Unit 1 Transformational Geometry
Math 8 Reg

Last Update: August 1, 2025

Archdiocesan Curriculum > Grade > Math 8 > Length of unit 22 to 27 days

Stage 1: Desired Results

General Information

In this unit, students will explore rigid motions—translations, reflections, and rotations—and observe their effects on figures, understanding that these transformations produce congruent images. They will describe rotations algebraically and perform sequences of transformations to determine congruency. Students will also study dilations, performing enlargements and reductions, and learn that these produce similar but not congruent figures. They will apply properties of dilations, including finding scale factors and centers of dilation, to recognize and create similar figures both on and off the coordinate plane.

Mathematical Practices:

- MP4 – Model with mathematics
- MP5 – Use appropriate tools strategically
- MP7 – Look for and make use of structure

Essential Question(s)

- How do rigid motions—translations, reflections, and rotations—affect the position and orientation of a figure without changing its size or shape?
- How can rotations be described algebraically, and how do they demonstrate the congruency of figures?
- How can sequences of transformations be used to determine if two figures are congruent?
- What distinguishes dilations from rigid motions, and how do scale factor and center of dilation affect the size and similarity of figures?
- How can dilations be used to recognize and create similar figures both on and off the coordinate plane?

Enduring Understanding/Knowledge

Students will:

- Explore and observe the effects of rigid motions (transformations) on figures.
- Describe translations and their effects on a figure.
- Describe reflections and their effects on a figure.
- Recognize and perform rotations; describe them algebraically and understand congruence.
- Perform and describe sequences of transformations to determine congruency.

Review/Assess

- Perform enlargements and reductions; understand that the result is not congruent to the preimage.
- Describe and apply the properties of dilations, including finding the scale factor and identifying the center of dilation, both on and off the coordinate plane.
- Recognize and create similar figures using dilations.

Review/Assess

Vocabulary

New	Review
• transformation • image • mapping notation • preimage • prime notation • translate • reflection • center of rotation • rotation • congruent • center of dilation • dilation • scale factor • similar	• coordinate plane • segment • vertex • line of reflection • quadrant • x-axis • y-axis • origin • reduction

Connections to Catholic Identity / Other Subjects

Religion/Catholic Identity:

- Just as transformations show how shapes can change but still retain their core properties, students can relate this to the idea of spiritual transformation—how faith changes individuals while maintaining their inherent dignity as children

Differentiation

Enrichment

- **Explore Composite Transformations** — Challenge students to analyze and describe multiple transformations applied in sequence, including combinations of rigid motions and

of God. Congruence and similarity highlight the unity and likeness we share in God's image, reinforcing the Catholic belief in the inherent value of each person and the call to live in harmony with one another. This lesson encourages students to see the beauty of change, unity, and divine purpose in both math and faith.

Other Subject Here:

- **ELA.** They help analyze the clarity, alignment, and comparisons between ideas, characters, and themes.
- **Art:** They refer to visual elements and design, where transparency, congruent proportions, and repeating patterns create harmony and impact.
- **Science:** They help understand the properties of materials, relationships between measurements or data, and evolutionary or chemical connections.
- **Social Studies:** These principles can be used to understand the openness of systems, the alignment of political actions with values, and comparisons between historical events or cultural practices.

dilations.

- **Algebraic Descriptions of Rotations** — Encourage students to generalize and write formulas for rotations around points other than the origin.
- **Investigate Properties of Similar Figures** — Have students explore deeper properties like ratio of perimeters and areas in similar figures, including proofs.
- **Coordinate Geometry Applications** — Assign tasks involving real-world applications of transformations, such as computer graphics or architectural designs using transformations.

Support

- **Use Manipulatives and Technology** — Provide physical tools (transparency sheets, tracing paper) or geometry software (GeoGebra, Desmos) to visualize and perform transformations concretely.
- **Guided Steps for Transformations** — Break down each transformation type with step-by-step instructions and examples, reinforcing vocabulary and effects on figures.
- **Visual Aids for Dilations** — Use clear diagrams and highlight scale factors and centers of dilation to make the concepts more accessible.
- **Simplified Coordinate Practice** — Begin with transformations centered on the origin and points with integer coordinates before progressing to more complex cases.
- **Frequent Checks for Understanding** — Incorporate quick formative assessments and use graphic organizers to track changes in coordinates and figure properties.

Standards & Benchmarks

Transformations and Congruence:

8.GM.1
Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane. (E)
8.G.A.2
Explain 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 of rigid transformations that proves the congruence between them.
8.G.A.1.b
Angles are taken to angles of the same measure.
8.G.A.1.c
Parallel lines are taken to parallel lines.
8.G.A.1.a
Lines are taken to lines, and line segments to line segments of the same length.

Transformations and Similarity:

8.GM.1
Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane. (E)
8.G.A.4
Explain 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 demonstrates the similarity between them.
8.G.A.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
CCSS.Math.Content.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.
CCSS.Math.Content.8.G.A.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.GM.1
Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane. (E)
8.G-CO.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).
8.G.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Teaching Ideas/Resources

Websites/Resources:

- Dilation Project - Mary Beth Briskey
- Transformation Worksheets: Translation, Reflection and Rotation
- Geometry Worksheets | Transformations Worksheets
- 12-All Transformations
- Delta Math Resource