***How to “Make” a Dilation* Teacher Guidelines**

**Role of technology**

Technology plays less of a role in this activity than the last two, but it still saves a tremendous amount of time. Further, the yes/no feature of the “Dilation?” makes the sketch *very* powerful to me; students are forced to realize that not all triangles that look largely alike are mathematically similar. And, of course, the automatic measurements and checkboxes are convenient.

**Teacher Guidelines/Directions for Technology**

Preface this activity with a warm-up or Socrative poll that references the previous days’ lessons. In particular, students should verbalize (or poll in) that dilations make objects larger, smaller, or (trivially) the same size by a certain scale factor. These transformations can be centered anywhere, and the location of the center of dilation absolutely affects the position of the image of the dilation. Moreover, the center of dilation is the intersection of the lines through the sets of corresponding points on the pre-image and image. After having gone over these things – this serves essentially as a formative assessment – let students loose on the task. Pass out the handout, get the students on the netbooks/computers/what have you, and let them work. The idea of this task is to get the students somewhat frustrated at why they can’t get the darn thing to say “Yes.”

Prompting with a specific attitude during this task is *critical*. Many students, when frustrated, completely shut down. Be aware of this. During the task, be looking out for these students. Guide them firstly with mathematical prompts regarding what they know about dilations, but after a while just encourage them to return all the points to the original triangles and look at the hints. The teacher’s positivity and encouragement must balance with the students’ struggle.

If some students get the idea very quickly, move them to work with students that have more trouble. This is a powerful tool for helping both students better understand the proportionality facet of dilations. If two students paired up are just stuck, getting nowhere after seven or eight minutes with blank stares on their faces, switch things up.

It is important to note that the sketch does have limitations. Using the intersection of the lines through corresponding vertices *will* help students understand the proportionality – but only if the hints are shown. This tactic might not actually result in a “yes,” though; Geogebra is so finicky that manually getting three lines to perfectly intersect at a point is quite difficult. If students choose this route, encourage them not so much to crave the “yes,” but use the hints to figure out what *exactly* they need and is going on; follow this up with prompts about slope. Encourage students to place their vertices where they have nice integer coordinates.

Once the activity is over – it is not a terribly long activity, but along with the warm-up discussion and discussion to follow, should take a whole class period – again hold a discussion with students. If any students have particularly clever solutions (like using the slope, or making it so that the triangles are dilated specifically from the origin in order to students to determine a nice pattern with the ratios), allow them to present. Otherwise, provide students with straight up notes: dilated figures have proportional side lengths. Since the notation can be tricky, I believe it is imperative that the teacher model for the students a proper proportion given a novel example (e.g. a quadrilateral with vertices that aren’t just A, B, C, & D). The next day, the students will have an open notes quiz.