Cliffside Park Public Schools

COURSE OF STUDY UNIT PLANNING GUIDE FOR:
GEOMETRY UNIT 2

Grade Level:
10th

Cliffside Park School District
Cliffside Park, NJ 07010
www.cliffsidepark.edu

Course Overview:

The study of High School geometry involves the study of Euclidean geometry. Students study congruence in terms of rigid motions. Experiment with transformations of shapes in the plane. Prove geometric theorems and make geometric conjectures. Students are required to understand similarity in terms of transformations. Prove theorems involving similarity. Define trigonometric ratios and solve problems using right triangles. They then use this understanding to apply trigonometry to general triangles.

Study continues with circles and the understanding and application of theorems about circles. Students explore arc lengths and areas of sectors. The course continues with translations between geometric descriptions and questions of conic sections. Coordinates are used to prove simple geometric theorems algebraically. Volume formulas are explored and explained. Two-dimensional and three-dimensional visualizations are explored. All geometric concepts are used to model situations and real-life events.

Overview of Units:

1. **Congruence and Constructions**
2. **Congruence, Similarity & Proof**
3. **Trigonometric Ratios & Geometric Equations**
4. **Spatial Reasoning: Polygons, Solids, Area and Volume**

Unit 2				
Unit Name: Congruence, Similarity & Proof **Primary Resource: Big Ideas Math Geometry by Ron Larson, 2015** **Duration: Approximately 11 weeks**				
WEEK 12 **Essential Question: How can you translate a figure in a coordinate plane?** 4.1				
NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
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). **HSG-CO.A.4.** Develop definitions of rotations, reflections, and translations in terms of angles, circles,	***Lesson Vocabulary*:** vector, initial point, terminal point, horizontal component, vertical component, component form, transformation, image, preimage, translation, rigid motion, composition of transformations ***Learning Goals*:** The student will use translations to move	• Perform translations • Perform compositions • Solve real-life problems involving compositions	• Mathematical practices p. 172 • Explorations: 1, 2, 3 p. 173, Translations • Discuss vocabulary • Core Concept p. 174 • Translation Postulate & Composition Theorem, p.176 • Use modeling with math word problems to illustrate real life examples of translations. • Use GeoGebra to demonstrate translations.	***Formative:*** Analyzing students' work and explorations in Dynamic Geometry Software, pg. 172 Analyzing Student classwork Strategic Questioning Thumbs up Think-Pair-Share Monitoring Progress questions 1-4 p. 175 Exit Slips Do Nows Leveled Homework p. 178 Mini assessments p. 180 TE Quizzes ***Summative:***

perpendicular lines, parallel lines, and line segments. 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. **HSG-CO.B.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. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with	figures, create designs and/or demonstrate geometric properties			Topic Tests Projects ***Benchmark Tests:*** Approximately every 5-6 weeks. ***Alternative:*** Verbally ask students to explain the procedure of translating a figure in a coordinate plane.

mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.				
Possible Resources: Fixed point of rigid motion - Illustrative Math Translations: Khan Academy Khan Academy in Spanish - Khan Academy en Espanol				
WEEK 13 **Essential Question: How can you reflect a figure in a coordinate plane? (4.2)**				
NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
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	***Lesson Vocabulary:*** reflection, line of reflection, glide reflection, line symmetry, line of symmetry ***Learning Goals:*** The student will use reflections to move	• Perform reflections • Perform glide reflections • Identify lines of symmetry • Solve real-life problems involving reflections	• Explorations: 1, 2 p. 181, Reflections • Discuss vocabulary • Core Concept p. 182-183 • Reflection Postulate p.184 • Use modeling with math word problems to illustrate real life examples of reflections.	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis pg. 187 Thumbs up Think-Pair-Share Monitoring Progress questions 5-9 p. 183 Exit Slips Do Nows Leveled Homework p. 186 Mini assessments p. 188 TE

that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). **HSG-CO.A.3**. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. HSG-CO.A.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **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. **HSG-CO.B.6**. Use geometric descriptions of	figures, create designs and/or demonstrate geometric properties		• Use GeoGebra to demonstrate reflections	Quizzes ***Summative:*** Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** • Have students perform reflections on Delta Math (https://www.deltamath.com/) • Have students perform reflections using straightedge and compass

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

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

Possible Resources:

Defining reflections - Illustrative Math
Reflections: Khan Academy , www.ixl.com
Khan Academy in Spanish - Khan Academy en Espanol

WEEK 14
Essential Question: How can you rotate a figure in a coordinate plane? (4.3)

NJSLS Standards	Concepts *What student will know.*	Skills *What students will be able to do.*	Activities	Assessments and Checks for Understanding
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). **HSG-CO.A.3**. Given a rectangle, parallelogram,	***Lesson Vocabulary:*** rotation, center of rotation, angle of rotation, rotational symmetry, center of symmetry ***Learning Goals:*** The students will identify and locate rotations	• Perform rotations • Perform compositions with rotations • Identify rotational symmetry	• Explorations: 1, 2, 3 p. 189, Rotations • Discuss vocabulary • Core Concept p. 190-191 • Rotation Postulate p.192 • Use modeling with math word problems to illustrate real life examples of rotations. • Use GeoGebra to demonstrate	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis, p. 195 Thumbs up, Thumbs down Exit Slips Do Nows Leveled Homework p. 194 Mini assessments p. 196 TE Quizzes ***Summative:*** Topic Tests

trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. **HSG-CO.A.4**. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **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. **HSG-CO.B.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. **HSG-MG.A.3**. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical			rotations	Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Have students perform a combination of translations, rotations, and reflections on GeoGebra and/or on paper using straightedge and compass

constraints or minimize cost; working with typographic grid systems based on ratios). **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.				

Possible Resources:

Rotations - Khan Academy, **https://www.ixl.com/**

Real world problem - Illustrative Math

Additional Resources:

www.GeoGebra.com
www.DeltaMath.com

WEEK 15
Essential Question(s): What conjecture can you make about a figure reflected in two lines? (4.4)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
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. **HSG-CO.B.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. **MP.1** Make sense of problems and persevere in solving them.	***Lesson Vocabulary:*** congruent figures, congruence transformation ***Learning goals:*** Students will learn how to identify congruent figures in the coordinate plane and describe congruent transformations.	• Identify congruent figures • Describe congruence transformations • Use theorems about congruence transformations .	• Explorations: 1, 2 p. 199, Congruence and Transformations • Discuss vocabulary • Core Concept p. 202-203 • Use modeling with math word problems to illustrate real life examples of congruence transformations. • Use GeoGebra to demonstrate reflections in parallel lines and in the intersecting lines.	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis, p. 205 Think-pair-share Reasoning exercise #23, p. 205 TE Exit Slips Do Nows Mini assessment p. 206 TE Quiz ***Summative:*** Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Use Delta Math to complete Composing Transforms Discovery Activity

MP.2 Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.				Use dynamic assessment and investigations on online platform.

Additional Resources:

Congruence Transformations - Khan Academy, www.ixl.com

Showing a triangle congruence: a special case - Illustrative Math

WEEK 16
Essential Question(s): What does it mean to dilate a figure? (4.5)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
HSG-CO.A.2. Represent transformations in the plane	***Lesson Vocabulary:***	• Identify and perform dilations	• Explorations: 1, 2 p. 207, Dilations • Discuss vocabulary	***Formative:*** Analyzing Student classwork

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). **HSG.SRT.A.1a**. Verify experimentally the properties of dilations given by a center and a scale factor: 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. **HSG.SRT.A.1b.** The dilation of a line segment is longer or shorter in the ratio given by the scale factor. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the	dilation, center of dilation, scale factor, enlargement, reduction ***Learning Goals:*** Students will dilate a figure in the coordinate plane .	• Solve real-life problems involving scale factors and dilations	• Core Concept p. 208-209 • Use modeling with math word problems to illustrate real life examples of dilations. • Use a compass and straightedge to construct a dilation	Strategic Questioning Error Analysis, p. 213 Dynamic Investigations Student discussion Exit Slips Do Nows Maintaining mathematical proficiency exercises pg. 214 TE Mini-assessment quiz pg. 214 TE ***Summative:*** Dynamic Assessment Tool Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Dilate an image on GeoGebra and find the scale factor.

reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.				
Additional Resources: Dilations- Khan Academy, www.ixl.com Effects of Dilations on Length, Area, and Angles - Illustrative Math				
WEEK 17 **Essential Question:** When a figure is translated, reflected, rotated, or dialated in the plane, is the image always similar to the original figure? (4.6)				
NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
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	***Lesson Vocabulary:*** Similarity transformation, similar figures ***Learning Goals:***	• Perform similarity transformations • Describe similarity transformations • Prove that figures are similar	• Explorations: 1, 2 p. 215 Dilations and Similarity, Rigid Motions and Similarity • Discuss vocabulary	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis, p. 220 Think-pair-share Reasoning exercise #20, p.

software. Specify a sequence of transformations that will carry a given figure onto another. **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. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically.	Students will perform and describe similarity transformations		• Core Concept p. 216 • Use modeling with math word problems to illustrate real life examples of similarity transformations • Use a compass and straightedge to perform similar transformations	220 TE Exit Slips Do Nows Mini assessment p. 220 TE Quiz ***Summative:*** Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Use Delta Math to complete Composition of Transformations: Shapes Use GeoGebra to perform similarity transformations and describe the outcomes Use dynamic assessment and investigations on online platform.

MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.				

Additional Resources:

Transformations, Congruence, and Similarity - Khan Academy, www.ixl.com

WEEK 18
Essential Question: How are similar polygons related? (8.1)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
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	***Lesson Vocabulary:*** Similar figures, similarity transformation, corresponding parts ***Learning Goals:*** Use similarity statements to decide	• Use similarity statements • Find corresponding lengths in similar polygons • Find perimeters and areas of similar polygons	• Explorations: 1, 2 p.,417, Similar Polygons • Discuss vocabulary • Core Concept p. 418-419 • Theorems on Perimeters and Areas of Similar Polygons • Use modeling with	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis, p. 424 #23, 24 TE Think-pair-share Reasoning exercise #27, p. 425 TE Exit Slips Do Nows

and the proportionality of all corresponding pairs of sides. **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). **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	whether the polygons are similar Calculate perimeter and area of similar polygons		math word problems to illustrate real life examples of finding perimeter and area of similar polygons.	Mini assessment p. 426 TE Quiz ***Summative:*** Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Use dynamic assessment and investigations on online platform.

Additional Resources: IXL, Khan Academy

WEEK 19
Essential Question(s): What can you conclude about two triangles when you know that two pairs of corresponding angles are congruent? (8.2)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
HSG-SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. **HSG-SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure.	***Lesson Vocabulary:*** Similar figures, similarity transformation ***Learning Goals:*** Prove triangles similar by Angle-Angle Similarity Theorem	• Use Angle-Angle Similarity Theorem	• Explorations: 1, p. 427, Comparing Triangles • Discuss vocabulary • Theorem: Angle-Angle (AA) Similarity p. 428 • Use modeling with math word problems to illustrate real life examples of finding measurements indirectly by using similar triangles • Use GeoGebra to construct similar triangles	***Formative:*** Analyzing Student classwork Strategic Questioning Error Analysis, p. 431 TE Thumbs up, Thumbs down Exit Slips Do Nows Mini assessments p. 432 TE Quizzes ***Summative:*** Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Illustrations in GeoGebra, computer projects, oral response, creative

MP.8 Look for and express regularity in repeated reasoning.				presentations or demonstration, etc

Possible Resources:

Solving equations - Khan Academy, www.ixl.com

Real world problem - Illustrative Math

WEEK 20
Essential Question: What are two ways to use corresponding sides of two triangles to determine that the triangles are similar? (8.3)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
HSG-SRT.B.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 **HSG-SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **HSG-GPE.B.5**	***Lesson Vocabulary:*** Similar figures, corresponding parts, slope, parallel lines, perpendicular lines ***Learning Goals:*** Prove triangle similarity by SSS and SAS	• Use the Side-Side-Side Similarity Theorem • Use the Side-Angle-Side Similarity Theorem • Prove slope criteria using similar triangles	• Explorations: 1 & 2, p. 435, Deciding Whether Triangles Are Similar • Discuss vocabulary • Side-Side-Side (SSS) Similarity Theorem p. 436 • Side-Angle-Side (SAS) Similarity Theorem p. 438 • Use modeling with math word problems to illustrate real life examples of	**Formative:** Analyzing Student classwork Strategic Questioning Error Analysis, p. 442 TE Dynamic Investigations Student discussion Exit Slips Do Nows Maintaining mathematical proficiency exercises pg. 444 TE Mini-assessment quiz pg. 444 TE

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). **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). **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.			application of SSS and SAS Similarity Theorems • Use GeoGebra to construct parallel and perpendicular lines and prove slope criteria using similar triangle	***Summative:*** Dynamic Assessment Tool Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** illustrations, computer projects, oral response, creative presentations or demonstration, etc

Possible Resources:

Solving equations - Khan Academy, www.ixl.com

Real world problem - Illustrative Math

WEEK 21:
Essential Question: What proportionality relationships exist in a triangle intersected by an angle bisector or by a line parallel to one of the sides? (8.4)

NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**
HSG-SRT.B.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 **HSG-SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **HSG-GPE.B.6** Find the point on a directed line segment between two given	***Lesson Vocabulary:*** Corresponding angles, ratio, proportion ***Learning Goals:*** Apply Proportionality Theorems	• Use the Triangle Proportionality Theorem and its converse • Use Three Parallel Lines Theorem • Use Angle Bisector Theorem	• Explorations: 1, 2 p. 445 Discovering a Proportionality Relationship • Discuss vocabulary • Triangle Proportionality Theorem and its Converse p. 446 • Three Parallel Lines Theorem p. 448 • Triangle Angle Bisector Theorem p. 449 • Use modeling with math word	**Formative:** Analyzing Student classwork Strategic Questioning Error Analysis, p. 451 TE Dynamic Investigations Student discussion Exit Slips Do Nows Maintaining mathematical proficiency exercises pg. 452 TE Mini-assessment quiz pg. 452 TE ***Summative:*** Dynamic Assessment Tool Topic Tests

points that partitions the segment in a given ratio. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.			problems to illustrate real life examples application of Three Parallel Lines Theorem pg. 451 TE • Use GeoGebra to construct a point along a directed line segment given a ratio, p. 447 TE	Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** Use dynamic assessment and investigations on online platform
Possible Resources: Solving similar triangles - Khan Academy, www.ixl.com				
Week 22: **Essential Question:** How are altitudes and geometric means of right triangles related? (9.3)				
NJSLS Standards	**Concepts** *What student will know.*	**Skills** *What students will be able to do.*	**Activities**	**Assessments and Checks for Understanding**

HSG-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments & critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	***Lesson Vocabulary:*** Altitude of a triangle, similar figures ***Learning Goals:*** Solve similar right triangles	• Identify similar triangles • Solve real-life problems involving similar right triangles • Use geometric means	• Explorations: 1, p. 477 Writing a Conjecture • Explorations: 2, p. 477 Comparing Geometric and Arithmetic Means • Discuss vocabulary • Core Concept pg. 480 • Right Triangle Similarity Theorem p. 478 • Geometric Mean (Altitude) Theorem p. 480 • Geometric Mean (Leg) Theorem Theorem p. 480 • Use modeling with math word problems to illustrate real life examples application of similar right triangles pg. 481, example 5 TE	**Formative:** Analyzing Student classwork Strategic Questioning Error Analysis, p. 483 TE Dynamic Investigations Student discussion Exit Slips Do Nows Maintaining mathematical proficiency exercises pg. 484 TE Mini-assessment quiz pg. 484 TE ***Summative:*** Dynamic Assessment Tool Topic Tests Projects **Benchmark Assessments:** Every 5-6 weeks. **Alternative:** illustrations, computer projects, oral response, creative presentations or demonstration, etc
Possible Resources Right Triangle Proportions - Delta Math , IXL , Illustrative Math				
Interdisciplinary Connections:				

NJSLS-ELA

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
W.11-12.2.D Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

NJSLS-S: Physics

HS-PS3-2 Energy Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects)
HS-PS3-5.5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction
HS-PS2-4 : Forces and Motions Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects

NGSS Practices:
Analyzing and Interpreting Data: Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
Developing and Using Models: Develop or use a model based on evidence to illustrate the relationships between systems or between *components of a system.*
Engaging in Argument from Evidence: Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.

NJSLS- Biology
HS-LS3 Heredity: Inheritance and Variation of Traits
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic

combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

NJSLS-Technology:
Students will use Desmos, GeoGebra or the TI-84 calculator to assist in graphing and analyzing these equations. They will discuss their findings with the instructor and their classmates. Students will participate in activities on Google Classroom and other online resources, Desmos. GeoGebra, IXL

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all the worksheets to convey the results.

Career Ready Practices:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

21st Century Life and Career:

9.1.12.B.6 Design and utilize a simulated budget to monitor progress of financial needs.
9.1.12.C.2 Compare and compute interest and compound interest and develop an amortization table using business tools.
9.1.12.C.3 Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit.

Integrated Differentiation/Accommodations/Modifications for Geometry Unit 2 *(Alternate Modes of Instruction and Support)*		
Modifications to Support Gifted and Talented Students	**Modifications to Support English Language Learners**	**Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)**
See specific modifications in each lesson. Integrate Higher Order Thinking Skills (HOTS) through questioning and extension projects specific to linear equations, inequalities and functions Provide menu of challenge activities for when the child finishes the lesson early (integrate technology when possible). College/Career Readiness skill enhancement - G & T students can research professions related to the Algebra. Have the student teach the lesson - peer tutoring (research-based strategy) Accelerate pace for students who are advanced in concepts. Use inquiry-based, discovery learning approaches that emphasize open-ended problems with multiple solutions or multiple paths to solutions. Allow students to design their own ways to find the answers to complex questions. Prove Ceva's theorem, p. 452	See specific modifications in each lesson. **Concept/Idea Map** - teacher models note-taking on transformations, reflections rotations, dilations, similarity Theorems, and constructions. **Contextualize language** See each lesson for specific vocabulary **Visuals and illustrations** to be used for transformations, reflections rotations, dilations, similarity Theorems, and constructions and other concrete terms. **Word/picture bank** available for students' reference in classroom, online and in their textbooks. **Wait Time Two** - extend basic "Wait Time" - after the 1st student responds to a question, the teacher waits an additional 5 - 7 seconds before calling on another student to ask a question about this unit. **Native Language Supports** (peer, online assistive technology, translation device, bilingual dictionary) Teach the text backward - **frontload** the concepts and vocabulary needed for learning the material and activating prior	See specific modifications in each lesson. Review student individual educational plan and/or 504 plan for instructional, assessment, and environmental supports. Allow student to use calculator to solve numerical problems. Teach students how to check the accuracy of the solution that was derived from use of the graphing calculator. Utilize manipulatives and/or visuals within instructional presentation of transformations, reflections rotations, dilations, similarity Theorems, and constructions. Teach students how to check the accuracy of the solution that was derived from use of the calculator or other method. Utilize graphic organizer or partially completed template for students to solve word problems and other complex problems in the unit. Provide study guides that are partially completed by teacher, allowing the student to fill in missing information during instruction in order to aid in obtaining information pertaining to modeling figures as they are transformed, reflected, rotated, dilated. Provide assistance when using similarity Theorems and doing constructions.

	knowledge vocabulary, see specific lesson for vocabulary list. Use a **word square** to teach target academic vocabulary for this unit.	Utilize visual aids such as charts or graphs connected to geometric terms and procedures to provide explicit instruction in how to analyze or use the data or information. By utilizing individual student assessment results, the teacher will provide small group or remedial instruction to review essential questions/big ideas, key concepts and provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems. Provide wait time to allow students to process orally presented information and questions relating to the unit. Access to word/picture banks to develop an understanding and use content-specific vocabulary. Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects, oral response, creative presentations or demonstration, etc. Support comprehension of unknown vocabulary, by providing examples of Note-taking, highlighting, underlining, etc. Students should be allowed given copies of grade level material or text so they can highlight or underline pertinent information. Text to speech/Oral reading if necessary Provide students with flexible seating options while working independently, depending on need or preference. Math-specific vocabulary and literary terms should be pre-taught before teaching relevant concepts. Allow extra time to complete in class written assignments.

		Provide students with a sample problem or list of steps or procedures for multi-step solutions to problems. Allow student to reference these procedures when solving independently. Reduce the number of assigned problems within a unit. Provide models or templates to teach the structure of how to solve problems systematically. If necessary, provide additional set of materials or online access so that students can utilize resources at school and home. Provide study guide for students to review before Unit quizzes or tests. Review essential questions/big ideas of congruency, similarity and proofs to provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems. Provide wait time to allow students to process orally presented information and questions relating to the unit.

Sources:
New Jersey Student Learning Standards (2016)- Math https://www.state.nj.us/education/cccs/2016/math/standards.pdf
New Jersey Student Learning Standards (2016) -ELA https://www.state.nj.us/education/cccs/2016/ela/g1112.pdf
New Jersey Student Learning Standards (2016)- Science https://www.state.nj.us/education/cccs/2016/science/
New Jersey Student Learning Standards: Technology (2014) http://www.state.nj.us/education/cccs/2014/tech/8.pdf
Career Ready Practices (2014) http://www.state.nj.us/education/cccs/2014/career/CareerReadyPractices.pdf