



ESL
SCIENCE
BUSINESS
BILINGUAL
PRESCHOOL
MATHEMATICS
LIBRARY MEDIA
SOCIAL STUDIES
WORLD LANGUAGES
GIFTED & TALENTED
TECHNOLOGY EDUCATION
ENGLISH LANGUAGE ARTS
FINE & PERFORMING ARTS
FAMILY & CONSUMER SCIENCE
HEALTH & PHYSICAL EDUCATION

RAHWAY PUBLIC SCHOOLS

CURRICULUM & INSTRUCTION

Content Area: Mathematics

Course: Geometry & Geometry Honors

Grade Level: 8-11

This curriculum is part of the Educational Program of Studies of the Rahway Public Schools.

ACKNOWLEDGMENTS

Jeffery Kurczeski,

Program Supervisor of 7-12 Math & Science and 9-12 Business & Technology Education

The Board acknowledges the following who contributed to the preparation of this curriculum.

Rachael Cane, Mathematics Teacher

Anna Winters, Mathematics Teacher

Dr. Tiffany A. Beer, Director of Curriculum and Instruction

Dr. Aleya Shoeib, Superintendent of Schools

Subject/Course Title:
Geometry & Geometry Honors
Grades 8-11

Date of Board Adoption:
August 27, 2024

RAHWAY PUBLIC SCHOOLS CURRICULUM

Geometry & Geometry Honors: Grades 8-11

PACING GUIDE

Unit	Title	Pacing
1	Basics of Geometry, Reasoning & Proofs, Parallel & Perpendicular Lines	10 weeks
2	Congruence, Constructions, Transformations	10 weeks
3	Similarity, Right Triangles, Trigonometric Ratios	10 weeks
4	Circles, Geometric Modeling, Probability	10 weeks

ACCOMMODATIONS

<p>504 Accommodations:</p> <ul style="list-style-type: none"> ● Provide scaffolded vocabulary and vocabulary lists. ● Provide extra visual and verbal cues and prompts. ● Provide adapted/alternate/excerpted versions of the text and/or modified supplementary materials. ● Provide links to audio files and utilize video clips. ● Provide graphic organizers and/or checklists. ● Provide modified rubrics. ● Provide a copy of teaching notes, especially any key terms, in advance. ● Allow additional time to complete assignments and/or assessments. ● Provide shorter writing assignments. ● Provide sentence starters. ● Utilize small group instruction. ● Utilize Think-Pair-Share structure. ● Check for understanding frequently. ● Have student restate information. ● Support auditory presentations with visuals. ● Weekly home-school communication tools (notebook, daily log, phone calls or email messages). ● Provide study sheets and teacher outlines prior to assessments. ● Quiet corner or room to calm down and relax when anxious. ● Reduction of distractions. ● Permit answers to be dictated. ● Hands-on activities. ● Use of manipulatives. ● Assign preferential seating. ● No penalty for spelling errors or sloppy handwriting. ● Follow a routine/schedule. ● Provide student with rest breaks. ● Use verbal and visual cues regarding directions and staying on task. ● Assist in maintaining agenda book. 	<p>IEP Accommodations:</p> <ul style="list-style-type: none"> ● Provide scaffolded vocabulary and vocabulary lists. ● Differentiate reading levels of texts (e.g., Newsela). ● Provide adapted/alternate/excerpted versions of the text and/or modified supplementary materials. ● Provide extra visual and verbal cues and prompts. ● Provide links to audio files and utilize video clips. ● Provide graphic organizers and/or checklists. ● Provide modified rubrics. ● Provide a copy of teaching notes, especially any key terms, in advance. ● Provide students with additional information to supplement notes. ● Modify questioning techniques and provide a reduced number of questions or items on tests. ● Allow additional time to complete assignments and/or assessments. ● Provide shorter writing assignments. ● Provide sentence starters. ● Utilize small group instruction. ● Utilize Think-Pair-Share structure. ● Check for understanding frequently. ● Have student restate information. ● Support auditory presentations with visuals. ● Provide study sheets and teacher outlines prior to assessments. ● Use of manipulatives. ● Have students work with partners or in groups for reading, presentations, assignments, and analyses. ● Assign appropriate roles in collaborative work. ● Assign preferential seating. ● Follow a routine/schedule.
<p>Gifted and Talented Accommodations:</p> <ul style="list-style-type: none"> ● Differentiate reading levels of texts (e.g., Newsela). ● Offer students additional texts with higher lexile levels. ● Provide more challenging and/or more supplemental readings and/or activities to deepen understanding. ● Allow for independent reading, research, and projects. ● Accelerate or compact the curriculum. ● Offer higher-level thinking questions for deeper analysis. ● Offer more rigorous materials/tasks/prompts. ● Increase number and complexity of sources. ● Assign group research and presentations to teach the class. ● Assign/allow for leadership roles during collaborative work and in other learning activities. 	<p>ML Accommodations:</p> <ul style="list-style-type: none"> ● Provide extended time. ● Assign preferential seating. ● Assign peer buddy who the student can work with. ● Check for understanding frequently. ● Provide language feedback often (such as grammar errors, tenses, subject-verb agreements, etc...). ● Have student repeat directions. ● Make vocabulary words available during classwork and exams. ● Use study guides/checklists to organize information. ● Repeat directions. ● Increase one-on-one conferencing. ● Allow student to listen to an audio version of the text. ● Give directions in small, distinct steps. ● Allow copying from paper/book. ● Give student a copy of the class notes.

- Provide written and oral instructions.
- Differentiate reading levels of texts (e.g., Newsela).
- Shorten assignments.
- Read directions aloud to student.
- Give oral clues or prompts.
- Record or type assignments.
- Adapt worksheets/packets.
- Create alternate assignments.
- Have student enter written assignments in criterion, where they can use the planning maps to help get them started and receive feedback after it is submitted.
- Allow student to resubmit assignments.
- Use small group instruction.
- Simplify language.
- Provide scaffolded vocabulary and vocabulary lists.
- Demonstrate concepts possibly through the use of visuals.
- Use manipulatives.
- Emphasize critical information by highlighting it for the student.
- Use graphic organizers.
- Pre-teach or pre-view vocabulary.
- Provide student with a list of prompts or sentence starters that they can use when completing a written assignment.
- Provide audio versions of the textbooks.
- Highlight textbooks/study guides.
- Use supplementary materials.
- Give assistance in note taking
- Use adapted/modified textbooks.
- Allow use of computer/word processor.
- Allow student to answer orally, give extended time (time-and-a-half).
- Allow tests to be given in a separate location (with the ESL teacher).
- Allow additional time to complete assignments and/or assessments.
- Read question to student to clarify.
- Provide a definition or synonym for words on a test that do not impact the validity of the exam.
- Modify the format of assessments.
- Shorten test length or require only selected test items.
- Create alternative assessments.
- On an exam other than a spelling test, don't take points off for spelling errors.

UNIT 1 OVERVIEW

Content Area: Mathematics

Unit Title: Basics of Geometry, Reasoning & Proofs, Parallel & Perpendicular Lines

Target Course/Grade Level: Geometry & Geometry Honors/Grades 8-11

Unit Summary: Students learn about the building blocks of Geometry: points, lines, and planes. Students are formally introduced to line segments, rays, angles, polygons, parallel lines, and perpendicular lines. Students explore congruent segments and angles and learn to construct them with a compass and straightedge. Students apply their knowledge of the Pythagorean theorem to derive the distance formula and use this to determine the perimeter of a given polygon. Students apply the midpoint formula to find the midpoint of a segment. Students develop an understanding of inductive and deductive reasoning and learn to write related conditional statements and formal proofs. Students identify special angle relationships that result when a transversal intersects parallel lines. Students solve problems by writing linear equations and using slopes to determine whether lines are parallel, perpendicular, or neither.

Approximate Length of Unit: 10 weeks

LEARNING TARGETS

NJ Student Learning Standards:

- G.CO.A.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- G.CO.C.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.C.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.C.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.CO.D.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). 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.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.
- G.GPE.B.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

- G.GPE.B.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
- G.GPE.B.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
- G.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).

Career Readiness, Life Literacies, and Key Skills:

- 9.2.12.CAP.2** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.6** Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.4.12.CI.1** Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1** Identify problem-solving strategies used in the development of an innovative product or practice.
- 9.4.12.CT.2** Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
- 9.4.12.IML.2** Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
- 9.4.12.TL.1** Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

Interdisciplinary Connections and Standards:

ELA

- L.SS.9–10.1** Demonstrate command of the system and structure of the English language when writing or speaking.
- RI.CR.9–10.1** cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.
- RI.CI.9–10.2** Determine one or more central ideas of an informational text and analyze how it is developed and refined over the course of a text, including how it emerges and is shaped by specific details; provide an objective summary of the text.
- RI.MF.9–10.6** Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
- W.AW.9–10.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence.
- W.IW.9–10.2** Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- SL.PE.9–10.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.PI.9–10.4** Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

Science

- HS-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit Understandings:

Students will understand that...

- Experimenting with transformations in the plane.
- Geometric theorems can be proved using logical reasoning.
- Geometric properties can be used to construct geometric figures.
- Proving theorems involving similarity.
- Utilizing coordinates to prove simple geometric theorems algebraically.
- Applying geometric concepts in modeling situations.

Unit Essential Questions:

- How can coordinates and the coordinate plane be used to prove theorems algebraically?
- How can you find the perimeter and area of a polygon in a coordinate plane?
- How are angles measured and classified?
- How can you use a compass and straightedge to copy a line segment?
- How can you describe angle pair relationships and use these descriptions to find angle measures?
- What does it mean when two lines are parallel, intersecting, coincident, or skew?
- How do you show a line is parallel/perpendicular to a given line passing through a given point?
- How is a conditional statement related to its converse, inverse, and contrapositive?

Knowledge and Skills:

Students will know...

- The building blocks of geometry: points, lines, planes, segments, angles, and rays.
- Measuring and constructing line segments.
- Finding midpoints and lengths of segments.
- Perimeters and areas of polygons in the coordinate plane.
- How to measure, construct, and describe angles.
- Angle pairs are formed by a pair of lines and a transversal: corresponding, alternate interior, alternate exterior, and same-side interior/consecutive.
- How to identify and use angle pairs (complementary, supplementary, linear, and vertical).
- Related conditionals: conditional, converse, inverse, and contrapositive.
- The difference between inductive and deductive reasoning.
- The structure of a two-column proof, paragraph proof, and flow proof.
- How to use proofs about segments, angles, and geometric relationships.
- Proofs and theorems about parallel and perpendicular lines.
- The relationship between the slopes of parallel and perpendicular lines.
- Vocabulary: point, line, plane, line segment, angle, acute angle, right angle, obtuse angle, complementary & supplementary angles, conditional statement, hypothesis, conclusion, equivalent statements, biconditional statement, conjecture, inductive reasoning, proof, theorem, parallel lines, parallel planes, transversal, corresponding angles, alternate interior angles, alternate exterior angles, consecutive interior angles, and perpendicular bisector.

Students will be able to...

- Identify and label points, lines, planes, segments, angles, and rays.
- Measure and draw segments and angles.
- Utilize formulas in the coordinate plane.
- Construct segments and angles.
- Illustrate intersections of lines and planes.
- Utilize the Segment Addition Postulate.
- Discover the lengths and midpoints of segments.
- Calculate the perimeters and areas of polygons in the coordinate plane.
- Perform constructions using a compass and straightedge.

- Interpret and sketch geometric diagrams.
- Differentiate angle pairs and apply their theorems and postulates to calculate missing measurements.
- Construct congruent angles and an angle bisector.
- Discover angle measures in pairs of angles.
- Use inductive and deductive reasoning.
- Justify steps using algebraic reasoning.
- Explain postulates using diagrams.
- Prove geometric relationships.
- Distinguish if conditional statements are true.
- Sketch a diagram given a verbal description.
- Use properties of algebra and algebraic proofs to solve equations.
- Prove geometric relationships by writing geometric proofs.
- Compare and contrast the different types of geometric proofs.
- Describe angle relationships formed by parallel lines and a transversal.
- Prove theorems involving parallel and perpendicular lines,
- Write equations of parallel and perpendicular lines.
- Distinguish between lines, planes, and pairs of angles and be able to identify each of them.
- Construct parallel lines, perpendicular lines, and perpendicular bisectors.
- Determine the presence/absence of a right angle by comparing slopes of intersecting lines.

EVIDENCE OF LEARNING

Assessment:

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- End of Unit Common Assessment - See folder for assessment links.
- Formative: warm-up activities, exploratory activities, class discussions, student participation, homework, and exit tickets.
- Summative: quizzes, tests, projects, and benchmark assessments.
- Open-ended problems that involve written responses with justification of answers.
- Renaissance Star Math Diagnostic Assessment – Fall, Winter, Spring

Learning Activities:

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Interactive Platforms: Desmos, Kahoot, Delta Math, Formative, Quizizz, Quizlet, Google Forms, Mathspace, PearDeck, Freckle, Geogebra, Gimkit, and Khan Academy.
- Group Work Suggestion: quiz trade, circuits, limit war, matching card games, jeopardy, relay review, and speed dating.
- **Sample Application Activities:**
 - Students apply their understanding of points, line segments, and angles to design and sketch the outline of a wildlife reservation to provide a protected habitat for a tiger population.
 - Students apply their understanding of conditional statements and reasoning to write conditional statements and related conditional statements that are related to the effects of climate change. Students are also asked to show that a conjecture about climate change is false.

- Students apply their understanding of constructing perpendicular bisectors to find the location of a power plant that is equidistant from two cities and the location of a power plant that is equidistant from three cities.

RESOURCES

Teacher Resources:

- **Textbook:** Larson, R. and Boswell, L. (2022). Geometry. Erie, PA: Big Ideas Learning, LLC.
- Useful Websites for Teachers to Explore:
 - www.illustrativemathematics.org
 - <http://www.ixl.com>
 - www.kutasoftware.com
 - <https://www.khanacademy.org/>
 - <https://learnzillion.com/>
 - <https://www.teachingchannel.org/>
 - <http://illuminations.nctm.org>
 - <https://www.flippedmath.com/>
 - <http://geogebra.org>
 - <http://mathopenref.com>

Equipment Needed:

- Projector, Computer/Laptop, Chromebooks, Document Camera, Graphing Calculator
- Graph paper
- Patty Paper
- Straight Edge
- Protractor
- Compass

UNIT 2 OVERVIEW

Content Area: Mathematics

Unit Title: Congruence, Constructions, and Transformations

Target Course/Grade Level: Geometry & Geometry Honors/Grades 8-11

Unit Summary: Students will work with a variety of proof formats as they investigate triangle congruence. Methods for determining triangle congruence (SAS, SSS, ASA, and AAS) are established using rigid motions. Students will use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures and will continue to use coordinates to prove theorems algebraically. Triangle congruence will be used to prove properties of quadrilaterals and other polygons and as well as being used to derive formulas for area and surface area. Students will build on their understanding of rigid motion as congruent triangles will be presented as a composition of rigid motion. Students will understand congruence and similarity in terms of transformations. Students will learn that rigid motions preserve distance and angle measures, whereas nonrigid transformations may change the shape or size of a figure.

Approximate Length of Unit: 10 weeks

LEARNING TARGETS

NJ Student Learning Standards:

- G.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).
- G.CO.A.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- G.CO.A.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- G.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.
- G.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.
- G.CO.B.7** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- G.CO.B.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- G.CO.C.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.C.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.C.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.C.A.3** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
- G.GPE.B.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 $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.
- G.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.
- G.SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Career Readiness, Life Literacies, and Key Skills:

- 9.2.12.CAP.2** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.6** Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.4.12.CI.1** Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1** Identify problem-solving strategies used in the development of an innovative product or practice.
- 9.4.12.CT.2** Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
- 9.4.12.IML.2** Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
- 9.4.12.TL.1** Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

Interdisciplinary Connections and Standards:

ELA

- L.SS.9–10.1** Demonstrate command of the system and structure of the English language when writing or speaking.
- RI.CR.9–10.1** cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.
- RI.CI.9–10.2** Determine one or more central ideas of an informational text and analyze how it is developed and refined over the course of a text, including how it emerges and is shaped by specific details; provide an objective summary of the text.
- RI.MF.9–10.6** Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
- W.AW.9–10.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence.
- W.IW.9–10.2** Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

SL.PE.9–10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.PI.9–10.4 Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

Science

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit Understandings:

Students will understand that...

- Experimenting with transformations in the plane.
- Geometric theorems can be proved using logical reasoning.
- Using coordinates to prove simple geometric theorems algebraically.
- Similarity in terms of similarity transformations.
- Theorems can be proved involving similarity.
- Polygons can be mapped as rigid motions to congruent polygons.
- Triangle congruence can be used to prove the properties of quadrilaterals.

Unit Essential Questions:

- What information is sufficient to determine whether two triangles are congruent?
- How can you use congruent triangles to make an indirect measurement?
- What conjectures can you make about the medians and altitudes of a triangle?
- How are the midsegments of a triangle related to the sides of the triangle?
- How are the sides related to the angles of a triangle?
- What are the properties of parallelograms?
- How can you translate, reflect, or rotate a figure in a coordinate plane?
- What does it mean to dilate a figure?

Knowledge and Skills:

Students will know...

- Translations, reflections, rotations, and dilations of figures.
- Congruence and similarity transformations.
- How to prove and use theorems about angles and triangles.
- Congruence in terms of rigid motions.
- Triangle congruence theorems: Side-Angle-Side (SAS), Angle-Angle-Side (AAS), Side-Side-Side (SSS), Angle-Side-Angle (ASA), and Hypotenuse-Leg (HL).
- Triangle Theorems: Isosceles Triangle, Triangle Sum, Exterior Angle, and Triangle Inequality.
- Adjacent interior and exterior angles are supplementary,
- Theorems about Perpendicular Bisector and Angle Bisector.
- Medians, altitudes, and midsegments of triangles.
- How to use indirect proofs to understand inequalities in triangles.
- Angle measures of polygons.
- Proofs and properties of parallelograms, trapezoids, and kites.
- Vocabulary: transformation, translation, rigid motion, reflection, glide reflection, line symmetry, rotation, rotational symmetry, congruent figures, similar figures, interior angles, exterior angles, corresponding parts, base, base angles, hypotenuse, coordinate proof, equidistant, concurrent, altitude of a triangle, midsegment of a triangle, indirect proof, diagonal, equilateral polygon, equiangular polygon, parallelogram, rhombus, rectangle, square, trapezoid, kite, circumcenter, orthocenter, incenter, and centroid.

Students will be able to...

- Identify transformations.
- Perform translations, reflections, rotations, and dilations.
- Describe congruence and similarity transformations.
- Solve problems involving transformations.
- Perform a composition of translations on a figure.
- Evaluate line and rotational symmetry in polygons.
- Solve real-life problems using congruence transformations.
- Prove that figures are similar.
- Classify triangles by sides and angles.
- Solve problems involving congruent polygons.
- Prove triangles congruent using a variety of theorems, including the Side-Angle-Side (SAS), Angle-Angle-Side (AAS), Side-Side-Side (SSS), Angle-Side-Angle (ASA), and Hypotenuse-Leg (HL) Theorems.
- Write a coordinate proof.
- Discover interior and exterior angle measures of triangles.
- Prove and utilize theorems about isosceles and equilateral triangles.
- Solve real-life problems using congruent triangles.
- Identify and use perpendicular and angle bisectors of triangles.
- Construct medians and altitudes of triangles to solve problems.
- Circumscribe/inscribe a circle outside/within a triangle.
- Solve real-life problems involving midsegments and using the Triangle Midsegment Theorem.
- Organize the side lengths of a triangle given the angle measures.
- Solve real-life problems using the Hinge Theorem.
- Discover missing angles in polygons.
- Describe the properties of parallelograms.
- Solve problems involving parallelograms in the coordinate plane.
- Justify that a quadrilateral in the coordinate plane is a parallelogram.
- Differentiate between the different types of quadrilaterals.

EVIDENCE OF LEARNING

Assessment:

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- End of Unit Common Assessment - See folder for assessment links.
- Formative: warm-up activities, exploratory activities, class discussions, student participation, homework, and exit tickets.
- Summative: quizzes, tests, projects, and benchmark assessments.
- Open-ended problems that involve written responses with justification of answers.
- Renaissance Star Math Diagnostic Assessment – Fall, Winter, Spring

Learning Activities:

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Interactive Platforms: Desmos, Kahoot, Delta Math, Formative, Quizizz, Quizlet, Google Forms, Mathspace, PearDeck, Freckle, Geogebra, Gimkit, and Khan Academy.

- Group Work Suggestion: quiz trade, circuits, limit war, matching card games, jeopardy, relay review, and speed dating.
- **Sample Application Activities:**
 - Students apply their understanding of symmetry and similarity transformations to create life-size illustrations of a butterfly and then construct a dilation to show how the butterfly would look under a magnifying glass.
 - Students apply their understanding of parallel lines cut by transversals and congruent triangles to prove that triangles in the net of the head of a bacteriophage are congruent.
 - Students apply their understanding of relationships within triangles to construct the circumcenter of a triangle to find the diameter of a plate using only a shard on the plate.
 - Students apply their understanding of interior angles of polygons, properties of parallelograms, and properties of kites to investigate and describe polygons found in several constellations.

RESOURCES

Teacher Resources:

- **Textbook:** Larson, R. and Boswell, L. (2022). Geometry. Erie, PA: Big Ideas Learning, LLC.
- Useful Websites for Teachers to Explore:
 - www.illustrativemathematics.org
 - <http://www.ixl.com>
 - www.kutasoftware.com
 - <https://www.khanacademy.org/>
 - <https://learnzillion.com/>
 - <https://www.teachingchannel.org/>
 - <http://illuminations.nctm.org>
 - <https://www.flippedmath.com/>
 - <http://geogebra.org>
 - <https://www.staedtler.com/intl/en/mandala-creator/>
 - <http://mathopenref.com>

Equipment Needed:

- Projector, Computer/Laptop, Chromebooks, Document Camera, Graphing Calculator
- Graph paper
- Patty Paper
- Straight Edge
- Protractor
- Compass

UNIT 3 OVERVIEW

Content Area: Mathematics

Unit Title: Similarity, Right Triangles, and Trigonometric Ratios

Target Course/Grade Level: Geometry & Geometry Honors/Grades 8-11

Unit Summary: Students will understand the properties of similar figures and prove theorems involving similarity. They will use similar triangles to prove the slope criteria for parallel and perpendicular lines. Students will construct a point along a directed line segment that partitions the segment in a given ratio. Students will prove and use theorems involving similarity. Students will use special triangles and the Pythagorean theorem to solve problems. Students will be introduced to right triangle trigonometric ratios and solve problems involving right triangles

Approximate Length of Unit: 10 weeks

LEARNING TARGETS

NJ Student Learning Standards:

- G.SRT.A.1** Verify experimentally 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.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.
- G.SRT.A.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- G.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.
- G.SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- G.SRT.C.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- G.SRT.C.7** Explain and use the relationship between the sine and cosine of complementary angles.
- G.SRT.C.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- G.SRT.D.9** Derive the formula $A = \frac{1}{2}ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
- G.SRT.D.10** Prove the Laws of Sines and Cosines and use them to solve problems.
- G.SRT.C.11** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
- G.GPE.B.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

G.GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Career Readiness, Life Literacies, and Key Skills:

9.2.12.CAP.2 Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.

9.2.12.CAP.6 Identify transferable skills in career choices and design alternative career plans based on those skills.

9.4.12.CI.1 Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CT.1 Identify problem-solving strategies used in the development of an innovative product or practice.

9.4.12.CT.2 Explain the potential benefits of collaborating to enhance critical thinking and problem solving.

9.4.12.IML.2 Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.

9.4.12.TL.1 Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

Interdisciplinary Connections and Standards:

ELA

L.SS.9–10.1 Demonstrate command of the system and structure of the English language when writing or speaking.

RI.CR.9–10.1 cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.

RI.CI.9–10.2 Determine one or more central ideas of an informational text and analyze how it is developed and refined over the course of a text, including how it emerges and is shaped by specific details; provide an objective summary of the text.

RI.MF.9–10.6 Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.

W.AW.9–10.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence.

W.IW.9–10.2 Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

SL.PE.9–10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.PI.9–10.4 Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

Science

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit Understandings:

Students will understand that...

- Similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles.
- Use coordinates to prove simple geometric theorems algebraically.

Unit Essential Questions:

- What is a non-rigid motion and how can it be defined?
- What are some real-life applications of similarity?
- What proportionality relationships exist in a triangle intersected by an angle bisector or by a line parallel to one of the sides?
- How can the Trigonometric Ratios be applied to real-life situations?
- How is Similarity related to the Trigonometric Ratios?

Knowledge and Skills:

Students will know...

- The relationship between similar polygons.
- The Angle-Angle Similarity Theorem.
- Triangle similarity theorems.
- Proportionality theorems.
- The Pythagorean Theorem.
- Special right triangles.
- Proportional relationships in right triangles.
- Right triangle trigonometric ratios: sine, cosine, and tangent.
- Vocabulary: dilation, scale factor, similar figures, similarity transformation, corresponding parts, proportion, Pythagorean triple, trigonometric ratios, angle of elevation, and angle of depression.

Students will be able to...

- Identify and perform dilations.
- Solve real-life problems involving scale factors and dilations.
- Interpret and write similarity statements.
- Discover corresponding lengths in similar polygons.
- Evaluate perimeters and areas of similar polygons.
- Determine whether polygons are similar or not.
- Implement the Angle-Angle Similarity theorem, the Side-Side-Side Similarity theorem, and the Side-Angle-Side Similarity theorem to determine whether triangles are similar.
- Discover lengths when two transversals intersect three parallel lines.
- Apply the Pythagorean theorem to solve problems involving triangles.
- Apply the converse of the Pythagorean theorem to solve problems.
- Classify triangles as acute, right, or obtuse by applying the converse of the Pythagorean Theorem.
- Use special right triangles to solve real-life problems.
- Select the appropriate methods to solve right triangles, including Pythagorean Theorem, special right triangles, and trigonometry.
- Implement methods for solving right triangles to solve real-life problems.
- Solve non-right triangles using the Law of Sines and the Law of Cosines.

<i>EVIDENCE OF LEARNING</i>

Assessment:

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- End of Unit Common Assessment - See folder for assessment links.
- Formative: warm-up activities, exploratory activities, class discussions, student participation, homework, and exit tickets.

- Summative: quizzes, tests, projects, and benchmark assessments.
- Open-ended problems that involve written responses with justification of answers.
- Renaissance Star Math Diagnostic Assessment – Fall, Winter, Spring

Learning Activities:

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Interactive Platforms: Desmos, Kahoot, Delta Math, Formative, Quizizz, Quizlet, Google Forms, Mathspace, PearDeck, Freckle, Geogebra, Gimkit, and Khan Academy.
- Group Work Suggestion: quiz trade, circuits, limit war, matching card games, jeopardy, relay review, and speed dating.
- **Sample Application Activities:**
 - Students apply their understanding of similar triangles to approximate the length of the base of the triangular opening on the Ancestral Chamber at the African Burial Ground Monument in New York City. Students will also use their understanding of scale drawings to create a scale drawing of the Ancestral Chamber and the Circle of Diaspora.
 - Students apply their understanding of solving right triangles to find the shoulder height of a woolly mammoth skeleton.

RESOURCES

Teacher Resources:

- **Textbook:** Larson, R. and Boswell, L. (2022). Geometry. Erie, PA: Big Ideas Learning, LLC.
- Useful Websites for Teachers to Explore:
 - www.illustrativemathematics.org
 - <http://www.ixl.com>
 - www.kutasoftware.com
 - <https://www.khanacademy.org/>
 - <https://learnzillion.com/>
 - <https://www.teachingchannel.org/>
 - <http://illuminations.nctm.org>
 - <https://www.flippedmath.com/>
 - <http://geogebra.org>
 - <http://mathopenref.com>

Equipment Needed:

- Projector, Computer/Laptop, Chromebooks, Document Camera, Graphing Calculator
- Graph paper
- Patty Paper
- Straight Edge
- Protractor
- Compass

UNIT 4 OVERVIEW

Content Area: Mathematics

Unit Title: Circles, Geometric Modeling, & Probability

Target Course/Grade Level: Geometry & Geometry Honors/Grades 8-11

Unit Summary: Students will understand and apply theorems about circles. They will translate between geometric descriptions and equations for circles and parabolas. Students will explain and use the formulas for the circumference and area of a circle. They will derive the fact that the length of the arc intercepted by an angle is proportional to the radius and explain and use the radian measure. Students will derive the formula for the area of a sector. They will apply geometric concepts in modeling situations. Students will understand independent probability and conditional probability, use them to interpret data, and use probability rules to find probabilities of compound events.

Approximate Length of Unit: 10 weeks

LEARNING TARGETS

NJ Student Learning Standards:

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

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

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

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

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

G.C.A.4 Construct a tangent line from a point outside a given circle to the circle.

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

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

G.GPE.A.2 Derive the equation of a parabola given a focus and directrix.

G.GPE.B.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 $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.

G.GMD.A.1 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.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

- G.GMD.B.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.A.1.1** 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.A.2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- G.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).

Career Readiness, Life Literacies, and Key Skills:

- 9.2.12.CAP.2** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.6** Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.4.12.CI.1** Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1** Identify problem-solving strategies used in the development of an innovative product or practice.
- 9.4.12.CT.2** Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
- 9.4.12.IML.2** Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
- 9.4.12.TL.1** Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

Interdisciplinary Connections and Standards:

ELA

- L.SS.9–10.1** Demonstrate command of the system and structure of the English language when writing or speaking.
- RI.CR.9–10.1** cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.
- RI.CI.9–10.2** Determine one or more central ideas of an informational text and analyze how it is developed and refined over the course of a text, including how it emerges and is shaped by specific details; provide an objective summary of the text.
- RI.MF.9–10.6** Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
- W.AW.9–10.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence.
- W.IW.9–10.2** Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- SL.PE.9–10.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
- SL.PI.9–10.4** Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

Science

- HS-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit Understandings:

Students will understand that...

- All circles are similar and relationships exist between angles formed by radii, chords, secants and tangents.
- Arc lengths and areas of sectors of circles are proportional.
- Three-dimensional objects can be generated by rotating two-dimensional objects around an axis.
- Geometric concepts can be applied in modeling situations.

Unit Essential Questions:

- What patterns do you notice between angles formed by radii, chords, secants and tangents?
- What are two ways to determine when a chord is the diameter of a circle?
- What is the relationship between the numbers of vertices V , edges E , and faces F of a polyhedron?
- How can you find the volume of a prism or cylinder that is not a right prism, right cylinder, or pyramid?

Knowledge and Skills:

Students will know...

- The difference between angle and arc measures in circles.
- Special segments and lines that intersect circles.
- The relationship between a diameter and a chord perpendicular to a diameter.
- The equation of a circle.
- Properties of inscribed angles and inscribed polygons.
- Angles are formed by chords, secants, and tangents.
- Equations of parabolas.
- Formulas for the circumference and area of a circle.
- The length of the arc intercepted by an angle is proportional to the radius.
- Arc length and radian measure.
- The formula for the area of a sector.
- How to draw and describe cross-sections of solid objects.
- Solids are generated by rotations of two-dimensional objects.
- Volume formulas for cylinders, pyramids, cones, and spheres.
- Surface area formulas for cones and spheres.
- The concept of density and modeling with volume.
- Vocabulary: circle, radius, diameter, concentric circles, central angle, minor arc, major arc, semicircle, congruent circles, inscribed angle, inscribed polygon, circumscribed circle, circumscribed angle, circumference, arc length, radian, sector of a circle, center of a polygon, radius of a polygon, a central angle of a polygon, face, edge, vertex, cross-section, volume, similar solids, lateral surface of a cone, chord of a sphere, density, solids of revolution, and axis of revolution.

Students will be able to...

- Classify lines and segments that intersect circles.
- Discover angle and arc measures in circles.
- Measure special segments and lines that intersect circles.
- Utilize properties of tangents to solve problems.
- Calculate arc and radian measurements.
- Convert between degrees and radians.
- Compare congruent arcs of circles.
- Utilize chords of circles to find arc measures and lengths.
- Describe the relationship between a diameter and a chord perpendicular to a diameter.

- Predict the center of a circle given three points on the circle.
- Illustrate angles and arcs determined by chords, secants, and tangents
- Utilize circumscribed angles to solve problems.
- Find lengths of segments of chords.
- Discuss segments of secants and tangents.
- Graph and write equations of parabolas.
- Discover the area of various 2-dimensional figures such as parallelograms, rectangles, trapezoids, rhombus, squares, triangles, circles, and regular polygons.
- Solve problems by finding the lateral areas, surface areas, and volumes of various solid figures such as rectangular prisms, cubes, pyramids, cones, and spheres
- Research 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.
- Model real-world objects with geometric shapes.

EVIDENCE OF LEARNING

Assessment:

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- End of Unit Common Assessment - See folder for assessment links.
- Formative: warm-up activities, exploratory activities, class discussions, student participation, homework, and exit tickets.
- Summative: quizzes, tests, projects, and benchmark assessments.
- Open-ended problems that involve written responses with justification of answers.
- Renaissance Star Math Diagnostic Assessment – Fall, Winter, Spring

Learning Activities:

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Interactive Platforms: Desmos, Kahoot, Delta Math, Formative, Quizizz, Quizlet, Google Forms, Mathspace, PearDeck, Freckle, Geogebra, Gimkit, and Khan Academy.
- Group Work Suggestion: quiz trade, circuits, limit war, matching card games, jeopardy, relay review, and speed dating.
- **Sample Application Activities:**
 - Students apply their understanding of inscribed angles and polygons to approximate the diameter of the Aubrey ring, a component of Stonehenge, and to find the measure of each arc subtended by adjacent Station Stones. Students also describe how to use the shorter sides of the Station Stone rectangle to inscribe a regular polygon in the Aubrey ring.
 - Students apply their understanding of the area of a circle to design a center-pivot irrigation system.
 - Students apply their understanding of surface area and volume to design an artificial cave to accommodate bats.

RESOURCES

Teacher Resources:

- **Textbook:** Larson, R. and Boswell, L. (2022). Geometry. Erie, PA: Big Ideas Learning, LLC.
- Useful Websites for Teachers to Explore:
 - www.illustrativemathematics.org
 - <http://www.ixl.com>
 - www.kutasoftware.com
 - <https://www.khanacademy.org/>
 - <https://learnzillion.com/>
 - <https://www.teachingchannel.org/>
 - <http://illuminations.nctm.org>
 - <https://www.flippedmath.com/>
 - <http://geogebra.org>
 - <http://mathopenref.com>

Equipment Needed:

- Projector, Computer/Laptop, Chromebooks, Document Camera, Graphing Calculator
- Graph paper
- Patty Paper
- Straight Edge
- Protractor
- Compass