

Green Township School District Gr. 8 Math Curriculum - July 2018

Unit 2: The Concept of Congruence (Approximate Instructional Time: 3 weeks)

NJ Student Learning Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills <i>(Learning goals are for the Unit but may not necessarily be in sequential order.)</i>
<p>8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations:</p> <p>a. Lines are transformed to lines, and line segments to line segments of the same length.</p> <p>b. Angles are transformed to angles of the same measure.</p> <p>c. Parallel lines are transformed to parallel lines.</p>	<p>MP 2 Reason abstractly and quantitatively.</p> <p>MP 3: Construct viable arguments and critique the reasoning of others.</p> <p>MP 5: Use appropriate tools strategically</p> <p>MP 6 Attend to precision.</p>	<p>Concept(s):</p> <ul style="list-style-type: none"> ● <i>A property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged.</i> <p>Students are able to:</p> <ul style="list-style-type: none"> ● show and explain that performing rotations, reflections, and translations on lines results in a line. ● show and explain that performing rotations, reflections, and translations on line segments results in a line segment and does not alter the length of the line segment. ● show and explain that performing rotations, reflections, and translations on angles results in an angle and does not alter the measure of the angle. ● show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines. ● explain that a property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged. <p>Learning Goal 1: Explain and model the properties of rotations, reflections, and translations with physical representations and/or geometry software using pre-images and resultant images of lines, line segments, and angles.</p>
<p>8.G.A.2. Understand that a two dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence</p>	<p>MP 2 Reason abstractly and quantitatively.</p> <p>MP 3: Construct viable arguments and critique the reasoning of others.</p>	<p>Concept(s): <i>A two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.</i></p> <p>Students are able to:</p> <ul style="list-style-type: none"> ● given two congruent figures, describe a transformation or sequence of

Green Township School District Gr. 8 Math Curriculum - July 2018

<p>that exhibits the congruence between them.</p>	<p>MP 5: Use appropriate tools strategically</p> <p>MP 6 Attend to precision.</p>	<p>transformations that shows the congruence between them.</p> <p>Learning Goal 2: Describe and perform a sequence of rotations, reflections, and/or translations on a two dimensional figure in order to prove that two figures are congruent.</p>
<p>8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. <i>For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.</i></p>	<p>MP.2 Reason abstractly and quantitatively.</p> <p>MP.3 Construct viable arguments and critique the reasoning. of others.</p>	<p>Concept(s): <i>Foundations of theorems for similarity of triangles.</i></p> <p>Students are able to:</p> <ul style="list-style-type: none"> ● Give informal arguments to establish facts about the angle sum of triangles. ● Give informal arguments to establish facts about exterior angles of triangles. ● Give informal arguments to establish facts about the angles created when parallel lines are cut by a transversal. <p>Learning Goal 3: Give informal arguments to justify facts about the exterior angles of a triangle and the sum of the measures of the interior angles of a triangle.</p> <p>Learning Goal 4: Give informal arguments to justify facts about the angles created when parallel lines are cut by a transversal.</p>
<p><u>Interdisciplinary Connections:</u></p> <p><u>NGSS Appendix for Alignment</u></p>	<p><u>Science:</u> MS Science standards do not overlap with concepts in this unit.</p> <p><u>English-Language Arts:</u> RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. RI.8.5. Analyze the structure an author uses to organize a specific paragraph in a text, including the role of particular sentences, to develop and to refine a key concept. RI.8.6. Determine an author’s point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints. RI.8.7. Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea. W.8.2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. A. Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia). B. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. C. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. D. Use precise language and domain-specific vocabulary to inform about or explain the topic. E. Establish and maintain a formal style/academic style, approach, and form. F. Provide a concluding statement or section that follows from and supports the information or explanation presented. W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)</p>	

Green Township School District Gr. 8 Math Curriculum - July 2018

	<p>W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.</p> <p>W.8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</p> <p>SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.</p> <p>A. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.</p> <p>B. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.</p> <p>C. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.</p> <p>D. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.</p> <p>SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.</p> <p>SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.</p> <p>SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.</p>
<p><u>21st Century Skills/ Career Ready Practices:</u></p>	<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <ul style="list-style-type: none"> ● Students will learn to work respectfully in groups within the classroom. <p>CRP2. Apply appropriate academic and technical skills.</p> <ul style="list-style-type: none"> ● Students will use technology to enhance conceptual understanding that distance is preserved when an object or line is translated on a plane or coordinate plane. <p>CRP4. Communicate clearly and effectively and with reason.</p> <ul style="list-style-type: none"> ● In line with the mathematical practices, students will explain and defend their reasoning when working on tasks in class and support this reasoning with evidence either verbally or in writing. <p>CRP6. Demonstrate creativity and innovation.</p> <ul style="list-style-type: none"> ● Students are encouraged to look at more than one way to solve a problem. This is evident through tasks that require the mathematical practice: modeling with mathematics. <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <ul style="list-style-type: none"> ● Students will be prompted to explore and make conjectures about the preservation of size during the lessons on translations. <p>CRP9. Model integrity, ethical leadership and effective management.</p> <ul style="list-style-type: none"> ● Students will learn time management skills when given both short-term and long-term tasks to complete. ● Students will learn leadership skills when working with groups. ● Students model integrity when completing assignments independently. <p>CRP10. Plan education and career paths aligned to personal goals.</p> <ul style="list-style-type: none"> ● In this unit, various real world applications are explored which may lead to a student's interest in a particular career field. <p>CRP12. Work productively in teams while using cultural global competence.</p>

Green Township School District Gr. 8 Math Curriculum - July 2018

	<ul style="list-style-type: none"> When working in groups, students will be encouraged to include all members and to encourage the contribution of all members.
2014 NJ Technology Standards:	<p>8.1 Educational Technology (Word PDF) All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.</p> <p>8.2 Technology Education, Engineering, Design and Computational Thinking - Programming (Word PDF) All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.</p> <ul style="list-style-type: none"> 8.2.8.E.3: Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution. <p>Please see relevant projects for technology standards 8.1 and 8.2:</p>

District/School Primary and Supplementary Resources	
<p>Primary Resource:</p> <p>Eureka Math (Unbound Ed - Module 2)</p>	<p>Supplementary Resources: <i>Algebra I</i> (Glencoe 2018) <i>Larsen Pre-Algebra</i> (Houghton Mifflin Harcourt 2012) <i>Chapter 12</i> <i>NJ Progress for Grade 8</i> (William H. Sadlier 2014) Unit 4: Lessons 23-27; 30-32;34-35 <i>Understanding Algebra I</i> (The Critical Thinking Company) Open Up Resources Online Curriculum</p> <p>Khan Academy</p> <p>Performance Tasks are available for use from the following sites: Illustrative Mathematics Coherence Map Inside Mathematics Problems of the Month YouCubed Tasks PARCC Released test items- Grade 8</p>
Materials:	Suggested Tasks for Use During Unit

Green Township School District Gr. 8 Math Curriculum - July 2018

<ul style="list-style-type: none"> ☐ <i>Graph paper</i> 	<p>TBD and updated as lesson planning commences.</p>
<p>District/School Formative Assessment Plan</p>	<p>District/School Summative Assessment Plan</p>
<ul style="list-style-type: none"> ● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Eureka Math Sprints ● Exit tickets 	<ul style="list-style-type: none"> ● Teacher created assessments and projects ● Eureka Math Mid- and End- Module Assessments (Constructed response item with rubric) ● Teacher/District created Quarterly Assessments ● Project on the use of water bottles Students should investigate how many water bottles are purchased versus recycled and use scientific notation to demonstrate understanding of the magnitude of numbers; extend to explore the impact on the environment and solutions to lessen the impact on the environment in our community.
<p>Instructional Best Practices and Exemplars</p>	<p>Mathematical Terms/Vocabulary</p>
<ul style="list-style-type: none"> ● <i>Facilitate partner and group collaborations</i> ● <i>Inquiry based tasks introduced before direct teaching</i> ● <i>Small and large group discussions</i> ● <i>Have students use a variety of representations or methods to show and explain their understanding.</i> ● <i>Build fluency over time.</i> 	<ul style="list-style-type: none"> ● Transformation A transformation is a rule, to be denoted by T, that assigns each point P of the plane a unique point which is denoted by $T(P)$. ● Basic Rigid Motion A basic rigid motion is a rotation, reflection, or translation of the plane. Basic rigid motions are examples of transformations. Given a transformation, the image of a point P is the point the transformation maps the point P to in the plane. ● Translation: A translation is a basic rigid motion that moves a figure along a given vector. ● Rotation: A rotation is a basic rigid motion that moves a figure around a point, P degrees. ● Reflection A reflection is a basic rigid motion that moves a figure across a line. ● Image of a point, image of a figure: Image refers to the location of a point or figure after it has been transformed. ● Sequence of Transformations: A sequence of transformations is more than one transformation. Given transformations T and S, $T \circ S$ is called the composition of T and S. ● Congruence: A congruence is a sequence of basic rigid motions (rotations, reflections, translations) of the plane. ● Transversal: Given a pair of lines l and m in a plane, a third line n is a transversal if it intersects l at a single point and intersects m at a single but different point.
<p>Focus Mathematical Concepts</p>	

Green Township School District Gr. 8 Math Curriculum - July 2018

Grade Level Fluency Requirement:

- ❖ *Concepts related to linear algebra and linear functions*

Mathematical Practices Applied to this Unit

MP 2: Reason abstractly and quantitatively. This module is rich with notation that requires students to decontextualize and contextualize throughout. Students work with figures and their transformed images using symbolic representations and need to attend to the meaning of the symbolic notation to contextualize problems. Students use facts learned about rigid motions in order to make sense of problems involving congruence.

MP 3: Construct viable arguments and critique the reasoning of others. Throughout this module, students construct arguments around the properties of rigid motions. Students make assumptions about parallel and perpendicular lines and use properties of rigid motions to directly or indirectly prove their assumptions. Students use definitions to describe a sequence of rigid motions to prove or disprove congruence. Students build a logical progression of statements to show relationships between angles of parallel lines cut by a transversal, the angle sum of triangles, and properties of polygons like rectangles and parallelograms.

MP 5: Use appropriate tools strategically. This module relies on students' fundamental understanding of rigid motions. As a means to this end, students use a variety of tools but none as important as an overhead transparency. Students verify experimentally the properties of rigid motions using physical models and transparencies. Students learn about translation, rotation, reflection, and congruence in general. Students determine when they need to use the transparency as a tool to justify conjectures or when critiquing the reasoning of others.

MP 6: Attend to precision. This module begins with precise definitions related to transformations and statements about transformations being distance- and angle-preserving. Students are expected to attend to the precision of these definitions and statements consistently and appropriately as they communicate with others. Students describe sequences of motions precisely and carefully label diagrams so that there is clarity about figures and their transformed images. Students attend to precision in their verbal and written descriptions of rays, segments, points, angles, and transformations in general.

Prerequisite skills & Foundational Standards

Refer to Achieve the Core Coherence Map for full detail on vertical and horizontal alignment to prerequisite skills & future skills.

[Coherence Map](#)

Geometric measurement: understand concepts of angle and measure angles.

4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

- An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one degree angle," and can be used to measure angles.
- An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

Green Township School District Gr. 8 Math Curriculum - July 2018

Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Differentiation/Accommodations/Modifications

Gifted and Talented

(content, process, product and learning environment)

Extension Activities

- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).
- Activities defined as “Gold” require more advanced logic and reasoning skills and will be provided as additional or replacement work on a weekly basis.
- Coordination with the G&T teacher in order to supplement the math curriculum as needed.

Anchor Activities

- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.

Green Township School District Gr. 8 Math Curriculum - July 2018

- Repetition and practice.
- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of class notes
- Pair with a peer for assistance during class

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(possible appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Establish expectations for correct spelling on assignments.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests and check Google classroom for updates and assignments
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Green Township School District Gr. 8 Math Curriculum - July 2018

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.