Winslow Township School District
Mathematics Curriculum – Geometry
Unit 2

Overview	Standards for Mathematical Content		Unit Focus	Standards for Mathematical Practice
Unit 2 **Congruence, Similarity & Proof**	● G.SRT.A.1 ● G.SRT.A.2 ● G.SRT.A.3 ● G.CO.C.9	● G.CO.C.10 ● G.CO.C.11 ● G.SRT.B.4 ● G.SRT.B.5	● Understand similarity in terms of similarity transformations ● Prove geometric theorems. ● Prove theorems involving similarity	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively.
Unit 2: *Suggested Open Educational Resources*	G.SRT.A.1 Dilating a Line G.SRT.A.2 Are They Similar? G.SRT.A.2 Similar Triangles G.SRT.A.3 Similar Triangles G.CO.C.9 Congruent Angles made by parallel lines and a transverse G.CO.C.9 Points equidistant from two points in the plane		G.CO.C.10 Midpoints of Triangle Sides G.CO.C.10 Sum of angles in a triangle G.CO.C.11 Midpoints of the Sides of a Parallelogram G.CO.C.11 Is this a parallelogram? G.SRT.B.4 Joining two midpoints of sides of a triangle G.SRT.B.4 Pythagorean Theorem G.SRT.B.5 Tangent Line to Two Circles	MP.3 Construct viable arguments & critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Winslow Township School District

Mathematics Curriculum – Geometry

Unit 2

Curriculum Unit 2	Standards		Pacing	
			Days	Unit Days
Unit 2 **Congruence, Similarity & Proof**	● G.CO.C.9 ● G.CO.C.10 ● G.CO.C.11 ● G.SRT.B.5	Construct and explain formal proofs of theorems involving lines, angles, triangles, and parallelograms. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	17	45
	● G.SRT.A.1 ● G.SRT.A.2 ● G.SRT.A.3 ● G.SRT.B.4 ● G.SRT.B.5	Verify the properties of dilations given by a center and a scale factor. Use the definition of similarity in terms of similarity transformations to decide if two given figures are similar and explain, using similarity transformations, the meaning of triangle similarity. Use the properties of similarity transformations to establish the Angle-Angle criterion for two triangles to be similar. Prove theorems about triangles. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	23	
	Assessment, Re-teach and Extension		5	

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Unit 2 Geometry		
Content Standards	**Suggested Standards for Mathematical Practice**	**Critical Knowledge & Skills**
● <mark>G.SRT.A.1</mark>. Verify experimentally the properties of dilations given by a center and a scale factor: G.SRT.A.1a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. G.SRT.A.1b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	MP.1 Make sense of problems and persevere in solving them MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): ● Dilation of a line that passes through the center of dilation results in the same line. ● Dilation of a line that does not pass through the center of dilation results in a line that is parallel to the original line. ● Dilation of a line segment results in a longer line segment when, for scale factor k, |k| is greater than 1. ● Dilation of a line segment results in a shorter line segment when, for scale factor k, |k| is less than 1. Students are able to: ● perform dilations in order to verify the impact of dilations on lines and line segments. Learning Goal 1: Verify the properties of dilations given by a center and a scale factor.
● <mark>G.SRT.A.2</mark>. 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.	MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): ● Similarity transformations are used to determine the similarity of two figures. Students are able to: ● given two figures, determine, using transformations, if they are similar. ● explain, using similarity transformations, the meaning of similarity for triangles. Learning Goal 2: Use the definition of similarity in terms of similarity transformations to decide if two given figures are similar and explain, using similarity transformations, the meaning of triangle similarity.
● <mark>G.SRT.A.3</mark>. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concept(s): ● Angle-Angle criterion for similarity Students are able to: ● explain Angle-Angle criterion and its relationship to similarity transformations and properties of triangles. Learning Goal 3: Use the properties of similarity transformations to establish the Angle-Angle criterion for two triangles to be similar.
● <mark>G.CO.C.9</mark>. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent*	MP.3 Construct viable arguments and critique the reasoning of others.	Concept(s): ● A formal proof may be represented with a paragraph proof or a two-column proof. Students are able to: ● construct and explain proofs of theorems about lines and angles including: – vertical 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. ● 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.* ● 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.*	MP.6 Attend to precision.	– congruence of alternate interior angles; – congruence of corresponding angles; – and points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. ● construct and explain proofs of theorems about triangles including: – sum of interior angles of a triangle; – congruence of base angles of an isosceles triangle; – the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; – and the medians of a triangle meet at a point. ● construct and explain proofs of theorems about parallelograms including: – opposite sides are congruent; – opposite angles are congruent; – the diagonals of a parallelogram bisect each other; – and rectangles are parallelograms with congruent diagonals. Learning Goal 4: Construct and explain formal proofs of theorems involving lines, angles, triangles, and parallelograms.
● G.SRT.B.4. 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*	MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision.	Concept(s): No new concept(s) introduced Students are able to: ● construct and explain proofs of theorems about triangles including: – a line parallel to one side of a triangle divides the other two sides proportionally; – and the Pythagorean Theorem (using triangle similarity). Learning Goal 5: Prove theorems about triangles.
● G.SRT.B.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	MP.7 Look for and make use of structure.	Concept(s): ● Corresponding parts of congruent triangles are congruent (CPCTC). Students are able to: ● prove geometric relationships in figures using criteria for triangle congruence. ● prove geometric relationships in figures using criteria for triangle congruence. ● solve problems using triangle congruence criteria (SSS, ASA, SAS, HL). ● solve problems using triangle similarity criteria (AA). Learning Goal 6: Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Unit 2 Geometry	
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
Pre-Assessment, Quizzes Exit Tickets Daily Monitoring Linkit!	Unit Benchmark Linkit! Diagnostic
Focus Mathematical Concepts	

Common Misconceptions:
- G.SRT.A.1, G.SRT.A.2,G.SRT.A.3

Some students often do not recognize that congruence is a special case of similarity. Similarity with a scale factor equal to 1 becomes a congruency.

Students may not realize that similarities preserve shape, but not size. Angle measures stay the same, but side lengths change by a constant scale factor.

Students may incorrectly apply the scale factor. For example students will multiply instead of divide with a scale factor that reduces a figure or divide instead of multiply when enlarging a figure.

Some students often do not list the vertices of similar triangles in order. However, the order in which vertices are listed is preferred and especially important for similar triangles so that proportional sides can be correctly identified.

- G.CO.C.9, G.CO.C.10, G.CO.C.11

Research over the last four decades suggests that student misconceptions about proof abound:

    • even after proving a generalization, students believe that exceptions to the generalization might exist;

    • one counterexample is not sufficient;

    • the converse of a statement is true (parallel lines do not intersect, lines that do not intersect are

    parallel); and

    • a conjecture is true because it worked in all examples that were explored.

Each of these misconceptions needs to be addressed, both by the ways in which formal proof is taught in geometry and how ideas about "justification" are developed throughout a student's mathematical education.

- G.SRT.B.4, G.SRT.B.5

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Students may incorrectly apply the scale factor. For example students will multiply instead of divide with a scale factor that reduces a figure or divide instead of multiply when enlarging a figure.

Some students often do not list the vertices of similar triangles in order. However, the order in which vertices are listed is preferred and especially important for similar triangles so that proportional sides can be correctly identified.

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District/School Tasks	District/School Primary and Supplementary Resources and Technology Integration
PARCC Released Items http://www.parcc-assessment.org/released-items **NJDOE Digital Item Library** https://nj.digitalitemlibrary.com/home **NJSLA Mathematics Evidence Statements** https://docs.google.com/spreadsheets/d/18M5r1jk4P729fTpAlWAzrw1gE6tken233I-Yk0U712M/edit#gid=554025491 **LinkIt! Form A, B, & C**	**Textbook** **IXL** https://www.ixl.com/ **Khan Academy** https://www.khanacademy.org/ **HS Flip Book:** http://community.ksde.org/Default.aspx?tabid=5646 **North Carolina Wikispaces** http://maccss.ncdpi.wikispaces.net/ **PARCC Educational Resources** http://www.parcc-assessment.org/assessments/test-design/mathematics/math-test-specifications-documents **Diversity, Equity & Inclusion Educational Resources** https://www.nj.gov/education/standards/dei/
Instructional Best Practices and Exemplars	
1. Identifying similarities and differences 2. Summarizing and note taking 3. Reinforcing effort and providing recognition 4. Homework and practice 5. Nonlinguistic representations	6. Cooperative learning 7. Setting objectives and providing feedback 8. Generating and testing hypotheses 9. Cues, questions, and advance organizers 10. Manage response rate

Vocabulary			
adjacent angles	consecutive interior angles	interior angles	proof
alternate exterior angles	corresponding angles	line segment	proportion
alternate interior angles	corresponding parts	median	Pythagorean Theorem
base angles of an isosceles triangle	diagonal	midpoint	theorem
center of dilation	dilation	perpendicular bisector	vertex angle
congruent segments	endpoints		

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.: Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint

https://www.usmint.gov/learn/kids/resources/educational-standards

Different ways to teach Financial Literacy.

https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/

Suggested Modifications for Special Education/504

Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignments. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

☐ Provide the opportunity to re-take tests   ☐ Individual Intervention/Remediation

☐ Modify activities/assignments/projects/assessments   ☐ Additional Support Materials

☐ Breakdown activities/assignments/projects/assessments into manageable units   ☐ Guided Notes

☐ Additional time to complete activities/assignments/projects/assessments   ☐ Graphic Organizers

☐ Provide an option for alternative activities/assignments/projects/assessments   ☐ Adjust Pacing of Content

☐ Modify Content   ☐ Increase one on one time

☐ Modify Amount   ☐ Peer Support

☐ Small Group Intervention/Remediation   ☐ Other Modifications for Special Education:

Suggested Modifications for At-Risk Students	
Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations	
☐ Provide the opportunity to re-take tests	☐ Modify Content
☐ Increase one on one time	☐ Modify Amount
☐ Oral prompts can be given	☐ Adjust Pacing of Content
☐ Using visual demonstrations, illustrations, and models	☐ Small Group Intervention/Remediation
☐ Give directions/instructions verbally and in simple written format	☐ Individual Intervention/Remediation
☐ Peer Support	☐ Additional Support Materials
☐ Modify activities/assignments/projects/assessments	☐ Guided Notes
☐ Additional time to complete activities/assignments/projects/assessments	☐ Graphic Organizers
☐ Provide an option for alternative activities/assignments/projects/assessments	☐ Other Modifications for Students At-Risk:

Suggested for English Language Learners	Suggested Modifications for Gifted Students
All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors ☐ Grades 9-12 WIDA Can Do Descriptors: ☐ Listening ☐ Speaking ☐ Reading ☐ Writing ☐ Oral Language Students will be provided with accommodations and modifications that may include: • Relate to and identify commonalities in mathematics studies in student's home country • Assist with organization • Use of computer • Emphasize/highlight key concepts • Teacher Modeling • Peer Modeling • Label Classroom Materials - Word Walls	Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic. • Raise levels of intellectual demands • Require higher order thinking, communication, and leadership skills • Differentiate content, process, or product according to student's readiness, interests, and/or learning styles • Provide higher level texts • Expand use of open-ended, abstract questions • Critical and creative thinking activities that provide an emphasis on research and in-depth study • Enrichment Activities/Project-Based Learning/ Independent Study Additional Strategies may be located at the links: ❖ Gifted Programming Standards ❖ Webb's Depth of Knowledge Levels and/or Revised Bloom's Taxonomy ❖ REVISED Bloom's Taxonomy Action Verbs

Suggested Activities	
☐ Do Now/Warm-Up	☐ Centers
☐ Whole Group	☐ Intervention/Remediation
☐ Small Groups	☐ Projects
☐ Guided Practice	☐Academic Games
☐ Independent Practice	☐ Other Suggested Activities:

Interdisciplinary Connections
Big Ideas Real-Life STEM Videos and Performance Tasks   **Interdisciplinary Connections: ELA**   **NJSLSA.R1**. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.   **NJSLSA.W2.** Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content   **NJSLSA.L1**. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking   **SL.9-10.4:** Present information, findings and supporting evidence clearly, concisely and logically. The content, organization, development and style are appropriate to task, purpose and audience.   **NJSLSA.L6:** Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Integration of Computer Science and Design Thinking NJSLS 8
8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.   8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.   8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible.   8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.   8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. • 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.