

# Transformational Geometry: GeoGebra Files

## Introduction to Transformations

These files can be used on a projector or interactive board to introduce geometric transformations. Of course, they can also be used by students.

In all the files, the orange polygon is the pre-image (“orange” / “original”.) Using the sliders animates the transformations in order to give an intuitive sense of how they work. Moving the pre-images, and various points can also be illuminating.

Then, files 4-7 can be used to try to guess which isometry was used, as well as to discuss where the center of rotation is, or the reflection line.

File 7 shows an isometry, but it is not one of the previous three. It can be done by combining a reflection with either a translation or a rotation. The standard way to do it is with a reflection followed or preceded by a translation whose vector is parallel to the reflection line. This is called a glide reflection. File 8 shows the two steps.

## Composition

These files are intended to provide an environment to explore the composition of transformations. It is not difficult to create more such figures to analyze other cases.

## Complex Numbers and Matrices

These files are useful to illustrate more advanced topics. They cannot be used in isolation to teach anything: they are intended to support the teaching of these topics which is done primarily by other means.

**complex numbers** shows the arithmetic of complex numbers in the plane, visually. Note that while point  $z$  can be moved anywhere, point  $w$  is confined to a circle centered at the origin — initially the unit circle.

**matrices 2** shows how to move a pre-image by way of a 2 by 2 transformation matrix. The coordinates of the vertices of the pre-image appear in the spreadsheet as **pre-x** and **pre-y**. The user can enter values in the matrix by way of the spreadsheet. The image instantly updates as the matrix changes.

**matrices 3** works the same way, using a 3 by 3 matrix.

This Web site summarizes many ideas about transformation matrices, and has a great online implementation of their products:

<http://www.smccd.net/accounts/hasson/hcoords.html#purpose>