Module 1: Reasoning with Shapes

TOPIC 2: RIGID MOTIONS ON A PLANE

This topic begins by reminding students of what they know about functions via a function machine. Instead of having a numeric or algebraic input and output, a geometric function machine has a geometric figure as the input and output. Students investigate simple geometric transformation machines, describing how each input shape is "carried" by geometric objects in the transformation machine to result in the output shape. Students then consider each of the rigid motions as functions and identify geometric figures with line symmetry and rotational symmetry.

Where have we been?

Students know that two figures are congruent if and only if there exists a sequence of one or more rigid motions that carries one of the figures onto the other. They have described the effect of rigid motion on two-dimensional figures using coordinates. This topic builds on this knowledge, requiring students to rely on geometric reasoning.

Where are we going?

In this topic, students begin the formal study of congruence and lay the groundwork for their study of similarity and trigonometry. Here they explain how the criteria for triangle congruence (SSS, SAS, and ASA) follow from the definition of congruence in terms of rigid motion. They will use the triangle congruence theorems in future topics to prove a wide range of geometric theorems.

Rigid Motions as Functions

A translation is a function, T, which takes as its input, b, the location of a point along a line and outputs $T_{AB}(b)$, the new location of the point after it has undergone a translation, or a slide, on the plane a distance of AB in the direction from point A to point B.

$T_{AB}(P) = P'$

$T_{AC}(P) = P''$

Reflections and rotations are also rigid motions which can be expressed as functions which map a set of points to another set of points.

It All Comes Back Around to Circles

Most textbooks are translated from English into at least one other language, usually Spanish. And in some school districts, general memos and letters to parents may be translated into many different languages!

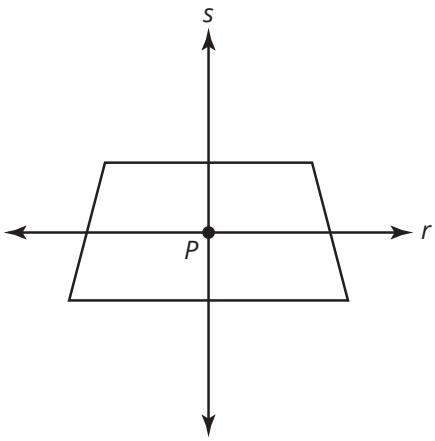
Of course, translating a language means something completely different from the word *translating* in geometry. The same can be said for *reflection*. A reflection pool is a place where one can reflect on one's thoughts, while also admiring reflections in the pool of still water.

Talking Points

Rotational and refl ectional symmetry will often be addressed on standardized tests.

Here is a sample question:

The figure shows two perpendicular lines, *s* and *r*, intersecting at point *P* in the interior of a trapezoid. Line *r* is parallel to the bases and bisects both legs of the trapezoid. Line *s* bisects both bases of the trapezoid.



Which transformation will always carry the figure onto itself?

The figure has reflectional symmetry. A reflection across line *s* will carry the figure onto itself. The figure does not have rotational symmetry.

Key Terms

isometry
An isometry is a rigid motion transformation that preserves size and shape.

concentric circles
Concentric circles are circles with a common center point.

rotational symmetry
A plane figure has rotational symmetry if you can rotate the figure more than 0° but less than 360° and the resulting figure is the same as the original figure in the original position.