

Unit #1 Congruence

Content Area: **Math**
Course(s):
Time Period:
Length: **14 weeks**
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Congruence

Learning Objectives

- Objective 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.
- Objective 10 - 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.
- Objective 11 - 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 $(0, 2)$.
- Objective 12 - 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).
- Objective 13 - Use coordinate rules to determine points of transformations.
- Objective 14 - Determine the coordinate rules for reflections and rotations.
- Objective 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).
- Objective 3 - Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- Objective 4 - 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.
- Objective 5 - 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.
- Objective 6 - 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.

- Objective 7 - Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- Objective 8 - 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.
- Objective 9 - 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.

Essential Skills

- Essential Skill 1 - Know the definition of angle, circle, perpendicular lines, parallel lines, line segment and point.
- Essential Skill 10 - Define triangle congruence in terms of rigid motion.
- Essential Skill 10 - Represent transformations in the plane using transparencies or technology
- Essential Skill 11 - Prove theorems about lines and angles: Including vertical angles, Alternate interior angles, Corresponding are all congruent Points on perpendicular bisector of a line segment are exactly those equidistant from the segment endpoints.
- Essential Skill 12 - Prove theorems about triangles: interior angles, triangle sum, base angles, isosceles triangles and triangles.
- Essential Skill 13 - Prove theorems about parallelograms: opposite sides are congruent, opposite angles are congruent, diagonals bisect each other, and conversely rectangles are parallelograms with congruent diagonals.
- Essential Skill 14 - Prove simple geometric theorems using coordinates.
- Essential Skill 15 - Prove the slopes for parallel and perpendicular lines.
- Essential Skill 16 - Use the slopes of parallel and perpendicular lines to solve geometric problems.
- Essential Skill 2 - Describe transformations as functions that take points in the plane as inputs and give others as outputs
- Essential Skill 3 - Compare transformations that preserve distance and angle to those that do not
- Essential Skill 4 - Describe the rotations and reflections that carry rectangle, parallelogram, trapezoid, regular polygons onto themselves.
- Essential Skill 5 - From a given geometric figure and a rotation, reflection, or translation draw the transformed figure.
- Essential Skill 6 - Be able to specify a sequence of transformations that will carry a given figure onto another.
- Essential Skill 7 - Use geometric descriptions to transform figures. Predict the effect of a given rigid motion on a given figure. Use the definition of congruence. Decide if figures are congruent.
- Essential Skill 8 - Use the definition of congruence of rigid motion to show that two triangles are congruent given that corresponding pairs of angles and sides are congruent
- Essential Skill 9 - Explain triangle congruence criteria.

Standards

MATH.9-12.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.
MATH.9-12.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).
MATH.9-12.G.CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.G.GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.
MATH.9-12.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).

Instructional Tasks/Activities

- G.CO.A.2 snotes.ws.2.prac.docx - Mapping/Functions, transformations/one to one functions
- G.CO.A.2 snotes.ws1.prac.docx - Coordinate Rules, input/output
- G.CO.A.2 snotes.ws34.prac.docx - Isometries
- G.CO.A.2 Worksheet #1 - Coordinate Rules, input/output
- G.CO.A.2 Worksheet #2 - Mapping/Functions, transformations/one to one functions
- G.CO.A.2 Worksheet #3 - Isometries
- G.CO.A.2 Worksheet #4 - Isometries
- G.CO.A.3 Activity #1 – Reflectional & rotational symmetry patty paper activity

- G.CO.A.3 Activity #2 – Flag Symmetry
- G.CO.A.3 notes.ws12.prac.docx - Reflectional and Rotational Symmetry
- G.CO.A.3 Worksheet #1 - Reflectional and Rotational Symmetry
- G.CO.A.3 Worksheet #2 - Reflectional and Rotational Symmetry
- G.CO.A.4 notes.ws12.prac.docx - Properties of transformations and notation
- G.CO.A.4 Worksheet #1 - Properties of transformations and notation
- G.CO.A.4 Worksheet #2 - Notation Summary
- G.CO.A.5 Activity #1 – Mini-Golf Project
- G.CO.A.5 Activity #2 – Billiards Project
- G.CO.A.5 Activity #3 – Tessellation Project
- G.CO.A.5 notes.ws.1.guide.docx - Reflections
- G.CO.A.5 notes.ws.2.guide.docx - Rotations
- G.CO.A.5 notes.ws3.guide.docx - Translations
- G.CO.A.5 notes.ws4.guide.docx - Construct Reflections
- G.CO.A.5 notes.ws5.guide.docx - Construct Rotations
- G.CO.A.5 notes.ws6.guide.docx - Construct Translations
- G.CO.A.5 notes.ws7.guide.docx - Coordinate Rules
- G.CO.A.5 notes.ws8.prac.docx - Double Reflections over parallel lines
- G.CO.A.5 notes.ws9.prac.docx - - Double reflections over Intersecting lines
- G.CO.A.5 Worksheet #1 - Reflections
- G.CO.A.5 Worksheet #10 - Summary of Double Reflections
- G.CO.A.5 Worksheet #2 - Rotations
- G.CO.A.5 Worksheet #3 - Translations
- G.CO.A.5 Worksheet #4 - Construct Reflections
- G.CO.A.5 Worksheet #5 - Construct Rotations
- G.CO.A.5 Worksheet #6 - Construct Translations
- G.CO.A.5 Worksheet #7 - Coordinate Rules
- G.CO.A.5 Worksheet #7h - Reflections over non - axis lines
- G.CO.A.5 Worksheet #8 - Double Reflections over parallel lines
- G.CO.A.5 Worksheet #9 - Double reflections over Intersecting lines
- G.CO.B.6 notes.ws1.prac.docx - Definition of Congruence Using Transformations
- G.CO.B.6 Worksheet #1 - Definition of Congruence Using Transformations
- G.CO.B.7 notes.ws1.prac.docx - Congruence of Triangles Using Transformations
- G.CO.B.7 Worksheet #1 - Congruence of Triangles Using Transformations
- G.CO.B.8 Activity #1 – Quadrilaterals made from triangles
- G.CO.B.8 notes.ws1.prac.docx - Identifying Triangle Congruence
- G.CO.B.8 notes.ws23.prac.docx - Proving Triangle Congruence
- G.CO.B.8 notes.ws4.prac.docx - CPCTC
- G.CO.B.8 Worksheet #1 - Identifying Triangle Congruence

- G.CO.B.8 Worksheet #1a - Identifying Triangle Congruence (NO SSA Options)
- G.CO.B.8 Worksheet #2 - Proving Triangle Congruence
- G.CO.B.8 Worksheet #3 - Proving Triangle Congruence
- G.CO.B.8 Worksheet #4 - CPCTC
- G.CO.C.10 snotes.ws1.prac.docx - Proof of Triangle Properties and Relationships & Isosceles Triangles, Triangle Angle Sum, and Exterior Angle Sum
- G.CO.C.10 Worksheet #1 - Proof of Triangle Properties and Relationships
- G.CO.C.10 Worksheet #1a - Proof of Triangle Properties and Relationships
- G.CO.C.10 Worksheet #2 - Isosceles Triangles, Triangle Angle Sum, and Exterior Angle Sum
- G.CO.C.10 Worksheet #3 - Mid-Segment Theorem
- G.CO.C.11 Activity #1 – Triangles form quadrilaterals – Property of quadrilaterals
- G.CO.C.11 Activity #2 – Use triangles and rotation to find the quadrilateral properties.
- G.CO.C.11 snotes.ws2.prac.docx - Properties of the Parallelograms
- G.CO.C.11 snotes.ws3.guide.docx - Proving Parallelogram Properties
- G.CO.C.11 Worksheet #1 - Properties of Parallelograms (Summary Sheet)
- G.CO.C.11 Worksheet #2 - Properties of the Parallelograms
- G.CO.C.11 Worksheet #3 - Proving Parallelogram Properties
- G.CO.C.9 snotes.ws12.prac.docx
- G.CO.C.9 Worksheet #1 - Parallel Lines and Their Angle Relationships
- G.CO.C.9 Worksheet #2 - Parallel Lines and Their Angle Relationships
- G.CO.C.10 snotes.ws3.prac.docx - Mid-Segment Theorem
- G.GPE.B.4 snotes.ws1.prac.docx - Slope, Distance, Midpoint
- G.GPE.B.4 snotes.ws3.prac.docx - Linear Equations
- G.GPE.B.4 Worksheet #0 - Formula Sheet
- G.GPE.B.4 Worksheet #1 - Slope, Distance, Midpoint
- G.GPE.B.4 Worksheet #3 - Linear Equations
- G.GPE.B.5 snotes.ws1.prac.docx - Parallel and Perpendicular Lines
- G.GPE.B.5 snotes.ws2.prac.docx - Applying Parallel and Perpendicular Lines
- G.GPE.B.5 snotes.ws3.prac.docx - Coordinate Proof
- G.GPE.B.5 snotes.ws4.prac.docx - Coordinate Proof - Abstract Values
- G.GPE.B.5 Worksheet #1 - Parallel and Perpendicular Lines
- G.GPE.B.5 Worksheet #2 - Applying Parallel and Perpendicular Lines
- G.GPE.B.5 Worksheet #3 - Coordinate Proof
- G.GPE.B.5 Worksheet #4 - Coordinate Proof - Abstract Values
- Parallel Line City Project

Assessment Procedure

- Classroom Total Participation Technique
- Classwork

- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Journal / Student Reflection
- Kahoot
- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Quiz Review
- Rubric
- Teacher Collected Data
- Test
- Test Review
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Appropriate Content Specific Online Resource
- GG G-CO.A.3.1 – Exploring Symmetry of Quadrilaterals
- GG G-CO.A.5.1 – Reflection Mini-Golf
- GG G-CO.A.5.4 – Reflection Kaleidoscopes
- GG G-CO.A.5.5 – Transformational Treasure Hunt
- GG G-CO.A.5.6 – Reflection Coordinate Rules
- GG G-CO.A.5.7 – Rotation Coordinate Rules
- GG G-CO.A.5.7a – Reflection & Rotation Coordinate Rule Practice
- GG G-CO.B.6.1 – Congruence by Transformations
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Slides
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson

- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally

- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- <http://geometrycommoncore.com>
- <https://education.ti.com/en/timathnspired/us/standards-search>
- <https://www.engageny.org/resource/high-school-geometry>