Waterbury Public Schools
Unit Instructional Tool
Geometry
Unit 2

Unit 2: Congruence, Proof and Constructions

Pacing: 5 weeks + 1 week for re-teaching/enrichment =25 periods + 5 periods re-teach/enrichment-30 days total

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* **1. Make sense of problems and persevere in solving them.** 2. Reason abstractly and quantitatively. **3. Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Standards Overview
• **Understand congruence in terms of rigid motions.** • **Prove geometric theorems.**

Unit 2: Congruence, Proof and Constructions

Periods	Priority and Supporting CCSS	Performance Objectives	Suggested Instructional Strategies	Resources	Pre-Requisite Knowledge
6	**CC.9-12.G.CO.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.**	• Given two parallel lines and a transversal, identify the special angle pairs and justify your answers. • Given two parallel lines and a transversal, solve for missing angle measures. • Prove the vertical angle theorem, alternate interior angle theorem. • Solve for lengths of segments on a perpendicular bisector • Prove the perpendicular bisector theorem.	• Identifying Similarities and Differences • Note Taking • Summarizing • Cooperative Learning • Nonlinguistic Representations • Vocabulary Development • Use multiple formats to write proofs: narrative paragraphs, flow diagrams, two-column format, and diagrams without words. • Focus on the validity of the underlying reasoning while writing proofs. • Use dynamic geometry software to explore angle relationships. • Connect angle relationships to the creation of tessellation patterns.	ML Geometry Concept & Skills: 5.2 Prove Theorems about Lines and Angles Prove Theorems about Perpendicular Lines Vertical Angles Parallel Lines Cut by a Transversal Angles and Parallel Lines Constructing a Perpendicular Bisector Perpendiculars and Bisectors **Ti-Nspire** • Angle Relationships • Angles formed by Parallel Lines cut by a Transversal **Ti-84** • Angles Formed By Parallel Lines • Angles and Transversals	• Know properties of supplementary, complementary, vertical, and adjacent angles (7.G.5).

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Periods	**Priority and** Supporting **CCSS**	Performance Objectives	Suggested Instructional Strategies	Resources	Pre-Requisite Knowledge
6	**CC.9-12.G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions**	• Describe why ASA, SAS, and SSS satisfy the congruency conditions for triangles.	• Identifying Similarities and Differences • Note Taking • Summarizing • Cooperative Learning • Nonlinguistic Representations • Vocabulary Development • Explore the minimum conditions necessary to show triangles are congruent using technology, reflective devices, patty paper, spaghetti, or grid paper. • Establish triangle congruence criteria using properties of rigid motion.	Congruence Theorems ML Geometry Concept & Skills: 5.2-5.4 Constructing the Nine Point Circle Bulletin Board Congruence Lesson Bulletin Board Congruence Math Task **Ti-Nspire** Congruent Triangles Congruent, or Not? **Ti-84** • Conditions that Prove Congruency • Congruent Triangles	• Definition of congruence in terms of rigid motions. • Definition of corresponding pairs of sides or angles.
6	**CC.9-12.G.CO.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.**	• Given two triangles transformed by rigid motion, determine if the conditions of congruency have been met.	• Identifying Similarities and Differences • Note Taking • Summarizing • Cooperative Learning • Nonlinguistic Representations • Vocabulary Development • Match pairs of cardboard congruent triangles and justify congruence.	Congruent Triangles Exploring ***Congruence*** **Virtual *Polystrips*** ML Geometry Concept & Skills: 5.1	• Define congruence in terms of rigid motions. • Understand that rigid motion is any combination of reflection, translation, and rotation preserving angle measure and side length.

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Periods	**Priority and** Supporting **CCSS**	Performance Objectives	Suggested Instructional Strategies	Resources	Pre-Requisite Knowledge
			• Measure angles and side lengths of triangles resulting from rigid transformations using a variety of technology and paper based methods (e.g., patty paper).	**Ti-Nspire** Geometry Nspired: Triangles: Corresponding Parts of Congruent **Ti-84** Triangle Congruence with Activity Center	
3	CC.9-12.G.CO.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.	• Determine if two given geometric figures are congruent in terms of rigid motion. • Given two geometric figures transformed by rigid motion, determine if the conditions of congruency have been met.	• Identifying Similarities and Differences • Note Taking • Summarizing • Cooperative Learning • Nonlinguistic Representations • Vocabulary Development • Use graph paper, tracing paper, physical models and geometry software to verify predictions regarding rigid motion and congruence. • Use frieze patterns and Escher art to explore congruency in transformations.	NUMB3RS - Season 3 - "Waste Not" - A Group of Symmetries ML Geometry Concept & Skills: 3.7, 5.7, 11.8 **Ti-Nspire** Transformation Application **Ti-84** Rotations in the Plane	• Understand and use reflections, translations, and rotations.
4	CC.9-12.G.CO.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	• Create a list of steps needed to construct congruent segments, angles, bisect segments and angles, parallel and perpendicular lines. • Use a compass and straightedge to construct congruent segments, angles, bisect segments and angles, parallel and perpendicular lines. • Use multiple methods to do the above.	• Identifying Similarities and Differences • Note Taking • Summarizing • Cooperative Learning • Nonlinguistic Representations • Vocabulary Development • Have students explore how to make a	ML Geometry Concept & Skills: 3.6, 5.2, 5.6, Constructions Animations Geometric Constructions NCTM Illuminations: Dividing a Town Into Pizza Delivery Regions	• Define the following terms: circle, bisector, perpendicular and parallel.

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Periods	**Priority and** Supporting **CCSS**	Performance Objectives	Suggested Instructional Strategies	Resources	Pre-Requisite Knowledge
	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		variety of constructions using different tools. Ask students to justify how they know their method results in the desired construction. • Discuss the underlying principles that different tools rely on to produce desired constructions (e.g., compass: circles, mira: reflections).	**Ti-Nspire** Constructing Similar Triangles **Ti-84** • Cabri Geometry Tour • Constructing Quadrilaterals • Constructing Similar Triangles	

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Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
● definition of congruence	● USE	3 2
● two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent	● SHOW	
● criteria for triangle congruence ○ ASA ○ SAS ○ SSS	● EXPLAIN	2

Essential Questions
In what ways can congruence be useful?
Corresponding Big Ideas
Proving and applying congruence provides a basis for modeling situations geometrically to solve problems.