1. \[ P' = P - \left( \frac{(P - P_0) \vec{n}}{|\vec{n}|} \right) \cdot \vec{n} \]

2. 
   a) Compute the normal vector \( n = (a, b, c) \) of the polygon using Newell’s algorithm.
   b) Generate the plane equation of the polygon \( ax+by+cz+d=0 \), where \( d \) can be computed using any one of the vertices of the polygon.
   c) Substitute each vertex of the polygon into the plane equation. If the values of the equation at all vertices are within a given error bound, then the polygon is planar, otherwise it is not.

3. To prove two transformations, \( A \) and \( B \), commute, you only need to show: \( AB = BA \)
   a) Matrix \( A \) is the general rotation matrix about an arbitrary axis, and matrix \( B \) is a scaling matrix \( S(s,s,s) \).
   b) The two rotation matrices are both in the form of the general rotation matrix about the same axis, except that the rotation angles are different.
   c) The two matrices are: \( T(a, b, c) \) and \( T(d, e, f) \)

4. A 2D affine transformation has 6 variables (first two rows of the 3x3 matrix) or degrees of freedom. Each 2D point before and after transformation can determine 2 degrees of freedom by their \( x \) and \( y \) coordinates. Therefore, we need three 2D points to specify a unique 2D affine transformation.

5. 
   a) First translate the plane so that it passes through the origin: \( T(-1, 0, 0) \)
   b) Rotate the plane about \( Z \) by 45 degree so that the plane coincide with the \( X-Z \) plane: \( R_z(45) \).
   c) Reflection about \( X-Z \) plane: \( S(1, -1, 1) \)
   d) Reverse the first two transformations, we now have: \( T(1,0,0)R_z(-45)S(1,-1,1)R_z(45)T(-1,0,0) \)