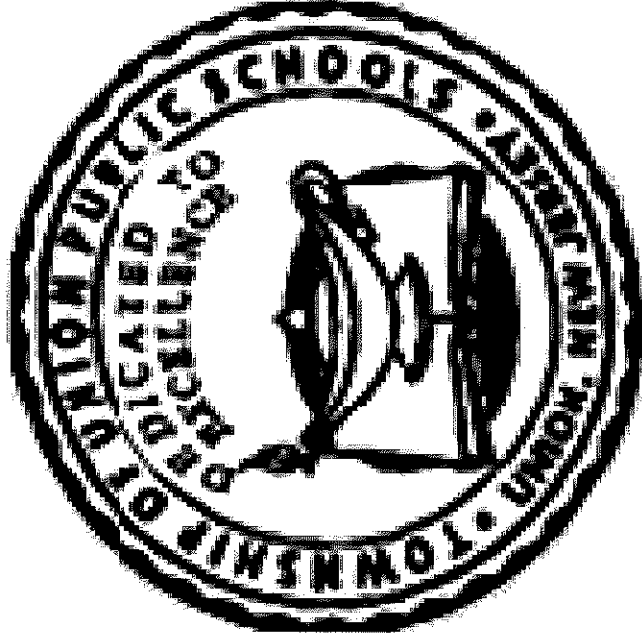
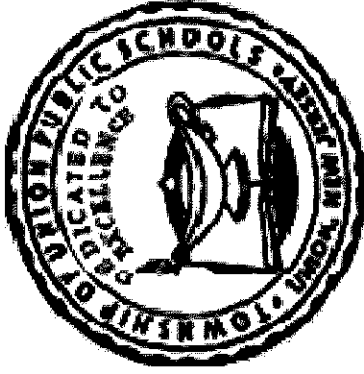


TOWNSHIP OF UNION PUBLIC SCHOOLS



MA280 Honors Geometry 2015

Curriculum Guide Approved June 2015



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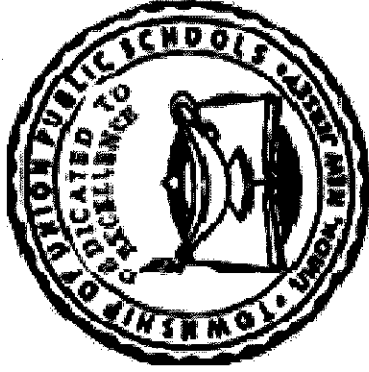
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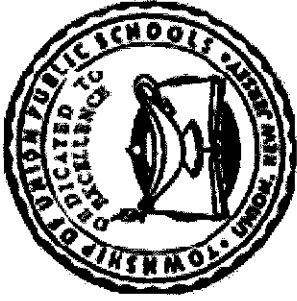
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District Mission Statement

The Township of Union Board of Education believes that every child is entitled to an education, designed to meet his or her individual needs, in an environment that is conducive to learning. State standards, federal and state mandates, and local goals and objectives, along with community input, must be reviewed and evaluated on a regular basis to ensure that an atmosphere of learning is both encouraged and implemented. Furthermore, any disruption to or interference with a healthy and safe educational environment must be addressed, corrected, or, when necessary, removed, in order for the district to maintain the appropriate educational setting.

District Philosophy Statement

The Township of Union Public School District, as a societal agency, reflects democratic ideals and concepts through its educational practices. It is the belief of the Board of Education that a primary function of the Township of Union Public School System is the formulation of a learning climate conducive to the needs of all students in general, providing therein for individual differences. The school operates as a partner with the home and community.



Statement of District Goals

- ❖ Develop reading, writing, speaking, listening, and mathematical skills.
- ❖ Develop a pride in work and a feeling of self-worth, self-reliance, and self discipline.
- ❖ Acquire and use the skills and habits involved in critical and constructive thinking.
- ❖ Develop a code of behavior based on moral and ethical principals.
- ❖ To be able to work with others cooperatively.
- ❖ Acquire a knowledge and appreciation of the historical record of human achievement and failures and current societal issues.
- ❖ Acquire a knowledge and understanding of the physical and biological sciences.
- ❖ Efficient and effective participation in economic life and the development of skills to enter a specific field of work.
- ❖ Appreciate and understand literature, art, music, and other cultural activities.
- ❖ Develop an understanding of the historical and cultural heritage.
- ❖ Develop a concern for the proper use and/or preservation of natural resources.
- ❖ Develop basic skills in sports and other forms of recreation.

Course Description

Moving towards formal mathematical arguments, the standards presented in this high school geometry course formalize and extend middle grades geometric experiences. Transformations are presented early in the year to assist with the building of conceptual understandings of the geometric concepts.

In Unit 1, triangle congruence conditions are established using analysis of rigid motion and formal constructions. Various formats will be used to prove theorems about angles, lines, triangles and other polygons. The work in Unit 2 will build on the students understanding of dilations and proportional reasoning to develop a formal understanding of similarity. The standards included in Unit 3 extend the notion of similarity to right triangles and the understanding of right triangle trigonometry. Work in Unit 4 will focus on circles and using the rectangular coordinate system to verify geometric properties and to solve geometric problems. Concepts of similarity will be used to establish the relationship among segments on chords, secants and tangents as well as to prove basic theorems about circles. The standards in Unit 5 will extend previous understandings of two-dimensional objects in order to explain, visualize, and apply geometric concepts to three-dimensional objects. Informal explanations of circumference, area and volume formulas will be analyzed. Unit 6 addresses properties of quadrilaterals and proving figures are parallelograms.

Recommended Textbooks

Continued use of the existing book is recommended:

Ron Larson, Laurie Boswell, Timothy Kanold and Lee Stiff, 2007, *Geometry*, McDougal Littell.

Curriculum Units

Unit 1 Congruence, Proof and Constructions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Use the undefined notion of a point, line, distance along a line and distance around a circular arc to develop definitions for angles, circles, parallel lines, perpendicular lines and line segments.	G.CO.1
2	Apply the definitions of angles, circles, parallel lines, perpendicular lines and line segments to describe rotations, reflections, and translations.	G.CO.1, G.CO.4
3	Develop and perform rigid transformations that include reflections, rotations, translations and dilations using geometric software, graph paper, tracing paper, and geometric tools and compare them to non-rigid transformations.	G.CO.2, G.CO.3 G.CO.4, G.CO.5
4	Use rigid transformations to determine, explain and prove congruence of geometric figures.	G.CO.5, G.CO.7, G.CO.8
5	Create proofs of theorems involving lines, angles, triangles, and parallelograms.* (Please note G.CO.10 will be addressed again in unit 2 and G.CO.11 will be addressed again in unit 4)	G.CO.9, G.CO.10 G.CO.11
6	Generate formal constructions with paper folding, geometric software and geometric tools to include, but not limited to, the construction of regular polygons inscribed in a circle.	G.CO.12, G.CO.13
7	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.5
8	Use coordinates to prove simple geometric theorems algebraically.	G.GPE.4

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

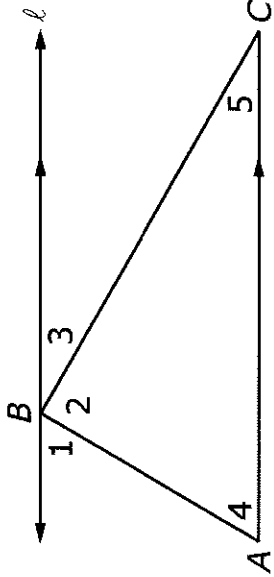
Code #	Common Core State Standards
G.CO.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
G.CO.2	Represent transformations in the plane using, e.g., 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. <i>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.</i>
G.CO.10	Prove theorems about triangles. <i>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.</i>
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.). <i>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.</i>

CCO.1B	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
CCP.1A	Use coordinates to prove simple geometric theorems algebraically. <i>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 $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.</i>
CCP.1S	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.)

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

CCSS #	Assessments
CCO	 <p>Using the figure above and the fact that line ℓ is parallel to segment \overline{AC}, prove that the sum of the angle measurements in a triangle is 180°.</p>

Unit 2 Similarity

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Generate proofs that demonstrate that all circles are similar.	G.C.1
2	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.1
3	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.2
4	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	G.SRT.3
5	Prove theorems about triangles.	G.CO.10, G.SRT.4
6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	G.GPE.6

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.

5. Use appropriate tools strategically.
 6. Attend to precision.
 7. Look for and make use of structure.
 8. Look for and express regularity in repeated reasoning.
- All of the content presented at this grade level has connections to the standards for mathematical practices.*

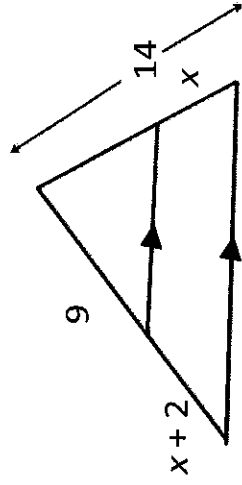
Common Core State Standards	
Code #	
G.C.A	Prove that all circles are similar.
6.SRT.1	Verify experimentally the properties of dilations given by a center and a scale factor. <ol style="list-style-type: none"> a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
6.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.
6.SRT.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
6.SRT.4	Prove theorems about triangles. <i>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.</i>
6.SRT.5	Prove theorems about triangles. <i>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.</i>
6.GPE.4	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Main Content Supporting Content Additional Content (identified by PARCC Model Content Frameworks).
Bold type indicates grade level fluency requirements. (identified by PARCC Model Content Frameworks).

Assessments

CCSS #

Find the value of x .



G-SRT

Unit 3 Right Triangles and Trigonometry

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Prove theorems about triangles.	CSR1.4
2	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	CSM1.5
3	Derive the definitions for trigonometric ratios using similarity of right triangles.	CSR1.6
4	Explain and use the relationship between the sine and cosine of complementary angles.	CSR1.7
5	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	CSR1.8

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

- 1 Make sense of problems and persevere in solving them.
 - 2 Reason abstractly and quantitatively.
 - 3 Construct viable arguments and critique the reasoning of others.
 - 4 Model with mathematics.
 - 5 Use appropriate tools strategically.
 - 6 Attend to precision.
 - 7 Look for and make use of structure.
 8. Look for and express regularity in repeated reasoning.
- All of the content presented at this grade level has connections to the standards for mathematical practices.*

Common Core State Standards	
G.SRT.1	Prove theorems about triangles. <i>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.</i>
G.SRT.2	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.SRT.3	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. Explain and use the relationship between the sine and cosine of complementary angles.
G.SRT.4	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ★

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

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Assessments	
CCSS #	
G.SRT	Two buildings on opposite sides of the street are 40m apart. The taller building is 185m. From the top of the taller building, the angle of depression to the top of the shorter building is 13°. Find the height of the shorter building.

Unit 4 Circles and Expressing Geometric Properties through Equations

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Identify and describe relationships among inscribed angles, radii, and chords. <i>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.</i>	G.C.2
2	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 geometric tools and geometric software.	G.C.3, G.C.4
3	Use similarity to 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.	G.C.5
4	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.GPE.1

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

Common Core State Standards	
G.C.1	Prove that all circles are similar.
G.C.2	Identify and describe relationships among inscribed angles, radii, and chords. <i>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.</i>
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.4	(+) Construct a tangent line from a point outside a given circle to the 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.

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Assessments	
CCSS #	
G.GPE	What is an equation for the distance from the point (3, 5) to an arbitrary point (x, y) ? Explain how the equation you found is related to the equation of a circle.

Unit 5 Extending to Three Dimensions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Develop informal arguments to 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).	G.GMD.1
2	Solve problems using volume formulas for cylinders, pyramids, cones, and spheres.	G. GMD.3
3	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. Use Flatland as a resource to explore two and three dimensional spaces.	G.GMD.4
4	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.MC.1
5	Use density concepts in modeling situations based on area and volume. (e.g., persons per square mile, BTUs per cubic foot).	G.MC.2
6	Solve design problems using geometric methods. (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	G.MC.3

Major Content Supporting Content Additional Content (Identified by PARCC Model Content Frameworks).

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Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

Common Core State Standards	
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.2	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.3	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
G.MG.4	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).

Mathematical Practices **Additional Content** (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Assessments	
CCSS #	
G.GMD	A sphere is inscribed in a cube so that it touches each of the 6 faces of the cube. The cube has a volume of 216. Find the radius of the sphere

Unit 6 Quadrilaterals

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Construct formal proofs using theorems, postulates, and definitions involving parallelograms.	CC.01
2	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	CC.01.7

Major Content Supporting Content **Additional Content** (Identified by PARCC Model Content Frameworks).
Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

- 1 Make sense of problems and persevere in solving them.
 - 2 Reason abstractly and quantitatively.
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 - 4 Model with mathematics.
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Common Core State Standards	
8.G.1	Prove theorems about parallelograms. <i>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.</i>
8.GPE.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Major Content Supporting Content **Additional Content** (Identified by PARCC Model Content Frameworks).

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Assessments	
CCSS #	
G.GPE.7	1. If A(0,0), B(2,6), C(5,7) and D(3,1) are the vertices of a quadrilateral, determine if ABCD is a parallelogram. You must show work to support your answer.

Pacing Guide – Honors Geometry

Marking Period 1

Topics	Chapter	Days
Administrative		2
Unit 1: Congruence, proof and construction Essentials of Geometry: Points, Lines, Planes and Angles	1 All	15
Reasoning and Proof	2 All	14
Parallel and Perpendicular Lines	3 All	12
Quarterly Exam, review and proof		2

Marking Period 2

Congruent Triangles	4 All	14
Unit 2 Similarity Similarity Bedroom Design Project	6 All	14
Unit 3: Right Triangles and Trigonometry Right Triangles	7.1 – 7.4	14
Mid Term Exam, review and Proof		3

Marking Period 3

Right Triangles and Trigonometry	7.5 – 7.7	10
Transformations review	9.3-9.7	10
Unit 4: Circles and Expressing Geometric Properties through Equations		
Circles	10 All	12
Measuring Lengths and Area	11 all	11
Quarterly exam and review		2

Marking Period 4

Topics	Chapter	Days
Unit 5: Extending to Three Dimensions		
Surface Area and Volume	12	12
Flatland: Book discussion and project presentations	All	5
Unit 6		
Quadrilaterals	8 All	12
Additional enrichment topics time permitting		
Relationships within Triangles	5 All	11
Final Exam and review		5