ACTIVITY 17
Translations, Rotations, and Reflections

Before doing this activity . . .

- you should review translation, rotation, reflection, isometry (or rigid transformation), area, and perimeter.
- edit the program’s preferences so that labels are shown automatically for all new points (select Preferences from the Edit menu)

ACTIVITY:

Step 1. Using the Segment tool, construct line segment AB.

Step 2. Mark the vector from point A to point B by selecting point A and point B (in that order) and then choosing Mark Vector from the Transform menu. (Note: You will see a quick animation.)

Step 3. Using the Segment tool, construct triangle CDE.
Step 4. Construct the polygon interior of triangle CDE by selecting the vertices in consecutive order and choosing \textit{TriangleInterior} from the \textit{Construct} menu.

Step 5. Translate triangle CDE by the marked vector AB by selecting the triangle’s interior, choosing \textit{Translate} from the \textit{Transform} menu, and clicking on \textit{Translate}.

Step 6. Change the length of line segment AB by clicking and dragging its endpoints. In a similar manner, change the size of triangle CDE. \textbf{What did you notice?}

Step 7. Measure the area of each of the triangles (select the triangle’s interior and then choose \textit{Area} from the \textit{Measure} menu). \textbf{What did you notice?}

Step 8. Measure the perimeter of each of the triangles (select the triangle’s interior and then choose \textit{Perimeter} from the \textit{Measure} menu). \textbf{What did you notice?} So, is a translation an example of an isometry (or rigid transformation)?

Step 9. Start a new page (choose \textit{Document Options} from the \textit{File} menu).
Step 10. Using the Circle tool, construct a circle.

Step 11. Using the Segment tool, construct central angle CAD.

Step 12. Select point B and the circle and choose Hide Objects from the Display menu.

Step 13. Select points C, A, and D (in that order) and choose Mark Angle from the Transform menu. (Note: You will see a quick animation.)

Step 14. Select point A and choose Mark Center from the Transform menu. (Note: You will see a quick animation.)
Step 15. Using the Segment tool, construct triangle EFG.

Step 16. Construct the polygon interior of triangle EFG by selecting the vertices in consecutive order and choosing Triangle Interior from the Construct menu.

Step 17. Rotate triangle EFG by the marked angle CAD by selecting the triangle’s interior, choosing Rotate from the Transform menu, and clicking on Rotate.

Step 18. Change the size of angle CAD by clicking and dragging its points. In a similar manner, change the size of triangle EFG. What did you notice?
Step 19. Measure the area of each of the triangles (select the triangle’s interior and then choose Area from the Measure menu). What did you notice?

Step 20. Measure the perimeter of each of the triangles (select the triangle’s interior and then choose Perimeter from the Measure menu). What did you notice? So, is a rotation an example of an isometry (or rigid transformation)?


Step 22. Using the Line tool , construct line AB.

Step 23. Select line AB and choose Mark Mirror from the Transform menu. (Note: You will see a quick animation.)

Step 24. Using the Segment tool , construct triangle CDE.

Step 25. Construct the polygon interior of triangle CDE by selecting the vertices in consecutive order and choosing Triangle Interior from the Construct menu.
Step 26. Reflect triangle CDE in line AB by selecting the triangle’s interior and choosing Reflect from the Transform menu.

Step 27. Change line AB by clicking and dragging the line and its points. In a similar manner, change the size of triangle CDE. What did you notice?

Step 28. Measure the area of each of the triangles (select the triangle’s interior and then choose Area from the Measure menu). What did you notice?

Step 29. Measure the perimeter of each of the triangles (select the triangle’s interior and then choose Perimeter from the Measure menu). What did you notice? So, is a reflection an example of an isometry (or rigid transformation)?

LOOKING BACK:

In this activity, you performed each of the transformations of translation, rotation, and reflection. In each case, you measured the area and perimeter of the pre-image and the image. As you noticed, in each case, the areas and perimeters were equal, thus supporting the fact that these transformations are examples of isometries (or rigid transformations). The advantage of doing these transformations in Geometer’s Sketchpad is that you are able to manipulate the figures and explore further.