

## KEY CONCEPT OVERVIEW

This module is all about geometry. Until now, students may have thought of two objects as being congruent if they were the same shape and the same size. In Topic A, we will lay the groundwork for arriving at a more precise mathematical definition of congruence. Students will be doing hands-on work as they **transform** (slide, turn, or flip) points, segments, lines and shapes.

To LEARN MORE about transformations, visit:

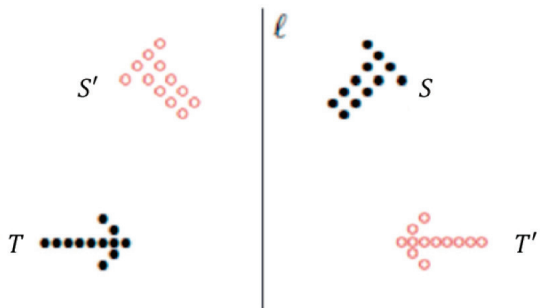
[eurmath.link/translation](http://eurmath.link/translation), [eurmath.link/reflection](http://eurmath.link/reflection), [eurmath.link/rotatecw](http://eurmath.link/rotatecw), and [eurmath.link/rotateccw](http://eurmath.link/rotateccw). The videos were developed by Sunil Koswatta.

You can expect to see homework that asks your child to do the following:

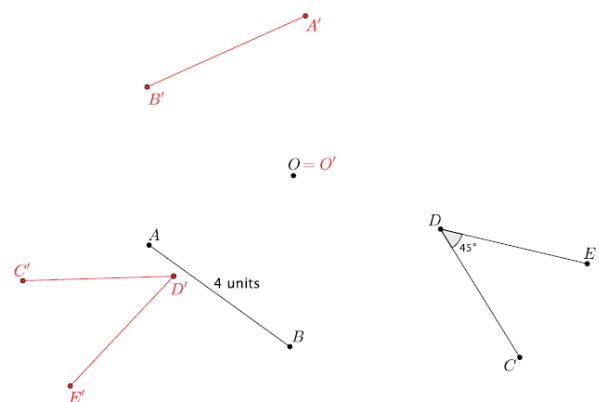
- Identify transformations (**translation, rotation, reflection**) that have been performed on shapes.
- Translate (slide), rotate (turn), and reflect (flip) objects using given criteria.
- Use accurate labeling and precise language when performing transformations.
- Determine lengths of segments and measures of angles (e.g.,  $45^\circ$ ,  $90^\circ$ ) after a transformation has been performed.
- Understand the special consequences of rotations of  $180^\circ$ .

## SAMPLE PROBLEMS (From Lessons 4 and 5)

The original images are in black, and the reflected (flipped) images are in red.



Let  $\overline{AB}$  be a segment of length 4 units and  $\angle CDE$  be  $45^\circ$ . Let there be a rotation by  $d$  degrees, where  $d < 0$ , about  $O$ . Find the images of the given figures.



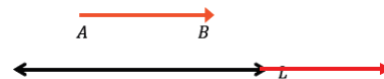
**Verify that students have rotated around center  $O$  in the clockwise direction.**

Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at [GreatMinds.org](http://GreatMinds.org).

**TERMS**

**Basic rigid motion:** Any transformation (such as a flip or a turn) in which the distance between any two points is kept the same. There are three basic types of rigid motions: translations (slides), reflections (flips), and rotations (turns).

**Coincide:** If you translate line  $L$  along a vector  $\overrightarrow{AB}$ , the new part of the line, in red, just extends the original line. We say line  $L$  and its image coincide.



**Collinear:** Points that are on the same line.

**Image:** An object that has been turned, flipped, or slid to a new location. This image should have a label with a prime (see below) to distinguish it from the original object.

**Length notation:** As a shortcut to writing, “The length of the segment  $AB$  is,” students use the notation  $|AB|$ .

**Map:** When an object maps onto another object, that means they’re congruent, or exactly the same. We say that Object 1 maps to, or maps onto, Object 2.

**Preserving:** Maintaining the original measure. For example, an angle preserves its measure when rotated, so a  $45^\circ$  angle will still be  $45^\circ$  after it has been rotated.

**Prime notation:** Original objects, shapes, or points are labeled with capital letters. When a point, shape, or object,  $P$ , is transformed, a prime is added to its label,  $P'$ . If that image is then transformed again, it will be labeled with two primes,  $P''$ . This continues for each new transformation.

**Reflect/Reflection:** A type of transformation that moves every point in the original object across a line of reflection (a line directly in the middle between the original and the new image). This is often referred to as a flip over a line. When describing a reflection, a student should write, “The original object was reflected over (or across)  $\overrightarrow{AB}$ .” In the first sample problem, the line of reflection is  $\ell$ .

**Rotate/Rotation:** A type of transformation that turns an object around a point. When describing a rotation, a student should write, “The original object was rotated around point  $P$  by  $45^\circ$ .” Rotations going in a clockwise direction have negative degree measures, while rotations in a counterclockwise direction have positive degree measures.

**Transformation:** The movement of a point, segment, line, or object. There are four transformations in Grade 8: translation (slide), rotation (turn), reflection (flip), and dilation (stretch or shrink).

**Translate/Translation:** A type of transformation that moves every point in the original object along a vector to a new location. This is often referred to as a slide along a vector. When describing a translation, a student should write, “The original object was translated along vector  $\overrightarrow{AB}$ .”

**Vector:** A line segment that has a direction; it is represented by a symbol on which one end is a point and the other end is an arrow. Its notation is  $\overrightarrow{AB}$  which means that when you translate a shape, you will start at point  $A$  and move the shape along the vector, stopping at point  $B$ .

**Coordinate:** The location of a point on the coordinate plane, written  $(x, y)$ . The first number is always the  $x$ -value of the point (left/right), and the second number is always the  $y$ -value of the point (up/down).

**Origin:** The point where the two axes intersect in the coordinate plane. Its coordinates are  $(0, 0)$ .

