

Problem 6 is both simple and hard. The transformation described in problem 6 is illustrated in figure 1.

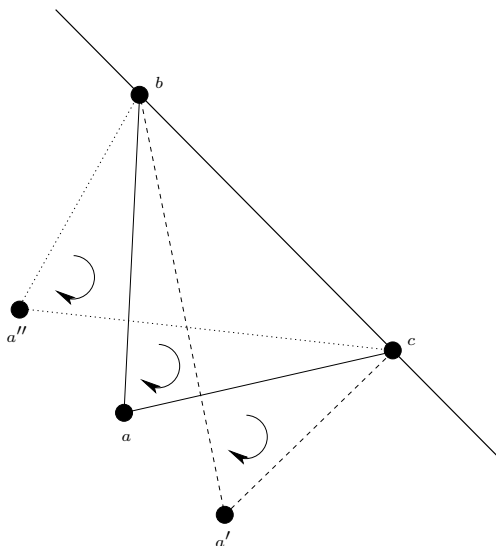


Figure 1: Effect of mapping on triangle orientation

The critical point is that the output of the mapping, either  $a \rightarrow a'$  or  $a \rightarrow a''$  (to illustrate that the result is independent of the direction of the displacement) the new triangle, either  $a'bc$  or  $a''bc$  has the same orientation as  $abc$ . The transformation preserves orientation since  $a$ ,  $a'$ , and  $a''$  have to all be on the same side of  $bc$ . To reverse the orientation either  $a'$  or  $a''$  would have to be on the opposite side of  $bc$  from  $a$ . Any number of successive applications of this type of mapping cannot change the orientation of the three points.

The input point configuration for problem 6 is shown in figure 2. The orientation of the input configuration is clockwise.

The output configuration for for part a is shown in figure 3, for part b in figure 4.

In both cases the output configuration is counter clockwise. You cannot get from the input configuration to the output configurations with any repeated application of the defined mapping.

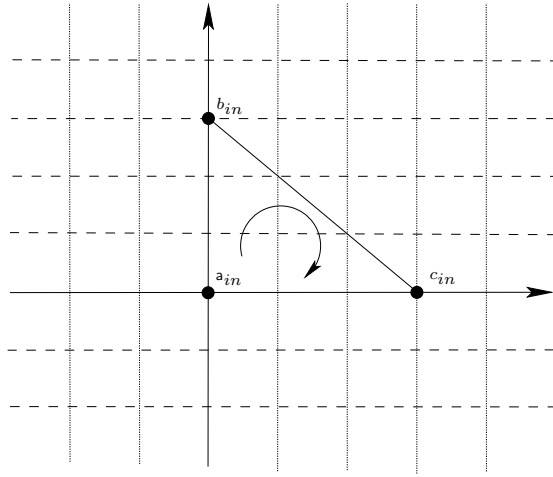


Figure 2: Input points for problem 6

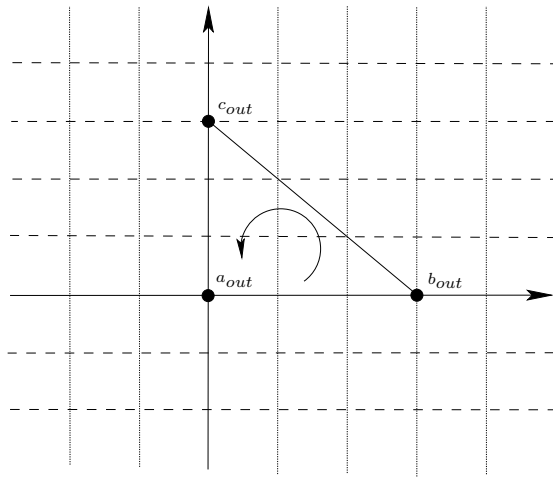


Figure 3: Output points for problem 6a

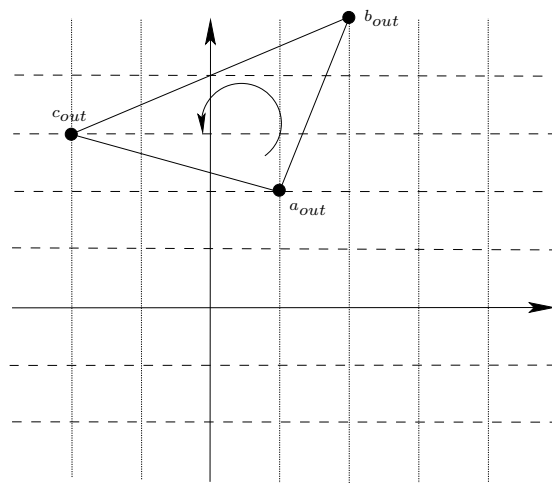


Figure 4: Output points for problem 6b