Unit 3 - Geometry

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

Students will perform translations, reflections, rotations and dilations. Verify experimentally the properties of congruent transformations and dilations in the coordinate plane. Use informal arguments to establish facts about angles formed from parallel lines and the exterior angles of triangles. Analyze and solve pairs of simultaneous linear equations (systems of equations).

Enduring Understandings

Reflections, translations, and rotations are actions that produce congruent geometric objects.

A dilation is a transformation that changes the size of a figure but not the shape.

If the scale factor of a dilation is greater than 1, the image resulting from the dilation is an enlargement, and if the scale factor is less than 1, the image is a reduction.

A two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of transformations.

Two shapes are similar if the length of all the corresponding sides are proportional and all the corresponding angles are congruent.

Two similar figures are related by a scale factor, which is the ratio of the lengths of corresponding sides.

Congruent figures have the same size and shape. If the scale factor of a dilation is equal to 1, the image resulting from the dilation is congruent to the original figure.

When parallel lines are cut by a transversal, corresponding angles, alternate interior angles, alternate exterior angles, and vertical angles are congruent.

The solution to a system of two linear equations in two variables is an ordered pair that satisfies both equations.

Some systems of equation have no solution and others have infinite solutions.

Essential Questions

What are transformations and what effect do they have on an object?
What does the scale factor of a dilation convey?
How can transformations be used to determine congruency or similarity?

What angle relationships are formed by a transversal?
What makes a solution strategy both efficient and effective?
How is it determined if multiple solutions to an equation are valid?
How does the context of the problem affect the reasonableness of a solution?
Why can two equations be added together to get another true equation?

Learning Objectives

Utilize the properties of rotation, reflection, and translation to model and relate pre-images of lines, line segments, and angles to their resultant image through physical representations and/or Geometry software.
Apply an effective sequence of rotations, reflections, and translations to prove that two dimensional figures are congruent.
Use the coordinate plane to locate pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations.
Recognize dilation as a reduction or an enlargement of a figure and determine the scale factor.
Apply an effective sequence of transformations to determine that figures are similar when corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations.
Justify facts about angles created when parallel lines are cut by a transversal.
Justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle and the angle-angle relationship used to identify similar triangles.
Apply methods of solving systems of linear equations by substitution or graphing; solve simple cases by inspection.

That if two triangles have two congruent angles, then they are similar triangles (angle-angle)
Transformations on the coordinate plane include rotation, reflection, and translation
Transformations can be described using coordinates
Transformations can be described without using coordinates
Congruence is determined by the angles and/or sides/line segments of a shape.
Congruence is having the same shape, but possibly different orientations
Parallel lines should remain parallel when undergoing a transformation
A translation is rigid motion in which a figure and its image have the same orientation
A reflection is a flip of a figure over a line
A line of reflection is where the image must be reflected over
A rotation is a turn of a figure around a given point (for this course, the origin (0,0) is our point; in Geometry the point will change to other than the origin)
A dilation is a transformation that changes the size of a figure
Scale factor is the ratio of the lengths of corresponding sides of a dilation
Complementary angles are angles whose measure add up to 90 degrees
Supplementary angles are angles whose measure add up to 180 degrees
Adjacent angles share both a common side and a common vertex
Vertical angles are opposite angles formed by two intersecting lines
Alternate exterior and alternate interior angles are determined by using the angles of parallel lines cut by a transversal, but are defined by either angles inside or angles outside.
A triangles' interior angles can be made into a straight line of 180 degrees

An exterior angle of a triangle is equal to the sum of the non-adjacent angles (exterior angle sum theorem)
Coordinates notation can be used to describe transformations

Standards: Content

8.EE.C.8.a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software
8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
8.G.A.1.a	Lines are transformed to lines, and line segments to line segments of the same length.
8.G.A.1.b	Angles are transformed to angles of the same measure.
8.G.A.1.c	Parallel lines are transformed to parallel lines.
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 that exhibits the congruence between them.
8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.A.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.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.

Standards: Interdisciplinary

9.1.8.CDM.4	Evaluate the application process for different types of loans (e.g., credit card, mortgage, student loans).
9.1.8.CP.1	Compare prices for the same goods or services.
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.1.8.DA.4	Transform data to remove errors and improve the accuracy of the data for analysis.
8.1.8.DA.5	Test, analyze, and refine computational models.
8.1.8.AP.1	Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.
8.1.8.AP.2	Create clearly named variables that represent different data types and perform operations on their values.

Assessment Evidence

Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Games, Exit Slips, Pre-Assessments, Math

	Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative & Benchmark	Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice Benchmark - LinkIt Benchmark Assessments, Totowa TPA
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, iPads, websites and digital interactives/models, multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Reveal Math Resources.

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad		Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)
	Climate Change		Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

	Self-Awareness	X	Relationship Skills
X	Responsible Decision-Making		Social Awareness
X	Self-Management		

21st Century Skills & Themes

	Global and Cultural Awareness	X	Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
X	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		