.com
- www.ixl.com/math/geometry
- www.khanacademy.org
- www.purplemath.com
- www.math.com
- www.coolmath.com
- www.edhelper.com
- www.youtube.com/mathdoris
- www.Teachertube.com
- www.themathpage.com

Text Crosswalk: McDougal Littell Geometry

- Definitions: 1.1, 1.4
- Transformations: 4.8, 6.7, 9.3-9.5, 9.7
- Triangle Congruency: 4.3-4.5
- Inductive and Deductive Reasoning: 2.2-2.4
- Proofs: 2.6-2.7, 4.1, 8.1-8.3
- Constructions and Paper Folding: pp. 33, 34, 152, 169, 195, 258, 261, 305, 307, 314, 323, 665, 767

*Differentiation: www.marzanoresearch.com/free_resources/itembank.aspx
http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated_instruction_udl

Unit 2: Similarity and Proofs

Goal(s)(NJCCCS and CCSS):

- G.C.1 Generate proofs that demonstrate that all circles are similar.
- G.SRT.1 Justify the properties of dilations given by a center and a scale factor. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged (the dilation of a line segment is longer or shorter in the ratio given by the scale factor.)
- G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- G.SRT.4, G.CO.10 Prove theorems about triangles.

Orange Board of Education _____ Geometry

Essential Questions:

- Why is it beneficial to know that all circles are similar?
- How does scale factor relate to similarity in triangles?
- How is knowledge of scale factor important to graphic designers?
- What is the least amount of information needed to prove two triangles similar? How do you know?
- How does the distance formula relate to determining ratios in a line segment?

Skills/Knowledge/Understandings:

- Construct the dilation of a figure
- Use circumference and diameter of a circle and dilations of a circle to prove similarity
- Use the definition of similar polygons to find missing measures in similar polygons
- Review ratio and proportion
- Define similar polygons and solids
- Discover shortcuts for similar triangles
- Learn about area and volume relationships in similar polygons
- Use the definition of similarity to solve problems
- Prove base angles of isosceles triangle are congruent
- Prove Pythagorean Theorem using triangle similarity
- Explain how AA Similarity Theorem proves similarity through transformations

Objectives:

- Using dilations, SWBAT generate proofs that demonstrate that all circles are similar.
- Using ratios, SWBAT justify the properties of dilations given by a center and a scale factor.
- Given two figures, SWBAT 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.
- Using the properties of similarity transformations SWBAT establish the AA criterion for two triangles to be similar.
- Using definitions, postulates, and theorems, SWBAT prove theorems about triangles.

Assessments:

Formative:

- observations, questioning, discussions, learning response logs, graphic organizers, peer or self-assessments, practice presentation, visual presentation, individual whiteboards, think pair share, kinesthetic assessments, constructive quizzes, SMART responders

Summative:

- Teacher created chapter assessments, Unit 2 Benchmark assessment

Authentic:

- http://illuminations.nctm.org/ActivityDetail.aspx?ID=116
- https://sites.google.com/site/commoncoremathcurriculum/geometry/expressing-geometric-properties
- https://sites.google.com/site/commoncoremathcurriculum/geometry/similarity-right-triangles-and-trig
- http://schools.nyc.gov/NR/rdonlyres/49162FEC-37E2-4A96-93C1-6671664FACD5/0/NYCDOEHSMathCompanyLogo_Final_102411_NY.pdf

Orange Board of Education _____ Geometry

Literacy Connections:

Write an essay or a report on the solution to a problem with mathematical justification.
Present an oral presentation with or without graphics or other media
Complete a written and oral presentation using graphic displays, 2D or 3D models, and/or spreadsheets.

Interdisciplinary Connections:

Students will discover how similarity in geometric figures relates and connects to graphic designers, gardeners, landscape artists, bridges, maps, money, pools, posters, and projectors.

Technology Integration:

All: http://www.ixl.com/math/geometry, https://sites.google.com/site/emilou2010/high-school-links/geometry, www.classzone.com.
http://www.learner.org/interactives/?grade_levels[]=9-12&disciplines[]=MATH
Prove Circles Similar: http://illuminations.nctm.org/ActivityDetail.aspx?ID=116
Polygon Similarity: http://www.mathwarehouse.com/geometry/similar/triangles/sides-and-angles-of-similar-triangles.php, http://library.thinkquest.org/20991/geo/spoly.html, http://www.mathopenref.com/similarpolygons.html
Introduction to Logic: http://www.themathpage.com/aBookI/logic.htm
Proofs: www.ehow.com/how_2314091_do-stepbystep-geometry-proof.html
Mnemonics: http://www.onlinemathlearning.com/mnemonics-for-geometry.html

Key Vocabulary:

ratio, proportion, means, extremes, geometric mean, scale drawing, scale, similar polygons, scale factor of two similar polygons, dilation, reduction enlargement, triangle, scalene, isosceles, equilateral, acute, right, obtuse, equiangular, interior angles, exterior angles, corollary to a theorem, congruent figures, corresponding parts, right triangle, legs, hypotenuse, isosceles triangle, legs, vertex angle, base, base angles

Useful Sites:

www.njctl.org
www.kendallhunt.com
www.ixl.com/math/geometry
www.khanacademy.org
www.purplemath.com
www.math.com
www.coolmath.com
www.edhelper.com
www.youtube.com/mathdoris
www.Teachertube.com
www.themathpage.com

Text Crosswalk: McDougal Littell Geometry

Similar Circles: http://math.tutorcircle.com/geometry/similarity-in-geometry.html, http://www.cpm.org/pdfs/state_supplements/Similar_Circles.pdf
Proportions & Similarity: 6.2-6.4 & 6.6
Triangle Proofs: 4.7, 5.1

*Differentiation: www.marzanoresearch.com/free_resources/itembank.aspx
http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated_instruction_udl

Orange Board of Education _____ Geometry

Unit 3: Trigonometry

Goal(s)(NJCCCS and CCSS): G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles. G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
Essential Questions: How does distance formula relate to determining ratios in a line segment? How does the Pythagorean Theorem support the case for triangle similarity? How does angle measure relate to triangle similarity? How are mnemonics helpful in learning trig ratios? What is the relationship between cosine and sine in relation to complementary angles? How do trigonometric ratios assist in determining height and depth when angle and distance to a given point are known? When could a contractor use the equation A=1/2absin(C) to find the area of a triangle? When is it appropriate to use Law of Sines instead of Law of Cosines? What are three real-world applications of Law of Sines and Law of Cosines?
Skills/Knowledge/Understandings: Apply the Pythagorean Theorem Find the length of the hypotenuse using two methods Use the Converse of the Pythagorean Theorem Use Similar Right Triangles Apply the Tangent Ratio Apply the Sine and Cosine Ratio Find hypotenuse and leg lengths using angles of depression and elevation Use inverse trigonometric functions to find angle measures Solve Right Triangles

Orange Board of Education _____ Geometry

Objectives:

Using the Distance Formula, SWBAT determine ratios in a line segment.
By using triangle congruence and similarity SWBAT prove theorems about triangles and solve problems and prove relationships in geometric figures.
Using congruence and similarity criteria for triangles to solve problems SWBAT prove relationships in geometric figures.
Using similarity of right triangles, SWBAT derive the definitions for trigonometric ratios.
Using definitions of angles and ratios, SWBAT explain and use the relationship between the sine and cosine of complementary angles.
Using trigonometric ratios and the Pythagorean Theorem SWBAT solve right triangles in applied problems.

Assessments:

Formative:

observations, questioning, discussions, learning response logs, graphic organizers, peer or self-assessments, practice presentation, visual presentation, individual whiteboards, think pair share, kinesthetic assessments, constructive quizzes, SMART responders

Summative:

Teacher created chapter assessments, Unit 3 Benchmark assessment

Authentic:

https://sites.google.com/site/commoncoremathcurriculum/geometry/similarity-right-triangles-and-trig

Literacy Connections:

Write an essay or a report on the solution to a problem with mathematical justification.
Present an oral presentation with or without graphics or other media
Complete a written and oral presentation using graphic displays, 2D or 3D models, and/or spreadsheets.

Interdisciplinary Connections:

Students will understand how trigonometry ratios are used in gardening, construction, kite designs, skateboarding, model rockets, dive-in movie theatres, skyscrapers, ski lifts, airplane landings, extension ladders, office buildings, and bridges.

Technology Integration:

All: http://www.ixl.com/math/geometry, https://sites.google.com/site/emilou2010/high-school-links/geometry, www.classzone.com, http://www.learner.org/interactives/?grade_levels[]=9-12&disciplines[]=MATH
Radian Measure: http://www.themathpage.com/atrig/radian-measure.htm
Trig Ratios: http://www.onlinemathlearning.com/basic-trigonometry.html
Solving Triangles: http://www.onlinemathlearning.com/basic-trigonometry.html
Law of Sines and Cosines: http://www.onlinemathlearning.com/basic-trigonometry.html, http://www.mathworksheetsgo.com/sheets/trigonometry/advanced/law-of-sines-and-cosines/worksheet.php
Mnemonics: http://www.onlinemathlearning.com/mnemonics-for-geometry.html

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Key Vocabulary: Pythagorean Theorem, trigonometric ratio, tangent, sine, cosine, angle of elevation, angle of depression, solve a right triangle, inverse tangent, inverse sine, inverse cosine, ratio, proportion, means, extremes, geometric mean, scale drawing, scale, similar polygons, scale factor of two similar polygons, dilation, center of dilation, scale factor of a dilation, reduction, enlargement
Useful Sites: www.njctl.org www.kendallhunt.com www.ixl.com/math/geometry www.khanacademy.org www.purplemath.com www.math.com www.coolmath.com www.edhelper.com www.youtube.com/mathdoris www.Teachertube.com www.themathpage.com
Text Crosswalk: McDougal Littell Geometry Pythagorean Theorem 7.1 & 7.2 Triangle Properties: 5.1 & 5.4 Slope: 3.4 Coordinate Geometry: 8.1 & 8.2 Polygon Proportions: 6.3 Trigonometry: 7.3, 7.5-7.7 Law of Sine & Cosine: pg. 490

*Differentiation: www.marzanoresearch.com/free_resources/itembank.aspx
http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated_instruction_udl

Orange Board of Education _____ Geometry

Unit 4: Circles and Expressing Geometric Properties through Equations

Goal(s)(NJCCCS and CCSS):

G.C.1 Prove that all circles are similar.

G.C.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

G.C.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

G.CO.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).

G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. (E.g. Find the equation of a line parallel or perpendicular to a given line that passes through a given point.

G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Essential Questions:

How is knowledge of the properties of circles and cylinders beneficial to the manufacturing industry?

Where are inscribed circles and circumscribed used in everyday life?

Why would landscape artists need to know how to create a tangent line?

How is area of a sector related to the length of the arc?

How are radii related to the sides of an inscribed right triangle?

How can the use of geometry and related algebraic equations assist in proving geometric theorems?

How is slope related to parallel and perpendicular lines?

Why is knowledge of geometry and algebra in relation to mathematics in the real world?

Orange Board of Education _____ Geometry

Skills/Knowledge/Understandings:

- Use properties of tangents
- Find arc measures
- Apply properties of chords
- Use inscribed angles in polygons
- Apply other angle relationships in circles
- Find segment lengths in circles
- Write and graph equations of lines

Objectives:

- By Identifying and describing relationships among inscribed angles, radii, and chords, SWBAT determine the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
- Using geometric tools and geometric software, SWBAT prove the properties of angles for a quadrilateral inscribed in a circle and construct inscribed and circumscribed circles of a triangle, and a tangent line to a circle from a point outside a circle.
- Using similarity SWBAT show 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.
- Using the Pythagorean Theorem, SWBAT derive the equation of a circle of given center and radius and find the center and radius of a circle given by an equation by completing the square.
- By Proving the slope criteria for parallel and perpendicular lines SWBAT use them to solve geometric problems.
- Using theorems, postulates, and definitions SWBAT construct formal proofs involving parallelograms.
- Using algebra and coordinates, SWBAT prove simple geometric theorems.
- Using the distance formula and coordinates SWBAT compute perimeters of polygons and areas of triangles and rectangles.

Orange Board of Education _____ Geometry

Assessments:

Formative:

observations, questioning, discussions, learning response logs, graphic organizers, peer or self-assessments, practice presentation, visual presentation, individual whiteboards, think pair share, kinesthetic assessments, constructive quizzes, SMART responders

Summative:

Teacher created chapter assessments, Unit 4 Benchmark assessment

Authentic:

Create a problem for other students to solve http://math.kendallhunt.com/documents/dg4/CondensedLessons/DG4CL_895_06.pdf

Research practical uses of inscribed and circumscribed circles pertaining to triangles and create a visual demonstrating the results of your research.

Design a garden using circles and lines and include at least two tangents in your diagram.

Watch the following video and create a similar problem for your peers to complete. http://www.5min.com/Video/How-to-Find-the-Area-of-a-Sector-of-a-Circle-275614332

Watch the following video http://www.youtube.com/watch?v=pZVufpgozCw

as a guide to derive the equation of a circle using the Pythagorean theorem and create a worksheet for your peers with three sample problems

Design visual representations of the link between algebra and geometry in relation to distance and area.

Literacy Connections:

Write an essay or a report on the solution to a problem with mathematical justification.

Present an oral presentation with or without graphics or other media

Complete a written and oral presentation using graphic displays, 2D or 3D models, and/or spreadsheets.

Interdisciplinary Connections:

Students will learn how the circle relates to gardening, music, fashion, space, golf, earthquakes, and the Olympic flag.

Technology Integration:

All: http://www.ixl.com/math/geometry, https://sites.google.com/site/emilou2010/high-school-links/geometry, www.classzone.com, http://www.learner.org/interactives/?grade_levels[]=9-12&disciplines[]=MATH

Properties of Circles: http://math.kendallhunt.com/documents/dg4/CondensedLessons/DG4CL_895_06.pdf

Heron's Formula: http://www.mathopenref.com/heronsformula.html

Mnemonics: http://www.onlinemathlearning.com/mnemonics-for-geometry.html

Key Vocabulary:

circle, center, radius, diameter, chord, secant, tangent, central angle, minor are, major arc, semicircle, congruent circles, congruent arcs, inscribed angle, radians, degrees, intercepted arc, standard equation of a circle, parallel lines, skew lines, parallel planes, perpendicular lines, slope, slope-intercept form, standard form, distance from a point to a line

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Useful Sites: www.njctl.org www.kendallhunt.com www.ixl.com/math/geometry www.khanacademy.org www.purplemath.com www.math.com www.coolmath.com www.edhelper.com www.youtube.com/mathdoris www.Teachertube.com www.themathpage.com
Text Crosswalk: McDougal Littell Geometry Circles: 10.1, 10.2, 10.4, &10.7 Slopes & Lines: 3.4-3.6 Special Parallelograms: 8.4 Distance Formula: 1.3 Heron's Formula: pg. 503

*Differentiation: www.marzanoresearch.com/free_resources/itembank.aspx
http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated_instruction_udl

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Unit 5: Extending to Three Dimensions

Goal(s)(NJCCCS and CCSS): G.GMD.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTU's per cubic foot). G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Essential Questions: How is height related to the area of a circle and the volume of a similar cylinder? In what contexts are volume formulas necessary for math after high school? Where is multidimensional math most studied? What could it express about our universe? How do artists consider geometric shapes when creating masterpieces? How does population density in NYC assist in the saving of the world's endangered languages? http://www.nytimes.com/2010/04/29/nyregion/29lost.html How is it possible for an object to have a finite area but unlimited perimeter?
Skills/Knowledge/Understandings: Identifying and naming solids Describe cross sections of solids Use nets to find surface area Find volume of prisms, cylinders, cones, pyramids, spheres, and composite solids

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Objectives:

By developing informal arguments SWBAT justify formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone (use dissection arguments, Cavalieri's principle, and informal limit arguments).

Using volume formulas for cylinders, pyramids, cones, and spheres, SWBAT solve real world problems.

By using two and three dimensions, SWBAT Identify the shape of a two-dimensional cross-section of a three-dimensional figure and identify three-dimensional objects created by the rotation of two-dimensional objects.

Using geometric shapes, their measures, and their properties SWBAT describe objects (e.g., person per square mile, BTU's per cubic foot).

By using geometric methods, SWBAT 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).

Assessments:

Formative:

observations, questioning, discussions, learning response logs, graphic organizers, peer or self-assessments, practice presentation, visual presentation, individual whiteboards, think pair share, kinesthetic assessments, constructive quizzes, SMART responders

Summative:

Teacher created chapter assessments, Unit 5 Benchmark assessment

Authentic:

https://sites.google.com/site/commoncoremathcurriculum/geometry/geometric-measurement-and-dimension
https://sites.google.com/site/commoncoremathcurriculum/geometry/modeling-with-geometry

Literacy Connections:

Write an essay or a report on the solution to a problem with mathematical justification.

Present an oral presentation with or without graphics or other media

Complete a written and oral presentation using graphic displays, 2D or 3D models, and/or spreadsheets.

Interdisciplinary Connections:

Students will examine the connection between geometry, physics, and ice hockey. http://science360.gov/obj/video/d3f86927-2e4d-44ad-afee-982d9617e62f/hockey-geometry

Technology Integration:

All: http://www.ixl.com/math/geometry, https://sites.google.com/site/emilou2010/high-school-links/geometry, www.classzone.com, http://www.learner.org/interactives/?grade_levels[]=9-12&disciplines[]=MATH

Solids: http://www.learner.org/interactives/geometry/3d_prisms.html

Mnemonics: http://www.onlinemathlearning.com/mnemonics-for-geometry.html

Key Vocabulary:

polyhedron, face, edge, vertex, cross section, prism, cylinder, pyramid, cone, volume, sphere, hemisphere, similar solids

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Text Crosswalk: McDougal Littell Geometry Solids: 12.1, 12.4-12.6

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http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated_instruction_udl