GeoGebra Basics

Handbook 6

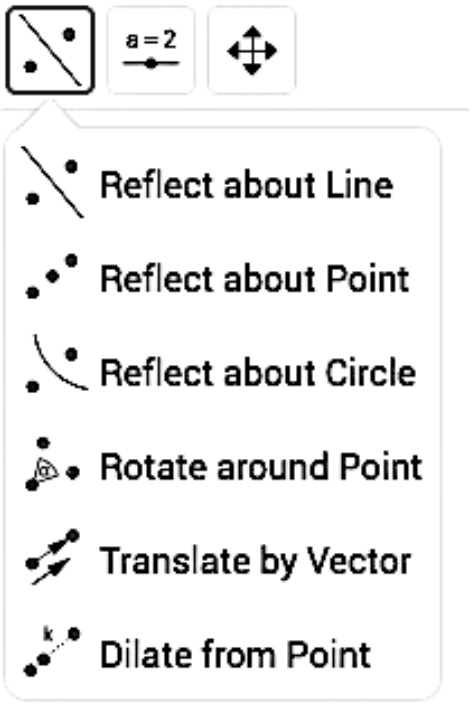
A Guide for Learning GeoGebra

Dr. Robert E. Mason IV

Table of Contents

Geometric Transformations

A transformation is a movement of a geometric figure to a new position. One kind of transformation is a reflection. You can do all the basic transformation geometry in **GeoGebra**. You will find all the transformation functions if you click the third icon from the left on the Toolbox

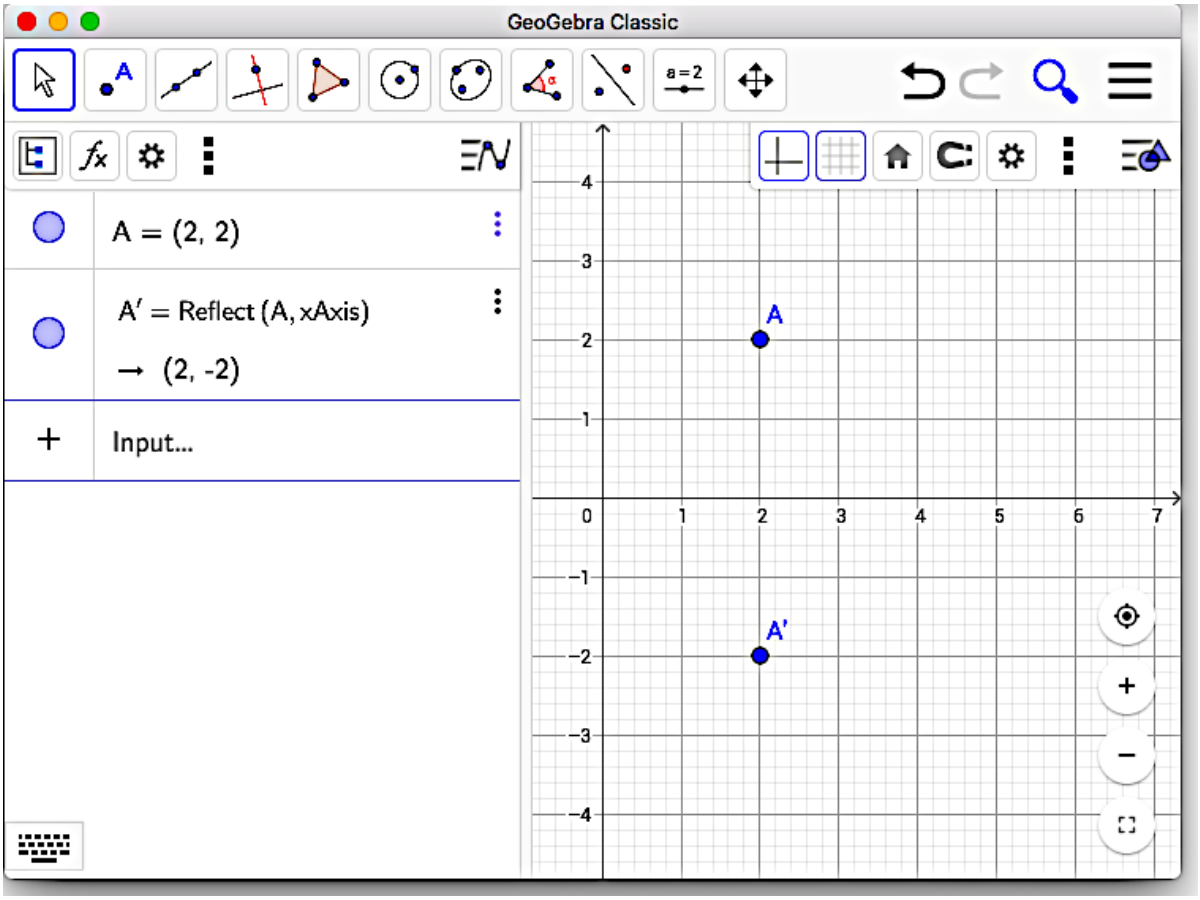


Construct a reflection in the x-axis

1. Let's determine the coordinates of the image of P(3, 2) if P is reflected across the x-axis.
2. Select the axes and grid in order to show them on the **Graphic View**.

3. Input (3,2)

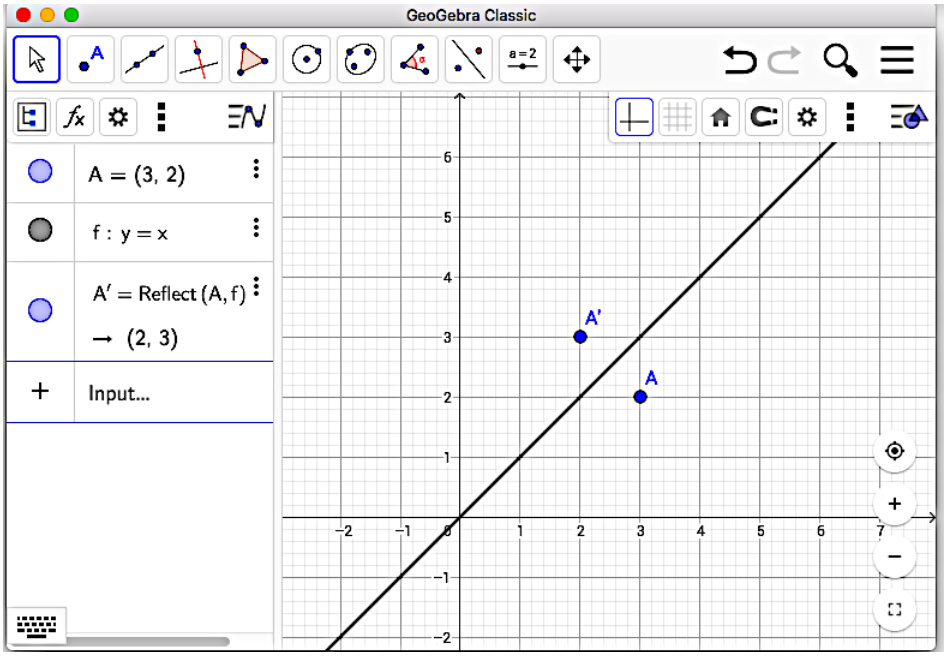
4. Select the **Reflect About Line** option.



Constructing a reflection of a point in the line y = x

Example: Determine the coordinates of the image of P(3; 2) if P is reflected across the line y = x.

1. Type: (3,2) in the Input bar
2. Type: y = x in the Input bar
3. Select the **Reflect About Line** option
4. Click the point (3, 2) and the line y = x.



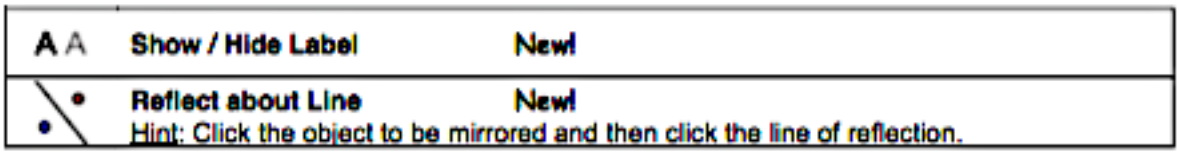
Challenge: Learn how to reflect a polygon across the x- and y- axes.

More Practice Using Geogebra to Reflect about a Line

Preparation

Make sure you have the picture the picture file saved on your computer.

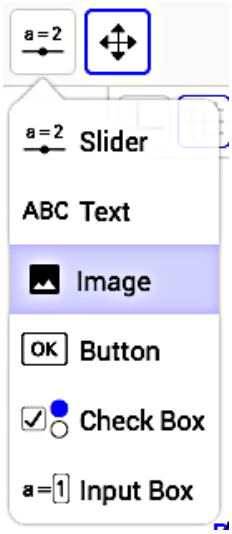
Open a new GeoGebra window.



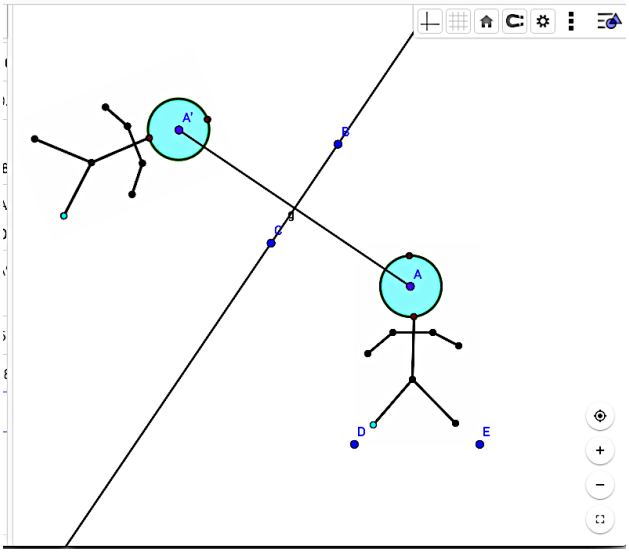
Hints: Don't forget to read the **Toolbar help** if you don't know how to use these tools. Try out the new tools before you start the construction.

 1. Create a new point A
2. Show the label of point A
 3. Construct a line of reflection through two points
 4. Create mirror point A at line to get image A'
 5. Create segment between point A and its image A'
6. Turn the Trace on for points A and A' Hint: Right-click the point and select Trace on. Whenever point A is moved it leaves a trace in the Graphic View.
7. Move point A to draw a dynamic figure.

8.  Insert the image you saved into the Graphic View.



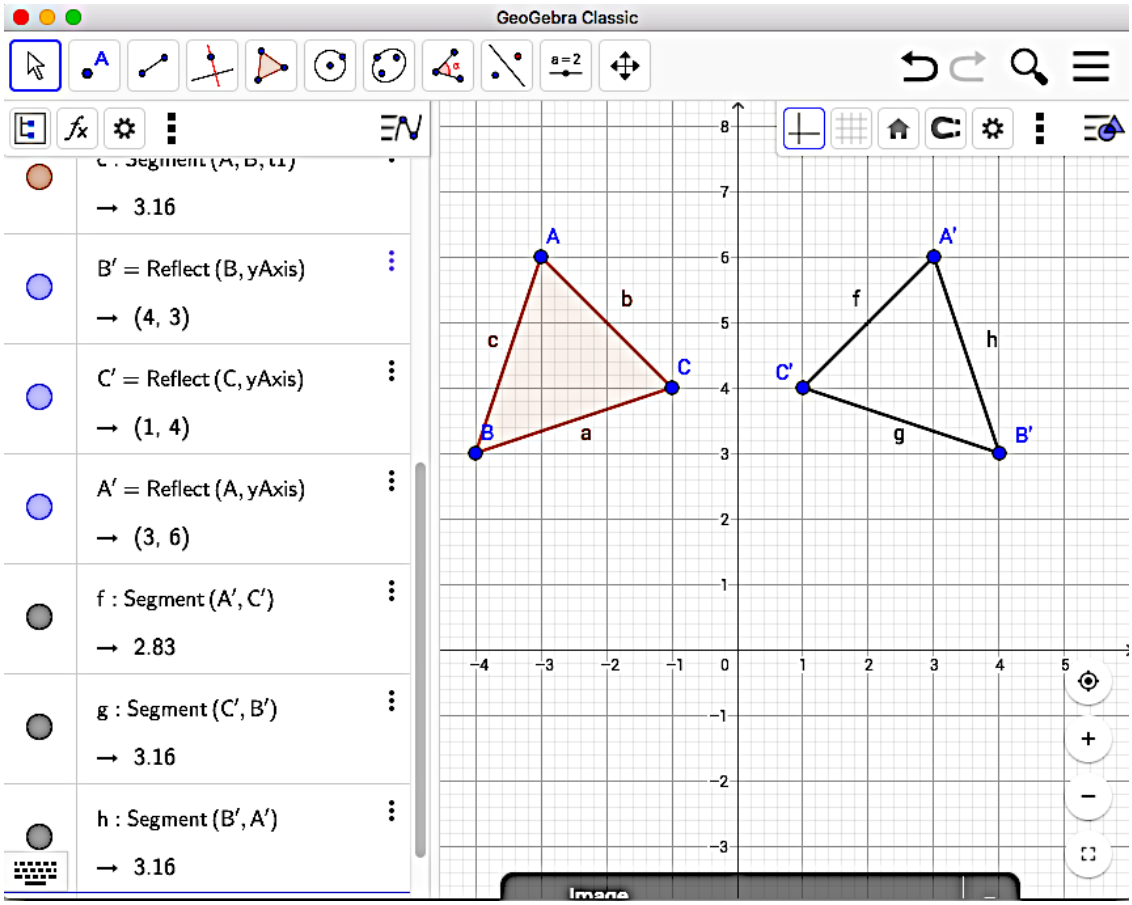
9. Adjust the position of the inserted image.



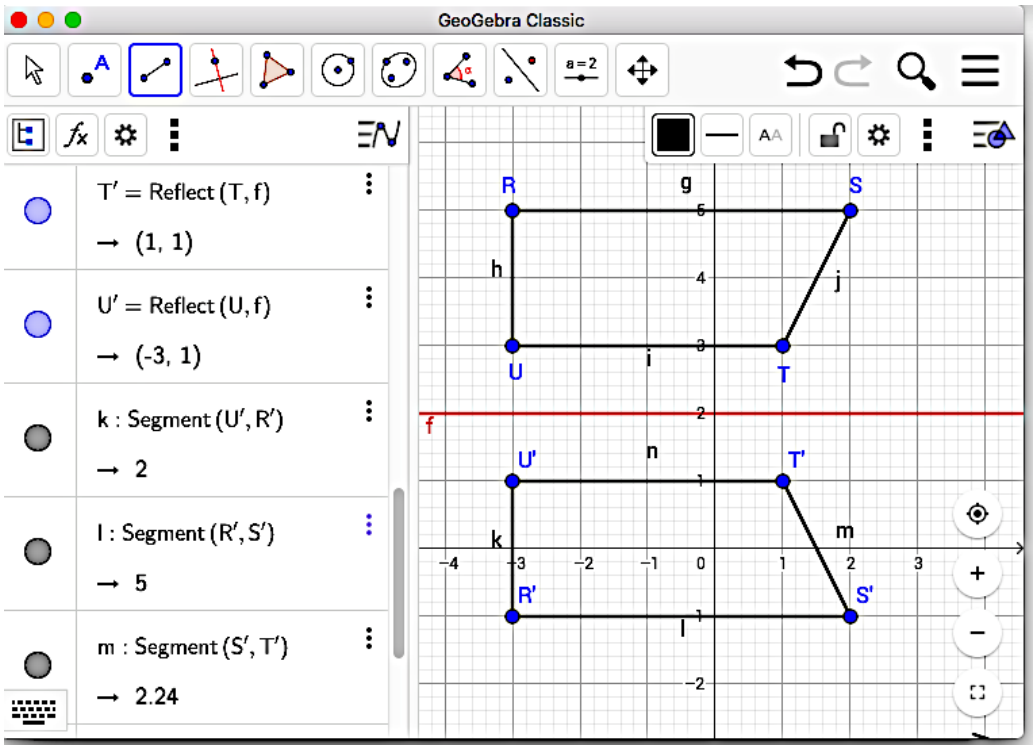
10. Set the image as Background image (Properties dialog, tab Basic).

Deepening your Understanding of a Reflection

A reflection is sometimes called a flip. The figure is flipped across or over or in a certain line. Observe that triangle ΔABC is reflected across the y-axis to make ΔA′B′C′. The corresponding points of the two triangles have the same y-coordinates. Their x-coordinates are opposites.



The figure that results from a reflection is called the image of the first figure under a reflection. R′S′T′U′ is the image of RSTU under a reflection in the line with equation y = 2. Corresponding points of the two figures are the same distance from the line of reflection, but on opposite sides.



Reflections do not change the shape or size of a figure, so the reflection image is congruent (≅ is the symbol used for congruency) to the original figure (the pre-image). In the examples above, ΔABC ≅ ΔA′B′C′, and RSTU ≅ R′S′T′U′.

Things to Remember about Reflections

Equations of horizontal lines – refer to figure 92 below.

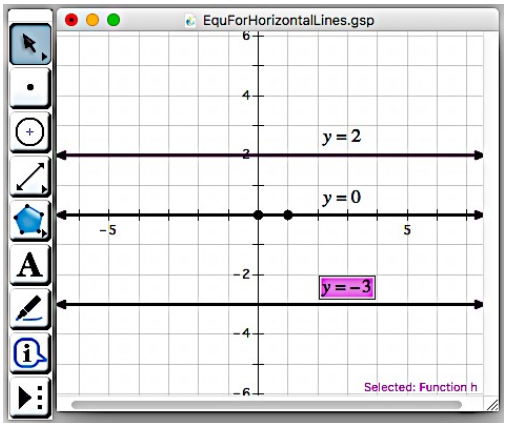


Figure 92 – Reflection 3

The x-axis has equation y = 0.

Equation of vertical lines – refer to figure 93 below.

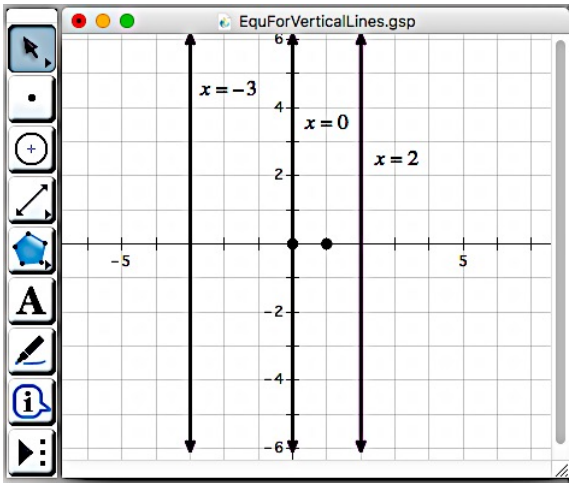


Figure 93– Reflection 4

The y-axis has equation x = 0.

Reflection Notation:

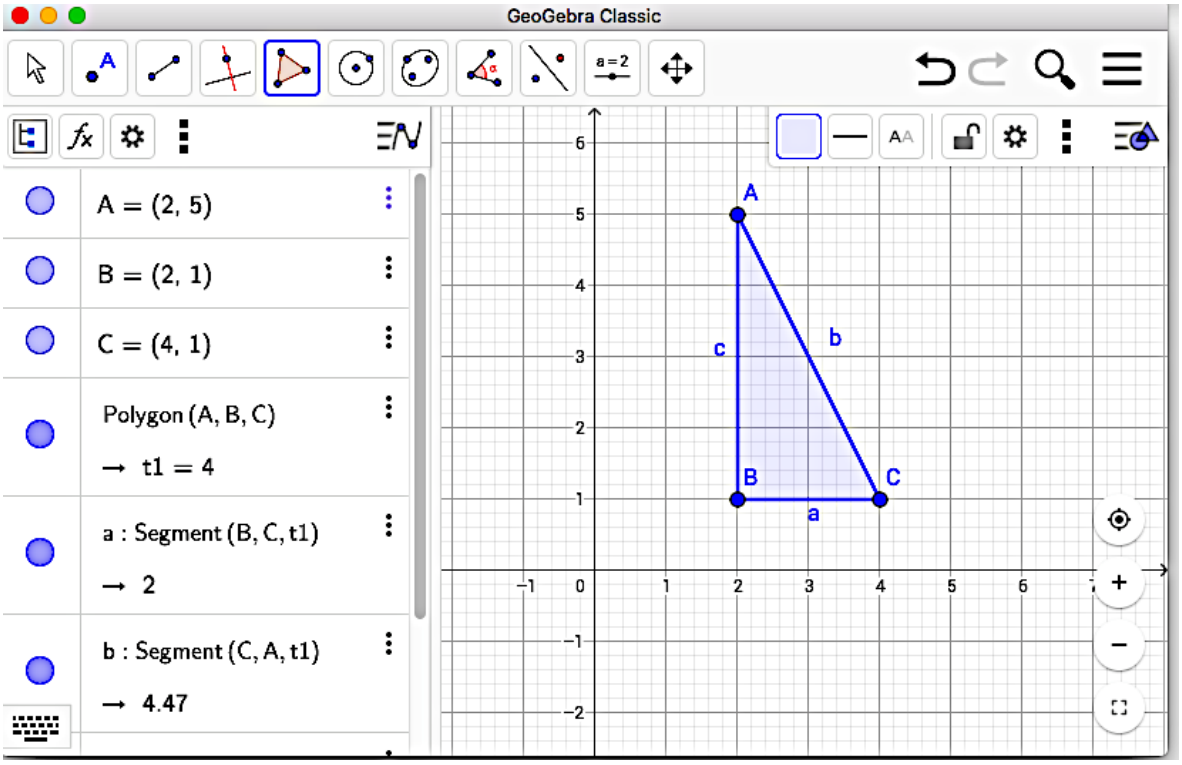
$r_x = {}_0(\Delta ABC) = \Delta A'B'C'$. Reflection over the line x = 0 (the y-axis).
$r_y = {}_0(RSTU) = R'S'T'U$ Reflection over the line y = 0 (the x-axis).

Reflection over an axis changes coordinates of points as follows:

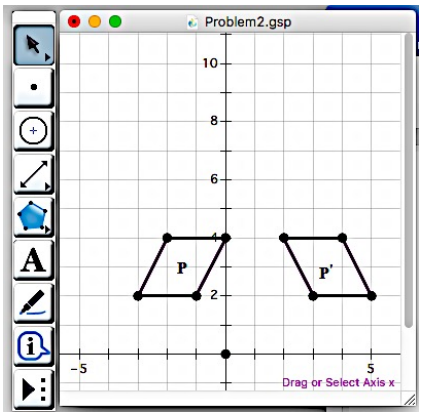
x-axis: $r_y = {}_0(x,y) = (x,-y)$
y-axis: $r_x = {}_0(x,y) = (-x,y)$

Test Your Understanding of Reflection

1. The diagram shows ΔABC. If ΔABC is reflected across the x-axis to produce ΔA′B′C′, what will be the coordinates of Point A′? First use the appropriate reflection notation formula to solve the problem, then check your computations by using GeoGebra to reflect ΔABC across the x-axis



2. The diagram below shows parallelogram P and its image under a certain reflection –



Which describes the reflection?

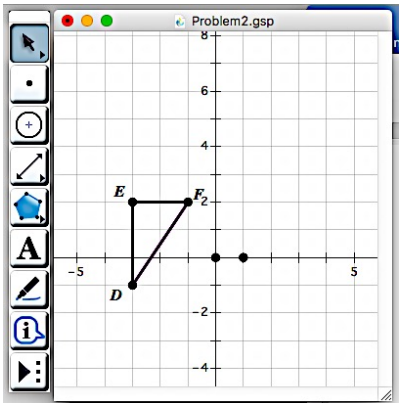
A $r_x = {}_1(P) = P'$

B $r_x = {}_2(P) = P'$

C $r_y = {}_2(P) = P'$

D $r_y = {}_4(P) = P'$

1. The diagram below shows ΔDEF



Without using **GeoGebra's** reflect tool, draw ΔD'E'F', the result of the reflection described by $r_y = {}_{-1}(\Delta DEF)$.