

Math 6140: Homework # 6.

1. (Use Geometer's Sketchpad.) Construct a triangle and its three medians. The medians divide the triangle into 6 smaller triangles—use a custom tool to construct their centroids (hide the lines you use to do this). Now connect these 6 centroids to form a hexagon. Find the ratio of the area of this hexagon and the area of the original triangle. (Sketchpad will give you a decimal approximation to this ratio: try to find the exact ratio as a fraction. It is **not** $9/25$.) Print out a picture.
2. (See Figure 1.) Prove that the bisectors of angles 1, 2 and 3 are concurrent. (Hint: use a strategy similar to the proof of Theorem 26.) Make a picture to illustrate your proof with Geometer's Sketchpad.

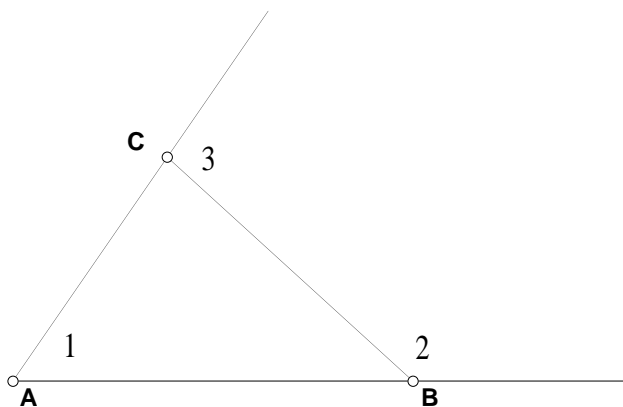


Figure 1

3. The medians of a triangle divide it into 6 small triangles. Prove that they all have the same area.
4. Let ABC be a triangle with centroid G . Let l be the line through G parallel to AB , and let D and E be the points where l intersects AC and BC respectively. Prove that the area of CDE is $4/9$ of the area of ABC .

5. (See Figure 2.) Given: $ABCD$ is a parallelogram, $\angle 1 = \angle 2$, $\angle 3 = \angle 4$, EF is parallel to AD . To prove: $AF = FB$.

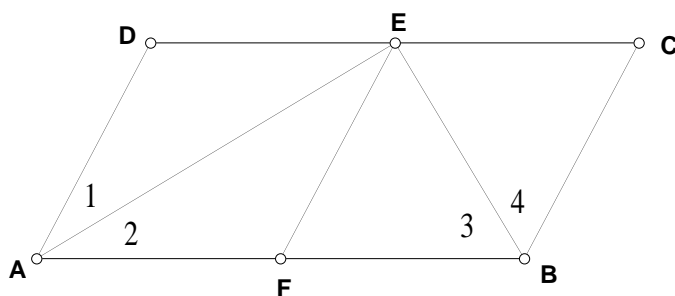


Figure 2

6. (See Figure 3.) Given: $\angle C = \angle D$ and $\triangle APR \cong \triangle BQT$. To prove $\triangle ADF \cong \triangle BCE$

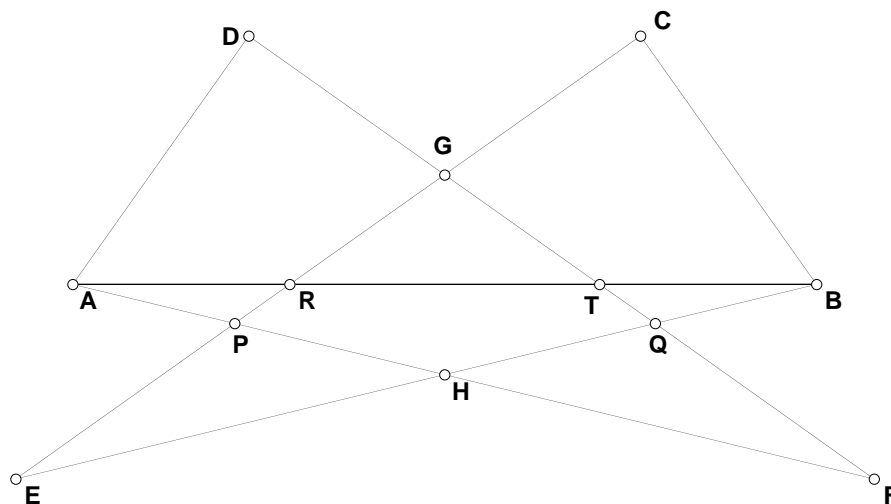


Figure 3

7. (See figure 4.) Prove that

$$\frac{A'B}{A'C} \frac{B'C}{B'A} \frac{C'A}{C'B} = 1.$$

(Hint: Use a strategy similar to Problem 4 from Assignment 5.)

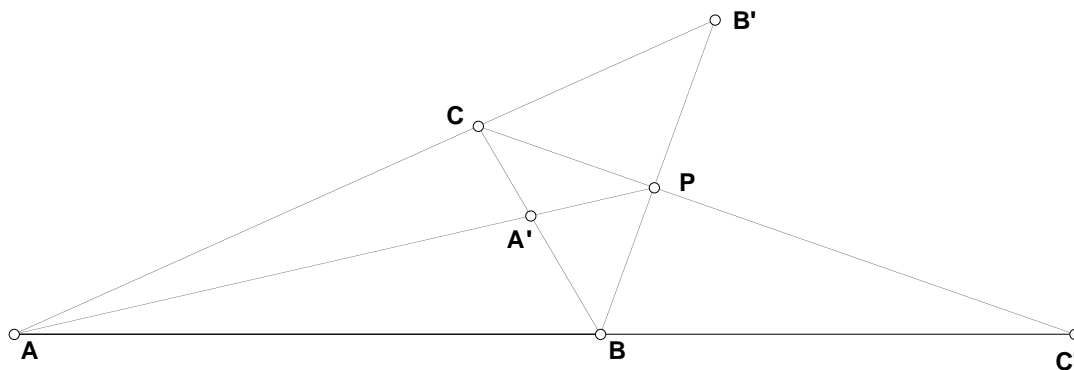


Figure 4