Unit 04 - Transformations

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 2**
Length: **2-3 weeks**
Status: **Published**

Brief Summary of Unit

In this unit, students will be be recalling and building on their previous knowledge of rigid and nonrigid transformations. Some language may sound familiar, but the applications should be new. This unit will include transformations, reflections, rotations, and dilations. Students will also be expected to combine transformations, including but not limited to glide transformations.

Revision Date: July 2024

Standards

Students will analyze geometric designs which connect to various cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

New Jersey Diversity and Inclusion Law

In accordance with New Jersey’s Chapter 32 Diversity and Inclusion Law, this unit includes instructional materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender

and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
G.CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G.CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.CO.A.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
G.CO.B.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.
G.SRT.A.1.a	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.1.b	The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.SRT.A.2	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.
SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

Essential Questions

- How can any of these transformations be combined for a composite transformation?
- How can translations, reflections, rotations, and dilations transform figures?
- How do you construct any/all of these transformations?

Enduring Understandings

- Identify and perform translations, dilations, reflections, and rotations of figures in a theoretical and practical setting.
- Understand congruence transformations using a variety of geometric applications.

- Understand similarity transformations using a variety of geometric applications.

Students Will Know

- How to describe congruence and similarity transformations.
- How to perform translations, reflections, rotations, and dilations.
- How to solve problems involving transformations.
- Types of transformations.

Students Will Be Skilled At

- Describing congruence transformations.
- Describing similarity transformations.
- Dilating figures.
- Explaining what rigid motion is.
- Identifying congruent figures.
- Identifying dilations.
- Identifying rotational symmetry in polygons and other shapes.
- Performing a composition of translations on a figure.
- Performing composition with reflections.
- Performing compositions with rotations.
- Performing similarity transformations.
- Reflecting figures.
- Rotating figures.
- Solving real-life problems involving scale factors and dilations.
- Translating figures.
- Using congruence transformations to solve problems.
- Writing a translation rule for a given translation.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: DeltaMath or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects

involving real world applications, and differentiated learning tasks in Khan Academy, and DeltaMath

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Most of the vocabulary in this chapter should be vaguely familiar to the students. Begin by defining a vector as a way of translating a point or figure on a coordinate plane. Remind students of the vocabulary image, preimage, and prime notation. Then work towards writing the translation rule based on a given preimage and image. Finally, students should be able to follow a composition of translations to determine a final figure.
- Combine learning about reflections and rotations on the same day. For reflections, students should be able to identify the reflection over each axis, as well as the line y=x. Build into glide reflection, which is the specific name for the composite transformation of a translation and reflection. For rotations, students should already know that they are using a counterclockwise rotation unless otherwise stated. Discuss the rotation rules for 90 degrees, 180 degrees and 270 degrees about the origin. Combine rotations with the other transformations to create unique composites. Include examples of rotational symmetry in everyday objects or in letters of the alphabet.
- Students will likely need additional time to practice these rigid transformations.
- Introduce dilations using the language scale factor, center of dilation, enlargement, and reduction. Students should be able to conclude that this transformation is different form the others because the shape itself is now changing. Foreshadow this to the concept of similarity, which will be discussed in Unit 7. Use algebra skills to determine measures of objects and coordinate locations after dilations occur.
- Use the idea of similarity to connect that other transformations can occur alongside a dilation. Therefore students should work on composite transformations that include any/all four types of transformations.
- Take a full day to construct each type of transformation. (For advanced students, construct composite transformations.)
- (Alternate plan: You can save all composite transformations for a day after all transformations have been taught.)

Materials

Core instructional materials: Core Book List including Big Ideas Math Common Core Geometry

Supplemental materials: Khan Academy, Edia, DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes
- Whiteboard tables

Suggested Strategies for Modifications

Possible accommodations/modification for Geometry