Geometry

Mathematics

Grade(s) 9th - 12th, Duration 1 Year, 1 Credit
Required Course

Course Overview

Geometry is designed to develop skills in the principles of logic, inductive and deductive reasoning in mathematical and non-mathematical situations. The parts, properties, areas and volumes of 2-D and 3-D figures are studied including in the coordinate plane and using trigonometric functions. Furthermore, this class will strengthen basic algebra skills.

Scope And Sequence

Timeframe	Unit	Instructional Topics
19 Day(s)	Introducing lines, segments, angles	1. Points, lines, and planes 2. Segment Addition Postulate, Defining congruence 3. Midpoint and Distance Formulas 4. Angles: classifying, naming, etc. 5. Supplementary, complementary 6. Taxi Cab Geometry 7. Algebraic angles
5 Day(s)	Conditional statements w/bicondtionals	1. p-> q, q->p, ~p->~q,~q->~p 2. Biconditionals and good definitions 3. Inductive reasoning 4. Venn Diagrams
12 Day(s)	Parallel and Perpendicular lines	1. Angle relationships formed by parallel lines cut by a transversal 2. Slopes of parallel, perpendicular lines and their equations
28 Day(s)	Congruence and Proof	1. Make geometric constructions_Copy 2. Prove geometric theorems_Copy
28 Day(s)	Transformations	1. Similarity transformations including proofs involving similarity_Copy 2. Experiment with transformations in the plane 3. Understand congruence in terms of rigid motion 4. Prove geometric theorems 5. Make geometric constructions
28 Day(s)	Extending to Three Dimensions	1. Explain volume formulas and use them to solve problems, and apply geometric concepts in modeling situations 2. Visualize the relation between two-dimensional objects and three-dimensional objects 3. Apply geometric methods (vertex-edge graph) 4. Application of area of 2-D shapes.
27 Day(s)	Similarity, Proof. and Trigonmetry	1. Similarity transformations including proofs involving similarity 2. TrigonometricRatios
28 Day(s)	Circles With and Without Coordinates	1. Circles including arc length and sectors, and modeling 2. Equation of conic section -circles, including coordinate proof.
28 Day(s)	Connecting Algebra and Geometry through Coordinates	1. Coordinate proofs 2. Equations of conic sections-circles and parabolas
9 Day(s)	Applications of Probability	1. Independence and conditional probability 2. CompoundEvents 3. Evaluate outcomes

Course Details

Unit: Introducing lines, segments, angles

Duration: 19 Day(s)

Unit Description

Students will be able to recognize and define lines, line segments, and rays.
Students will be able to identify obtuse, acute, and right angles.
Students will be able to find the distance and midpoint between two given points.
Students will understand parallel and perpendicular lines.

Enduring Understandings (Knowledge & Skills)

Textbook "Geometry" from Mcgraw Hill, Chapter 1.
Various other homework assignments from online and other supplemental materials.
Graph paper, straight edge, worksheets, ruler, computer access and chromebooks

Academic Vocabulary

Chromebooks
Google Classroom

Using google maps to identify cities and approximate locations.
https://www.google.com/maps

Summative Assessment

Point, Line, Line Segment, Ray, Plane, Acute Angle, Obtuse Angle, Right Angle, Straight Angle

Materials and Resources (optional)

Unit Test
Performance task - Map Distance and Midpoint Project

Topic: Points, lines, and planes
Duration: 1 Day(s)

Topic Description (short)

Defining point, line, plane, intersection in order to provide the basic information needed for geometry.

Learning Targets

Apply definitions to have a better understanding of geometry.

Learning Targets linked to Priority Standard = ✙

Topic: Segment Addition Postulate, Defining congruence
Duration: 2 Day(s)

Topic Description (short)

Naming segments, using the definition of "betweenness" and congruence to find measures of segments.

Learning Targets

Applying understanding of the segment addition postulate to find measures of segments.

Learning Targets linked to Priority Standard = ✙

Topic: Midpoint and Distance Formulas
Duration: 5 Day(s)

Topic Description (short)

Exploring number lines while applying the midpoint and distance formulas. Exploring coordinate planes and applying the distance and midpoint formulas.

Learning Targets

Explore midpoint and distance on a number line.
Exploring Distance and midpoint on a coordinate plane.

Learning Targets linked to Priority Standard = ✙

Topic: Angles: classifying, naming, etc.
Duration: 5 Day(s)

Learning Targets

Identify, correctly label, and sketch the following: acute, right, obtuse, and straight angles, congruent angles, and angle bisectors
Use angle addition to calculate angle measures.
Use the angle bisector definition to calculate angle measures.

Learning Targets linked to Priority Standard = ✙

Topic: Supplementary, complementary
Duration: 2 Day(s)

Learning Targets

Identify pairs of angles as complementary, supplementary.
Use the definitions and relationships of complementary, supplementary, adjacent, and vertical angles to determine missing angle measures.

Learning Targets linked to Priority Standard = ✙

Topic: Taxi Cab Geometry
Duration: 1 Day(s)

Topic Description (short)

Exploring the difference between taxi cab geometry and Euclidian geometry.

Learning Targets

Measure distance using taxicab Geometry.

Learning Targets linked to Priority Standard = ✙

Topic: Algebraic angles
Duration: 3 Day(s)

Topic Description (short)

Applying definitions of vertical angles, supplementary, complementary to algebraically find the measure of angles.

Learning Targets

Use the definitions of complementary, supplementary, and adjacent angles to calculate angle measures
Identify and solve for angle measures using linear pairs.
Identify and solve for angle measures using vertical angles.

Learning Targets linked to Priority Standard = ✙

Unit: Conditional statements w/bicondtionals

Duration: 5 Day(s)

Unit Description
The exploration and use of logic in the study of geometry and good definitions.

Enduring Understandings (Knowledge & Skills)
Geometry by Glencoe 2010 copyright

Academic Vocabulary
Using Chromebooks

Topic: p-> q, q->p, ~p->~q,~q->~p

Duration: 2 Day(s)

Topic Description (short)
The use and application of the conditional statements

Learning Targets
Student will be able to use and apply the logic statements.

Learning Targets linked to Priority Standard = ✙

Topic: Biconditionals and good definitions

Duration: 1 Day(s)

Topic Description (short)
The use of the conditional and the converse with truth value of (T) and then combining them into a biconditional and determining good definitions.

Topic: Inductive reasoning

Duration: 1 Day(s)

Topic Description (short)
The application of Inductive reasoning to extend patterns.

Learning Targets
Students will be able to predict and make sense of patterns by the application of inductive.

Learning Targets linked to Priority Standard = ✙

Topic: Venn Diagrams

Duration: 1 Day(s)

Topic Description (short)
The construction and reading of venn diagrams as a problem solving tool.

Learning Targets
constructing and reading venn diagrams as problem solving tools.

Learning Targets linked to Priority Standard = ✙

Unit: Parallel and Perpendicular lines

Duration: 12 Day(s)

Unit Description
The application of the parallel lines cut by a transversal theorems.

Enduring Understandings (Knowledge & Skills)
textbook, chromebook, color scaffold for angle relationships, tape for wall versions of ||, word wall

Academic Vocabulary
Using chromebooks through google classroom.

Summative Assessment
Alternate interior, Alternate exterior, corresponding, Consecutive interior, consecutive exterior, supplementary,parallel, perpendicular, skew

Materials and Resources (optional)
Test over unit.

Topic: Angle relationships formed by parallel lines cut by a transversal

Duration: 6 Day(s)

Topic Description (short)
Discover the angle relationships and names of angles formed when parallel lines are cut by a transversal.

Learning Targets
Identify and apply angle relationships.
Students will be able to use and apply symbolic manipulation to angle relationships formed when parallel lines are cut by a transversal.
Prove theorems about lines and angles:
vertical angles congruent
alternate interior angles congruent
corresponding angles congruent
points on a perpendicular bisector of a line segment are equidistant from the segment's endpoints

Learning Targets linked to Priority Standard =

Topic: Slopes of parallel, perpendicular lines and their equations **Duration:** 6 Day(s)

Topic Description (short)
Write-identify slopes of parallel or perpendicular lines.

Learning Targets
Write-identify slopes of parallel lines.
Write-identify slopes of perpendicular lines.

Learning Targets linked to Priority Standard =

Unit: Congruence and Proof **Duration:** 28 Day(s)

Topic: Make geometric constructions_Copy **Duration:** 2 Day(s)

Topic Description (short)
Make geometric constructions, integrated into the topics in which they apply.

Learning Targets
Make formal geometric constructions with a variety of tools
Construct an equilateral triangle, a square, and a regular hexagon in an inscribed circle

Learning Targets linked to Priority Standard =

Topic: Prove geometric theorems_Copy **Duration:** 10 Day(s)

Topic Description (short)
Students
will prove theorems about lines, angles, triangles, and parallelograms by using narrative proofs, two-column proofs, and diagrams.

Learning Targets
Prove theorems about lines and angles:
vertical angles congruent
alternate interior angles congruent
corresponding angles congruent
points on a perpendicular bisector of a line segment are equidistant from the segment's endpoints
Prove theorems about triangles
Prove theorems about parallelograms
Prove relationships in geometric figures.
Prove theorems about parallelograms
Prove theorems about triangles
Prove theorems about triangles.

Learning Targets linked to Priority Standard =

Unit: Transformations **Duration:** 28 Day(s)

Unit Description
Students will experiment with transformations in the plane, understand congruence in terms of rigid motions, prove geometric theorems, and make geometric constructions.

Enduring Understandings (Knowledge & Skills)
Textbook "Geometry" from Mcgraw Hill. Chapter 9. Various other homework assignments from online and other supplemental materials.

graph paper, straight edge, posters, Worksheets, ruler, patty paper, computer access and chromebooks

Academic Vocabulary
Turtle pond from NCTM, google classroom, Pixar TeD Talk, online Tetris game,

3 online quizes at
http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-07-845773-

4&chapter=16&lesson=4&quizType=1&headerFile=4&state=na%22

http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-07-845773-4&chapter=16&lesson=5&quizType=1&headerFile=4&state=na%22

http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-07-845773-4&chapter=16&lesson=6&quizType=1&headerFile=4&state=na%22

MC Escher offical website: http://www.mcescher.com/

http://www.tessellations.org/methods-diy-papercut.shtml

Summative Assessment

rotation, reflection, translation, order of rotational symmetry,isometries, image ,preimage or original, rotation, reflection, translation, translation vector, direction and distance of translation, angle of rotation, center of rotation, rigid transformation, line of reflection , symmetry- reflectional symmetry,

- line symmetry
- rotational symmetry
- point symmetry

Materials and Resources (optional)

The assessment chosen for the objectives, styles of answers. Tessellation and scoring guide, alphabet symmetry as performance type events.

Topic: Similarity transformations including proofs involving similarity_Copy **Duration:** 10 Day(s)

Topic Description (short)

Understanding similarity in terms of similarity transformations including modeling the geometric concepts.

Learning Targets

Verify experimentally the properties of dilations.
Description: Students will manipulate 2-D shapes using centers of dilation.
Assessment: Project-area method of dilation, Initials project
Classroom Observation
Quiz/Test
Use dry erase boards for student responses as formative assessment.
Thumbs up/down for formative assessment and verification of student agreement on answers.
Interactive Geogebra with questions in Google classroom

Determining similarity and proportionality.
Description: The use of scale factors and proportions to determine if shapes are similar.
Assessment: Assignments
Bell work
exit slips

Using AA property of similarity.
Description: The use of cross products to solve for missing values in similar triangles, and images with parallel lines.
Assessment: Assignments
Classroom Observation
Formative Assessment
Quiz/Test

Use congruence and similarity of triangles to solve problems.
Description: solving for missing values in figures with similar triangles or 3 or more parallel lines.
Assessment: Exit Slip
Assignments
Common Assessment

Learning Targets linked to Priority Standard = ✠

Topic: Experiment with transformations in the plane **Duration:** 9 Day(s)

Topic Description (short)

Students will know the definitions of angle, circle, perpendicular line, parallel line, and line segment, and represent and identify transformations in the plane such as translation, rotations and reflections.

Learning Targets

Define angle, circle, perpendicular line, parallel line, and line segment
Represent transformations in the plane
Describe transformations as functions
Compare transformations
Assessment: Classroom Assessment
Homework
Graphic Organizer

Describe rotations and reflections that carry a parallelogram, trapezoid, or regular polygon onto itself
Assessment: Quiz/Test
Define rotations, reflections, and rotations in terms of angles, circles, and lines
Assessment: Performance Evaluation
Draw a transformed figure
Determine a sequence of transformations that will carry a figure onto another
Assessment: Other Products or Performances

Learning Targets linked to Priority Standard =

Topic: Understand congruence in terms of rigid motion **Duration:** 2 Day(s)

Topic Description (short)
Students will use geometric descriptions of rigid motion to explain congruence of two geometric figures. ASA, AAS, SAS, and SSS will be used to meet criteria for congruent triangles by corresponding pairs of sides and corresponding pairs of angles congruent.

Learning Targets
Use rigid motions to transform figures such as a tessellation and transformation notation.
Decide if two figures are congruent in terms of rigid motion.
Assessment: Class Discussion/Participation
Assignments
"snowball" cooperative learning structure
Classwork

Learning Targets linked to Priority Standard =

Topic: Prove geometric theorems **Duration:** Ongoing

Topic Description (short)
Students
will prove theorems about lines, angles, triangles, and parallelograms by using narrative proofs, two-column proofs, and diagrams.

Learning Targets
Write two-column proofs for segments .

Learning Targets linked to Priority Standard =

Topic: Make geometric constructions **Duration:** 2 Day(s)

Topic Description (short)
Make geometric constructions, integrated into the topics in which they apply.

Learning Targets
Make formal geometric constructions with a variety of tools
Construct an equilateral triangle, a square, and a regular hexagon in an inscribed circle

Learning Targets linked to Priority Standard =

Unit: Extending to Three Dimensions **Duration:** 28 Day(s)

Unit Description
Students will explain volume formulas and use them to solve problems, visualize the relation between between two-dimensional and three-dimensional objects, and apply geometric concepts in modeling situations.

Topic: Explain volume formulas and use them to solve problems, and apply geometric concepts in modeling situations **Duration:** 25 Day(s)

Topic Description (short)
Give informal explanations of the formulas for the circumference and area of a circle, volume of a cylinder, pyramid, and cone, and use the measures to describe objects.

Learning Targets
Argue the formulas for:
circumference of a circle
area of a circle
volume of a cylinder, pyramid, and cone
Use volume formulas

Learning Targets linked to Priority Standard =

Topic: Visualize the relation between two-dimensional objects and three- dimensional objects **Duration:** 3 Day(s)

Topic Description (short)

Identify the shapes of two-dimensional objects and three-dimensional objects, and identify the cross-sections of three dimensional objects.

Learning Targets

Identify the shapes of cross-sections of 3-dimensional objects
Identify three-dimensional objects generated by rotations of two dimensional objects
Use geometric shapes and measures to describe objects-complex area of shapes

Learning Targets linked to Priority Standard = ✚

Topic: Apply geometric methods (vertex-edge graph) **Duration:** 3 Day(s)

Topic Description (short)

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).□

Topic: Application of area of 2-D shapes. **Duration:** 12 Day(s)

Topic Description (short)

The use of the concept of area in geometric shapes including simple shapes and composite-compound shapes.

Learning Targets

Learn how to recognize basic shapes within more complex figures.
Add or subtract basic shapes to find the area of more complex figures.
Find the area of irregularly shaped geometric figures

Learning Targets linked to Priority Standard = ✚

Unit: Similarity, Proof. and Trigonmetry **Duration:** 27 Day(s)

Unit Description

Understanding similarity in terms of similarity transformations, proving theorems involving similarity, along with defining trig ratios are the focus of this unit. Students will apply geometric concepts in modeling situations and trigonometry to general triangles.

Enduring Understandings (Knowledge & Skills)

Textbook Geometry from Mcgraw Hill. Various worksheet and homework assignments from online and supplementary resources. see attachments

graph paper, straight edge, Worksheets, ruler,patty paper, access to chromebooks

Academic Vocabulary

The option of using Geogabra tube for animated demos of dilations.

Summative Assessment

Dilation, center of dilation, image, preimage, dilation factor

Materials and Resources (optional)

The assessment (TEST) was chosen (assembled) to meet the objectives and the variety of answer styles.
The Dilation Project was chosen for an individual performance event.

Topic: Similarity transformations including proofs involving similarity **Duration:** 10 Day(s)

Topic Description (short)

Understanding similarity in terms of similarity transformations including modeling the geometric concepts.

Learning Targets

Verify experimentally the properties of dilations.
Description: Students will manipulate 2-D shapes using centers of dilation.
Assessment: Project
Classroom Observation
Quiz/Test
Determining similarity and proportionality.
Using AA property of similarity.
Prove theorems about triangles.
Use congruence and similarity of triangles to solve problems.
Prove relationships in geometric figures.
Explain triangle congruence (ASA, SAS, SSS)
Show two triangles congruent by CPCTC

Learning Targets linked to Priority Standard = ✚

Topic: TrigonometricRatios **Duration:** 15 Day(s)

Topic Description (short)

Define trigonometric ratios and solve problems involving right triangles and applying trig to general triangles in such cases as the law of sines

or cosines.

Learning Targets
Understanding and using the trig ratios of sine, cosine, and tangent.
Use sine and cosine of complementary angles.
Use trig ratios and the Pythagorean theorem to solve right triangle applications.

Learning Targets linked to Priority Standard = ✙

Unit: Circles With and Without Coordinates

Duration: 28 Day(s)

Unit Description
Students will understand and apply theorems about circles, find arc lengths and areas of sectors of circles, translate between the geometric description and the equation for a conic section, use coordinates to prove simple geometric theorems algebraically, and apply geometric concepts in modeling situations.

Topic: Circles including arc length and sectors, and modeling

Duration: 10 Day(s)

Topic Description (short)
Understanding and applying theorems about circles. Finding arc length and area of sectors including modeling of geometric concepts.

Learning Targets
Prove that all circles are similar
Identify and describe inscribed angles, radii, and chords
Construct and described inscribed and circumscribed triangles
Find arc lengths and areas of sectors
Assessment: chapter 11 exam

Learning Targets linked to Priority Standard = ✙

Topic: Equation of conic section -circles, including coordinate proof.

Duration: 5 Day(s)

Topic Description (short)
Translate between the geometric description and the equation for the conic section-circle.Using coordinates to prove simple geometric theorems algebraically.

Learning Targets
Derive the equation of a circle.

Learning Targets linked to Priority Standard = ✙

Unit: Connecting Algebra and Geometry through Coordinates

Duration: 28 Day(s)

Unit Description
Using coordinates to prove simple geometric theorems algebraically and translating between the geometric description and the equations for a conic section is the focus of this unit.

Topic: Coordinate proofs

Duration: 14 Day(s)

Topic Description (short)
Using coordinates to prove simple geometric theorems algebraically.

Learning Targets
Prove simple theorems algebraically.
Write and use Equation of parallel and perpendicular lines.
Determine perimeters and areas of polygons using coordinates.

Learning Targets linked to Priority Standard = ✙

Topic: Equations of conic sections-circles and parabolas

Duration: 5 Day(s)

Topic Description (short)
Translating between the geometric description and the equation for circles and parabolas

Learning Targets
Derive the equation of a parabola given a focus and directrix.

Learning Targets linked to Priority Standard = ✙

Unit: Applications of Probability

Duration: 9 Day(s)

Unit Description
Students will understand independence and conditional probability and use them to interpret data, use the rules of probability to compute

probabilities of compound events in a uniform probability model, and use probability to evaluate outcomes of decisions.

Topic: Independence and conditional probability **Duration:** 3 Day(s)

Topic Description (short)
Understanding independence and conditional probability and use them to interpret data.

Learning Targets
Determine sample spaces and outcomes for unions, intersections,or complements of events.
Independent probabilities.
Construct and interpret two-way frequency tables of data as a sample space.
Applying concepts of conditional probability in every day situations.

Learning Targets linked to Priority Standard =

Topic: CompoundEvents **Duration:** 3 Day(s)

Topic Description (short)
Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Learning Targets
Conditional probability given two events and interpret in terms of a model.

Learning Targets linked to Priority Standard =

Topic: Evaluate outcomes **Duration:** 3 Day(s)

Topic Description (short)
Use probability to evaluate outcomes of decisions.

Learning Targets
Calculate probabilities to determine if a scenario is fair.

Learning Targets linked to Priority Standard =