8th Grade Mathematics

Congruence and Similarity, Unit 4b, April 7th – May 2nd



ORANGE PUBLIC SCHOOLS OFFICE OF CURRICULUM AND INSTRUCTION OFFICE OF MATHEMATICS CURRICULUM GUIDE

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Unit Overview

In this unit, students will

- Understand transformations and the effects on a geometric figure
- Understand that reflections, rotations, and translations are actions that produce congruent geometric objects
- A dilation is a transformation that changes the size of a figure, but not the angles
- When parallel lines are cut by a transversal, corresponding and vertical angles are congruent

Curriculum Guide

| Monday, 4/7 | Tuesday, 4/8 | Wednesday, 4/9 | Thursday, 4/10 | Friday, 4/11 |
|---|-------------------------|-----------------------|--|--|
| Lesson 1 Translations | Lesson 2 Reflections | Lesson 3 Rotations | Lesson 4 Dilations – Introductory Task and Guided Practice | Lesson 14 Dilations – Collaborative and Independent |
| Monday, 4/14 | Tuesday, 4/15 | Wednesday, 4/16 | Thursday, 4/17 | Friday, 4/18 |
| Lesson 5 Combination of Transformations | SGO Post | SGO Post | Lesson 6 Triangles and Angles – Introductory Task and Guided Practice | Lesson 6 Triangles and Angles – Collaborative Practice |
| Monday, 4/28 | Tuesday, 4/29 | Wednesday, 4/30 | Thursday, 5/1 | Friday, 5/2 |
| NJ ASK | NJ ASK | NJ ASK | NJ ASK | NJ ASK |

Content Overview

Rationale

As referenced in the PARCC Model Content Frameworks, students should build on previous 7th grade work with proportions, unit rates, and graphing in preparation for deeper learning and understanding of linear relationships. Students have been working with linear equations informally since kindergarten. Building a strong foundation in earlier Ratios and Proportions and Expressions and Equations standards will aid in student success in grade 8.

Expressions and Equations questions constitute 25% of the possible points on the Grade 8 New Jersey Assessment of Skills and Knowledge. This unit plan incorporates carefully selected tasks to allow students to build concepts, practice procedures, and apply knowledge in real world and mathematical situations with systems of equations and functions.

To ensure quality materials were given to students and teachers, Common Core Modules were specially designed. These Modules were developed for use in grades 3 – 8 and Algebra I as response to the need for rich problem solving tasks that satisfy higher levels of cognitive demand. We took cues from the National Mathematics Advisory Panel's Final Report (2008) in recognizing *the mutually reinforcing benefits of conceptual understanding, procedural fluency, and automatic (i.e., quick and effortless) recall of facts.* (p. xiv). The Modules contain a variety of well-selected items (offering a triad of conceptual, procedural, real world and mathematical problem solving). Students experience a steady diet of these types of problems throughout each of the Modules. In an effort to provide the District with mathematical content that is narrow, focused and deep, each Module is centered on the Critical Areas specified by the Common Core State Standards for Mathematics (CCSSM) and the Priority Areas denoted within the Partnership for Assessments of Readiness for College and Careers (PARCC) Framework.

Structure of the Modules

The Modules embody 3 integrated frameworks that promote the development of conceptual and problems solving skills and computational fluency. The **conceptual framework** of the Modules builds from the concrete to the pictorial to the abstract (and the constant blending of each) to help students develop a deeper understanding of mathematics. The Modules also reference a **multiple representations framework** that encourages teachers to present content in multiple modalities to support flexible thinking. These frameworks go beyond concrete representation (i.e. manipulatives) to promote the realistic representation of concepts addressed in multiple settings. Lastly, the Modules embody a '**gradual release' framework** that encourages teachers to present practice format.

INTRODUCTORY TASKS

The Introductory Tasks serve as the starting point for the referenced standard and are typically either diagnostic, prerequisite or anticipatory in nature.

GUIDED PRACTICE

Serves for additional teacher guided instruction for students who need the additional help. The tasks can be modeled with students.

COLLABORATIVE PRACTICE

Serve as small group, or partnered work. The work should promote student discourse, which allows students to make sense of problems and persevere in solving them (MP.1). Through teacher-facilitated, whole group discussion, students will have the opportunity to critique the reasoning of others (MP.3).

INDEPENDENT PRACTICE

Can be used as additional in-class practice, Independent Practice, etc. This work should be reviewed and discussed. Procedural fluencies are reinforced within this section.

SUMMATIVE PROBLEMS

These problems are performance tasks that reflect an amalgamation of the skills addressed within the Module. They assesses the student's ability to apply the skills learned in a new and non-routine context. More than one-step; problems usually require intermediate values before arriving at a solution (contextual applications). In the US, we see one step problems that require either recall or routine application of an algorithm.

Common Core Standards

| | Verify experimentally the properties of rotations, reflections, and translations: | | |
|-------|---|--|--|
| 8.G.1 | Lines are taken to lines, and line segments to line segments of the same length. | | |
| | Angles are taken to angles of the same measure. | | |
| | Parallel lines are taken to parallel lines. | | |
| 8.G.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 that exhibits the congruence between them. | | |
| 8.G.3 | Describe the effect of dilations, translations, rotations, and reflections on two- dimensional figures using coordinates. | | |
| 8.G.4 | Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. | | |
| 8.G.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. 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. | | |

Connections to the Mathematical Practices

| | Make sense of problems and persevere in solving them |
|-----|---|
| 1 | - Students interpret geometric happenings with multiple transformations |
| • | - Students reason about angles given information in a problem or visual |
| | |
| | Reason abstractly and quantitatively |
| 2 | Students interpret similarity and congruence with or without a coordinate grid |
| _ | - Students interpret transformations |
| | Construct viable arguments and critique the reasoning of others |
| | Students learn to determine accuracy in transformations and understanding angle |
| 3 | - Students learn to determine accuracy in transformations and understanding angle |
| | and congruency relationships |
| | Model with mathematics |
| | - Students are able to recognize a specific set of transformations to map one figure |
| 4 | onto its congruent image. |
| | - Students prove that all triangles have interior angles with a sum of 180 degrees |
| | Lice appropriate tools strategically |
| | Students use coordinate grids, given angle measures, and given directions to prove |
| 5 | congruence and similarity |
| | |
| | Attend to precision |
| 6 | - Students are careful about using transformations to prove congruence and similarity |
| Ŭ | Students use knowledge of parallel lines to reason appropriately |
| | |
| | Look for and make use of structure |
| 7 | - Students discover now rotations, translations, reflections, and dilations can be done without a coordinate grid from understanding the changes that happen in each of the |
| · ' | quadrants after a rotation |
| | |
| | Look for and express regularity in repeated reasoning |
| 8 | - Students are able to prove congruence using transformations |
| | |

Vocabulary

| Term | Definition |
|-------------------------|--|
| Congruent Figures | Figures that have the same size and shape (same angles and sides) |
| Corresponding Sides | Sides that have the same relative positions in geometric figures |
| Corresponding Angles | Angles that have the same relative positions in geometric figures |
| Dilation | A transformation that grows a geometric figure by a scale factor. A scale factor less than 1 will shrink the figure, and scale factor greater than 1 will enlarge the figure |
| Reflection | A transformation that "flips" a figure over a line of reflection |
| Reflection Line | A line that is the perpendicular bisector of the segment with endpoints at a pre-image point and the image of that point after a reflection. |
| Rotation | A transformation that turns a figure about a fixed point through a given angle and a given direction. |
| Scale Factor | The ratio of any two corresponding lengths of the sides of two similar figures. |
| Transformation | The mapping or movement of all the points of a figure in a plane according to a common operation. |
| Translation | A transformation that "slides" each point of a figure the same distance in the same direction |
| Transversal | A line that crosses two or more lines |

Potential Student Misconceptions

- Students do not realize that congruent shapes can be "checked" by placing one atop the other
- Students may think the terms translation, reflection and rotation are interchangeable.
- Students do not conceptualize that clockwise and counterclockwise can be the same depending on the angle specified
- Students confuse congruence with similarity.
- Students sometimes confuse the different kinds of notation used with similarity
- Students are unfamiliar with the symbolic notation used to identify angles and their measures.
- Students confuse the terms supplementary and complementary.
- Students believe that all adjacent angles are either complementary or supplementary.
- Students may incorrectly identify vertical angles.
- Students will think that angles are congruent when there are no parallel lines present.

Teaching Multiple Representations – Grade 8 Major Work





Extensions and Sources

Online Resources

http://www.illustrativemathematics.org/standards/k8

- Performance tasks, scoring guides

https://www.khanacademy.org/

- Tracks student progress, video learning, interactive practice

http://www.doe.k12.de.us/assessment/files/Math Grade 8.pdf

- Common Core aligned assessment questions, including Next Generation Assessment Prototypes

https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx

- Special Needs designed tasks, assessment resources

http://www.parcconline.org/sites/parcc/files/PARCCMCFMathematicsGRADE8_Nov2012V3_FI NAL.pdf

- PARCC Model Content Frameworks Grade 8

http://commoncoretools.files.wordpress.com/2011/04/ccss_progression_ee_2011_04_25.pdf

- Progressions of Expressions and Equations from grades 6-8