Unit 12: Transformations

Content Area: **Mathematics**
Course(s): **English I, Geometry, Honors Geometry**
Time Period: **May**
Length: **2 weeks**
Status: **Published**

Unit Overview

- Describe the symmetry of figures and solids.
- Locate images of figures by composites of mappings.
- Locate images of figures by reflection, translation, glide reflection, rotation, and dilation.
- Recognize and use all terms related to transformations.
- Recognize the properties of the basic mappings.

Enduring Understandings

- Algebra is used with geometric formulas and properties to find unknown values.
- Coordinate geometry can be used to represent and verify geometric and algebraic relationships.
- Geometric transformations conserve shape and area.

Essential Questions

- How are geometric transformations used in real-world situations?
- How are transformations in geometry related to functions in algebra?
- How can we best represent and verify geometric/algebraic relationships?
- How do coordinates allow us to verify geometric relationships?
- What is the result of a geometric transformation?
- Why do we learn algebra before geometry?

Lesson Titles/Objectives

- To describe the symmetry of figures and solids
- To locate images of figures by reflection, translation, glide reflection, rotation, and dilation
- To locate the images of figures by composites of mappings
- To recognize and use the terms identity and inverse in relation to mappings
- To recognize and use the terms image, preimage, mapping, one-to-one mapping, transformation, isometry, and congruence mapping
- To recognize the properties of basic mappings

Standards

MA.G-CO.A	Experiment with transformations in the plane
	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MA.G-CO.B	Understand congruence in terms of rigid motions
MA.G-SRT.A	Understand similarity in terms of similarity transformations
MA.G-GMD.B	Visualize relationships between two-dimensional and three-dimensional objects

Indicators

MA.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).
MA.G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MA.G-CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
MA.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.
MA.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.
MA.G-SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor:
MA.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.
MA.G-SRT.A.1b	The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MA.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.
MA.G-GMD.B.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

21st Century Skills and Career Ready Practices

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when

	it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

Inter-Disciplinary Connections

LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.L.11-12.6	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; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
STEM.9-12.9.4.12.O.(1).12	Model technical competence by developing and applying processes and concepts in the design process.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Intro. composite mappings
- Intro. composite of two reflections is a translation
- Intro. congruence mapping
- Intro. dilations
- Intro. functions and one-to-one mapping
- Intro. glide reflections
- Intro. identity of mappings
- Intro. image and preimage
- Intro. Inverses of mappings
- Intro. line symmetry
- Intro. Mappings

- Intro. point symmetry
- Intro. Reflections
- Intro. reflections about a line
- Intro. reflections about the origin
- Intro. rotational symmetry
- Intro. rotations
- Intro. symmetry in the plane
- Intro. symmetry in the space
- Intro. transformations and isometry
- Intro. translations
- Review anticipatory Set
- review composite functions
- Review Homework
- Review HSPA warmup
- Review Quiz
- students will take a quiz on 14.1-14.5
- Students will take a quiz on 14.6-14.8
- Students will take a test on chapter 14

Modifications:

ELLs Modifications

- Utilize explicit learning strategies that are well planned in advance (intentional planning)
- 1:1 testing
- Offer alternate/or modify assessments
- Use manipulatives where possible

IEP & 504 Modifications

- scaffolded notes
- students could use calculator and/or other math tools (x grids, chips, etc)
- teaching the main ideas/concepts (limiting not needed details)to be taught and repeating them in several different ways over several different days (goal is 7 different ways same concept for students with learning disabilities)

G&T Modifications

- Different test items.
- Employ differentiated curriculum to keep interest high.
- Encourage students to explore concepts in depth and encourage independent studies or investigations

Formative Assessment

- closure find dilation of a figure from a given point
- closure slope and distance to find transformations
- journal write
- pass out of class
- think-pair-share
- warm up identify types of transformations
- warm up transformations on coordinate plan

Summative Assessment

- Test transformations using coordinate geometry

Resources & Technology

Technology

- Geometer sketchpad
- Mathxl
- Smart Board
- Ti-84 calculator
- Videos

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.