



## Translations, Reflections, and Rotations

### Lesson Plan Grades 3–5

#### Mathematics, Geometry Focus

Students will learn that congruent figures can be moved in ways that will not change their shape and size.

#### ISTE NETS S Standards

- I. Basic Operations and Concepts
- IV. Technology Communications Tools
- VII. Technology Problem-Solving and Decision-Making Tools

#### Content Standards

- Apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about the shape, size, position, or motion of objects.

#### Learning Objectives

- Identify and describe the results of translations, reflections, and rotations. (Use a horizontal line translation, reflection over a vertical line, or rotation of 90° clockwise around a given point of a geometric figure or picture).

#### Technology Components:

- Computer with LCD projector, Internet connection, and color printer
- Discovery Education *unitedstreaming* account (<http://www.unitedstreaming.com>)
- Presentation software such as Microsoft PowerPoint
- Access to the Internet for teacher- and student-based research

#### Materials

- Power polygons
- Pattern blocks (optional)
- Graph paper
- Construction paper (optional)

#### Lesson Starter

- Begin the lesson by activating students' prior knowledge about congruent figures, which have the same size and shape. Using power polygons or pattern blocks, have students identify pairs of shapes that are congruent and those that are not.
- Discuss shapes around the room, soliciting input from students about where they see geometry in their homes, communities, public places, on television, and in the news.
- Explain that basic geometry underlies many aspects of life, from sidewalks to buildings to classroom arrangements.

#### Prior Technology Skills Knowledge

- Students should be familiar with using a mouse, using a keyboard to enter text, starting and stopping a program, and saving a file. In addition, for this lesson, students should be able to use



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the Microsoft Office draw tools in Microsoft Excel to design and manipulate basic shapes across a spreadsheet grid.

## Prior Knowledge

- Distribute power polygons to students and graph paper to use as a placemat. Talk about the different ways a shape can be moved, while its shape and size do not change. Have students take out their right triangle and trace a shape on the graph paper.
- Explain that one way to move a shape is to slide it. Have students slide their triangle in a straight direction across the paper. Tell students that this forms a translation. Have them trace the translation. Did its size and shape change?
- Explain that another way a shape can be moved without changing its size and shape is to flip it. Have students line up the side of their triangle with a line on the graph paper and flip it over the line. Explain that this motion forms a reflection because it shows the mirror image of the shape. Have them trace the reflection. Did its size and shape change?
- A third way a shape can be moved is to turn it. Have students turn the shape. This motion is called a rotation because it moves around a point, just like the hands on a clock rotate. Have them trace the rotation. Did its size and shape change?

## Present New Content

- Create a presentation on translations, reflections, and rotations. Include *unitedstreaming* video.
  - Show students segments 23, 24, and 25 of *Discovering Math: Geometry (Grades 3-5)* available through [www.unitedstreaming.com](http://www.unitedstreaming.com).

## Independent Learning Experience

- Ask students to work independently at computer stations to create a cityscape that demonstrates geometry in a real-world setting. Students should be given the flexibility to decide if their landscape is the one they have seen, or one they have created in their imaginations.
- Using Microsoft Excel, have students create a new spreadsheet. Review the basic draw tools in Microsoft Excel to demonstrate how to draw a basic shape, fill it with color, select it, and slide (translate), flip (reflect), and rotate it.
- Instruct students to create a cityscape, a piece of geometrical artwork that demonstrates using at least three different basic shapes. Have them fill in their spreadsheet using the appropriate terminology (translations, reflections, and rotations). Discuss some jobs that use geometry in a direct way, such as planners and designers.
- Have students practice manipulations tessellations at <http://illuminations.nctm.org/ActivityDetail.aspx?ID=27>. Have them complete a worksheet in which they create a grid of tessellations, identify congruent shapes, and determine if shapes are related by a translation, a flip, or a slide.
- Set up the video “Mathematical Eye: Shapes and Angles,” segment four of *Investigating Tessellations*, available on *unitedstreaming* at a math center or station.
- At another math station, provide scissors, tape, and construction paper cut into rectangles. Have students cut a small piece of any shape from one side of the rectangle, tape it to the other side, and use the figure to create a tessellation. Once they create their own tessellation, they can describe what motions they used to create the tessellation.



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## Feedback

- Circulate around the room, providing feedback to individuals working on practice problems or tessellations.

## Assessment

- Have students draw a figure such as an L shape and show what happens when it is moved in three ways: translation, reflection, and rotation. Label each drawing with the type of movement it shows.

## Transfer

- Have students use Geometry etools or drawing software to work with transformations.
- Investigate rotational symmetry, where figures rotate onto themselves with less than a full turn.

## Citations

Discovery Channel School. *Discovering Math: Concepts in Geometry*. 2005, *unitedstreaming*, <http://www.unitedstreaming.com/>

United Learning. *Mathematical Eye: Shapes and Angles*. 1989, *unitedstreaming*, <http://www.unitedstreaming.com/>