



Geometry - Unit D - Congruence and Similarity Geometry

Unit Focus

Chapters 5 and 6 develop an understanding of triangle congruence, relationships, and the conditions that guarantee congruence or similarity. Students use SSS, SAS, ASA, and AAS criteria to determine triangle congruence and apply this knowledge in proofs. In Chapter 6, students explore triangle inequalities and the relationships between side lengths and angle measures, as well as special segments like medians, altitudes, and angle bisectors. Chapter 8 extends the work with triangles and polygons to develop an understanding of similarity and proportionality. Students explore criteria for triangle similarity, critique the differences between criteria for congruence and similarity, and use scale factors in real-world applications.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - 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. (CCSS.MATH.CONTENT.HSG.CO.B.7) - Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. (CCSS.MATH.CONTENT.HSG.CO.B.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. (CCSS.MATH.CONTENT.HSG.CO.C.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. (CCSS.MATH.CONTENT.HSG.CO.C.10) - 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. (CCSS.MATH.CONTENT.HSG.SRT.A.2) - Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. (CCSS.MATH.CONTENT.HSG.SRT.A.3) - 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. (CCSS.MATH.CONTENT.HSG.SRT.B.4)	<i>Students will be able to independently use their learning to...</i> T1 Understand the attributes and relative property of objects. T2 Understand shapes and spatial relationships. T3 Represent situations using mathematical reasoning and symbols T4 Construct viable arguments using clear and appropriate mathematical language and critique the reasoning of others.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Triangle congruence can be established through specific criteria. U2 Congruence can be used to prove other geometric relationships. U3 The properties of triangle segments and inequalities help define triangle characteristics. U4 Similarity is based on proportional relationships.	<i>Students will keep considering...</i> Q1 How do we know when two triangles are congruent? Q2 How can triangle congruence help prove other properties? Q3 What do side lengths and angles reveal about triangle structure? Q4 How can we use similarity to solve geometric problems?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 Triangle congruence criteria. K2 How to construct triangle congruence proofs. K3 Definitions of medians, altitudes, angle bisectors, and perpendicular bisectors.	<i>Students will be skilled at...</i> S1 Apply congruence criteria. S2 Write and justify triangle congruence proofs. S3 Use triangle relationships to solve problems.

Stage 1: Desired Results - Key Understandings

- Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (CCSS.MATH.CONTENT.HSG.SRT.B.5)
- Find the point on a directed line segment between two given points that partitions the segment in a given ratio. (CCSS.MATH.CONTENT.HSG.GPE.B.6)
- Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). (CCSS.MATH.CONTENT.HSG.MG.A.1)
- 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). (CCSS.MATH.CONTENT.HSG.MG.A.3)
- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Construct viable arguments and critique the reasoning of others. (CCSS.MATH.MP.3)
- Use appropriate tools strategically. (CCSS.MATH.MP.5)
- Attend to precision. (CCSS.MATH.MP.6)

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)
- Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)

K4 Triangle inequality properties.

K5 Similarity criteria.

K6 Vocabulary:

- interior angles
- exterior angles
- corresponding parts
- legs of a triangle
- base angles of an isosceles triangle
- hypotenuse
- equidistant
- median of a triangle
- altitude of a triangle
- perpendicular bisector
- angle bisector
- midsegment of a triangle

S4 Use perpendicular and angle bisectors of triangles.

S5 Use medians and altitudes of triangles to solve problems.

S6 Find distances using triangle segment properties and theorems.

S7 Analyze side-angle relationships in triangles.

S8 Write and solve proportional equations to find side lengths.

S9 Use similarity and congruence to determine angle measurements and side lengths.