MODULE 1 OVERVIEW

TEKS* Addressed:
8.3A, 8.3B, **8.3C,** 8.8D, 8.10A, 8.10B, **8.10C**, 8.10D
*Bold TEKS = Readiness Standard

Transforming Geometric Objects

Sessions: **41**

Why is this module named *Transforming Geometric Objects*?

Transforming Geometric Objects engages students in transforming geometric objects using translations, reflections, rotations, and dilations.

Students use rigid motion transformations to develop their understanding of congruence and extend that understanding to include similarity. They then use congruence and similarity, along with transformations, to establish geometric facts about triangles, similar triangles, and the relationships between special angles pairs formed when parallel lines are intersected by a transversal.

Throughout the module, students use transformations to build new knowledge and develop conceptual understanding of geometric concepts.

The Research Shows . . .

"Congruence and similarity are central relational concepts in the study of geometry. An understanding of these relationships provides students with tools to investigate and analyze other relationships among, and properties of, shapes (e.g., transformations and how they function). These geometric relationships help to connect many concepts within geometry and to link geometry itself to other areas of mathematics and to problems in the world around us."

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What is the mathematics of *Transforming Geometric Objects*?

Transforming Geometric Objects contains three topics: *Rigid Motion Transformations*, *Similarity*, and *Line and Angle Relationships*. Students use patty paper to investigate transformations of geometric objects. These investigations lead to an understanding of congruence and similarity. Students use the new knowledge to establish facts about triangles and relationships between special angle pairs.

1 DAY PACING = 45-MINUTE SESSION

20 SESSIONS
19 LEARNING • 1 ASSESSMENT

TOPIC 1 *Rigid Motion Transformations*

Learning Together: 14 Sessions

TEKS: 8.10A, 8.10B, **8.10C**

Students use patty paper and the coordinate plane to investigate the creation of congruent figures with translations, reflections, and rotations.

- Students use patty paper to develop intuition about the properties of the transformations.
- Students then generalize the effects on coordinates of figures after transformations.
- Students use algebraic representations to explain the effect of translations, reflections, and rotations on the coordinate plane.
- Students specify a transformation that maps congruent figures onto each other.

Learning Individually: 5 Sessions

Targeted Skills Practice for *Rigid Motion Transformations*

- Students translate, reflect, and rotate images and use these transformations to determine whether figures are congruent.
- Students use translations, reflections, or rotations to map congruent figures.

10 SESSIONS
9 LEARNING • 1 ASSESSMENT

TOPIC 2 *Similarity*

Learning Together: 6 Sessions

TEKS: 8.3A, 8.3B, **8.3C,** 8.10A, 8.10B, 8.10D

Students investigate dilations and similarity.

- Students make connections between scale factors and dilation factors and define similar figures.
- Students dilate figures on the coordinate plane using the origin as the center of dilation and generalize the coordinates of images formed from a dilation.

Learning Individually: 3 Sessions

Targeted Skills Practice for *Similarity*

- Students dilate triangles given the origin as the center of dilation and scale factors.
- Students describe each dilation needed to map given pre-images onto images.
- Students identify corresponding angles and write ratios to identify proportional sides of figures.

Learning Together: 7 Sessions

TEKS: 8.8D

Students use their knowledge of transformations, congruence, and similarity to establish the Triangle Sum theorem, the Exterior Angle theorem, relationships between angles formed when a transversal cuts parallel lines, and the Angle-Angle Similarity theorem.

- Students use hands-on tools to make and justify conjectures.
- Students use equations to solve related problems, including ones with complex diagrams.

Learning Individually: 3 Sessions

Targeted Skills Practice for *Line and Angle Relationships*

- Students apply the Triangle Sum and Exterior Angle theorems to determine unknown angle measures.
- Students classify angle pairs formed when a transversal intersects parallel lines and then determine each angle measure.
- Students use Angle-Angle Similarity to verify that each given pre-image is similar to a corresponding image.

How is *Transforming Geometric Objects* connected to prior learning?

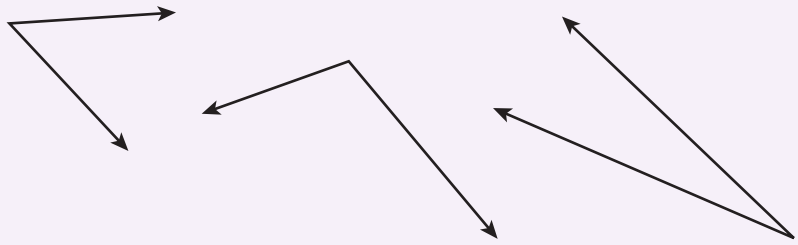
Transforming Geometric Objects builds on students' long-developing geometric knowledge. They know an object's name is not dependent on orientation or size, setting the foundation for similarity.

Students operate with rational numbers to determine the effects on coordinates of figures after transformations. They use scale factors to understand dilations in terms of coordinates and determine whether figures are similar. Students' experimentation with the uniqueness of triangles and their understanding of angle pairs provide the foundation for using congruence and similarity to establish triangle properties and special angle relationships. (*Refer to the Math Representation shown for a visual of this concept.*)

Math Representation

When you construct a triangle using these given angles, you will always construct an obtuse scalene triangle.

However, although the angle measures are the same, you can construct multiple triangles with different side lengths. All of the triangles are the same shape, but they are different sizes.

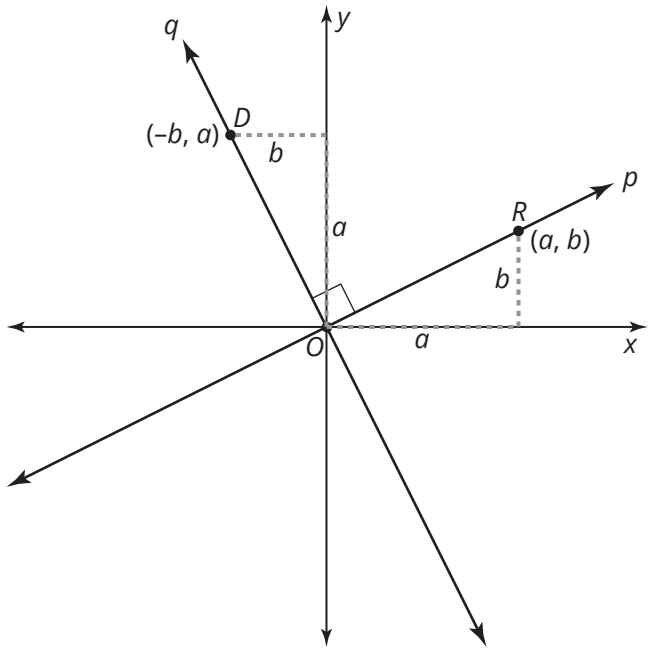


When will students use knowledge from *Transforming Geometric Objects* in future learning?

This module provides opportunities to build intuition and conceptual understanding of transformations and the relationships of figures created from transformations. In Module 2, **Developing Function Foundations**, students will use similar triangles to explain the constant slope in linear equations. They will use translations, dilations, and reflections to transform $y = x$ and describe the resulting graph and equation. Students will apply these same transformations to each function family they study in future courses.

In future courses, students will use function notation to connect geometric and algebraic transformations. They will use transformations to prove geometric properties formally.

You can use the graph shown to verify that the slopes of perpendicular lines are opposite reciprocals.



Point R lies on line p.

You can rotate line p 90° counterclockwise using the origin as the center of rotation.

The coordinates of $R(a, b)$ are transformed into the coordinates of $D(-b, a)$.

The slope of p is $\frac{b}{a}$, and the slope of q is $\frac{-a}{b}$. The slope of line q is the opposite reciprocal of the slope of line p.

1 Transforming Geometric Objects

MODULE 1 Assessment Summary

Topic	Topic Title	Name	Administered	TEKS*
1	Rigid Motion Transformations	End of Topic Assessment	After Topic 1	8.10A 8.10B **8.10C**
2	Similarity	End of Topic Assessment	After Topic 2	8.3A 8.3B **8.3C** 8.10A 8.10B 8.10D
3	Line and Angle Relationships	End of Topic Assessment	After Topic 3	8.8D

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