

02 Congruence

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **7 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

[NJSLs Geometry curriculum overview](#)

In this unit, students begin by reasoning about the relationships between congruent parts of figures, and congruent figures. They use transformations as tools for reasoning and generalizing. Students use transformations to prove three theorems about triangle congruence: Side-Angle-Side Triangle Congruence, Angle-Side-Angle Triangle Congruence, and Side-Side-Side Triangle Congruence. As students prove new theorems, they apply those theorems to prove results about quadrilaterals, isosceles triangles, and other figures. Finally, students have a chance to apply their skills to conjecture and explore congruences and properties of quadrilaterals. (IM)

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

In this unit, students begin by reasoning about the relationships between congruent parts of figures, and congruent figures. They use transformations as tools for reasoning and generalizing. Students use transformations to prove three theorems about triangle congruence: Side-Angle-Side Triangle Congruence, Angle-Side-Angle Triangle Congruence, and Side-Side-Side Triangle Congruence. As students prove new theorems, they apply those theorems to prove results about quadrilaterals, isosceles triangles, and other figures. Finally, students have a chance to apply their skills to conjecture and explore congruences and properties of quadrilaterals. (IM)

Essential Questions:

- What is necessary to prove that two figures are congruent?
- If two figures are congruent, what other relationships are consequences of their congruence?
- In what ways can congruent figures be used to solve modeling and application problems?

Enduring Understandings:

- The congruence criteria established through rigid motions is used to establish methods for proving congruent triangles, these are then used in turn to prove other relationships including congruence relationships in other figures.

- Properties of quadrilaterals are based on properties and relationships of triangles.

CONTENT AREA STANDARDS

MA.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.
MA.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.
MA.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.
MA.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.
MA.G-CO.C.9	Prove theorems about lines and angles.
MA.G-CO.C.10	Prove theorems about triangles.
MA.G-CO.C.11	Prove theorems about parallelograms.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.1.a	Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
CS.K-12.2.b	Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness.
CS.K-12.2.c	Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.5	Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate

	summary of the text.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- When two polygons are congruent, there is a specific order in which we must identify the letters in a congruence statement.
- There are conditions in triangles when no information is formally given, however it will be necessary to mark diagrams i.e. vertical angles, shared sides and angles, a right angle will adjacent to another right angle in a linear pair, the base angles of an isosceles triangle are congruent
- Knowledge and application of vertical angles, shared sides and angles, properties of perpendicular lines, angle bisectors, midpoints, angle and segment bisectors enable us to prove that two triangles are congruent by one of the following methods.: SSS, SAS, ASA, AAS, and HL
- After congruence has been determined in a triangle, a congruence statement can be formed which will allow us to identify the remaining corresponding parts of congruent triangles which must be congruent
- Properties of quadrilaterals are proven based on properties of (congruent) triangles

Procedural Knowledge

Students will be able to:

- Mark a diagram to indicate congruent sides or angles to indicate a shared side or angle, vertical angles, adjacent right angles to another right angle in a linear pair.
- Mark a diagram to indicate congruent sides or angles when information is given regarding two triangles. For example, a midpoint is given, an angle is bisected, a segment is bisected, two segments are perpendicular, two lines are parallel.

- Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. *Comprehension*
- Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. Identify if two figures have been reflected, translated and/or rotated. *Comprehension*
- 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. *Comprehension*
- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. *Analysis*
- Prove theorems about lines and angles. *Knowledge Utilization*
- Prove theorems about parallelograms. Determine if a quadrilateral is a parallelogram based upon its angle measures and side lengths. *Knowledge Utilization*
- Prove theorems about triangles. *Knowledge Utilization*

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Task completion and review of quizzes and material presented in the Geometry class

Summative Assessments

There will be no formal assessments in this course.

RESOURCES (Instructional, Supplemental, Intervention Materials)

NJ DOE Model Curriculum unit: [Congruence, Proof & Constructions](#)

Illustrative Mathematics unit: [Congruence](#)

Khan Academy unit: [Congruence](#)

NJCTL unit: [Congruent Triangles](#)

Desmos Activities: [Triangle angle sum](#), [Congruent Triangles](#), [Congruent Triangles \(introduction\)](#), [isosceles triangles](#), [parallelograms](#)

Patty paper folding activities to promote understanding of angle and segment bisectors, vertical angles

Kuta Software worksheets

Approved course textbook

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.