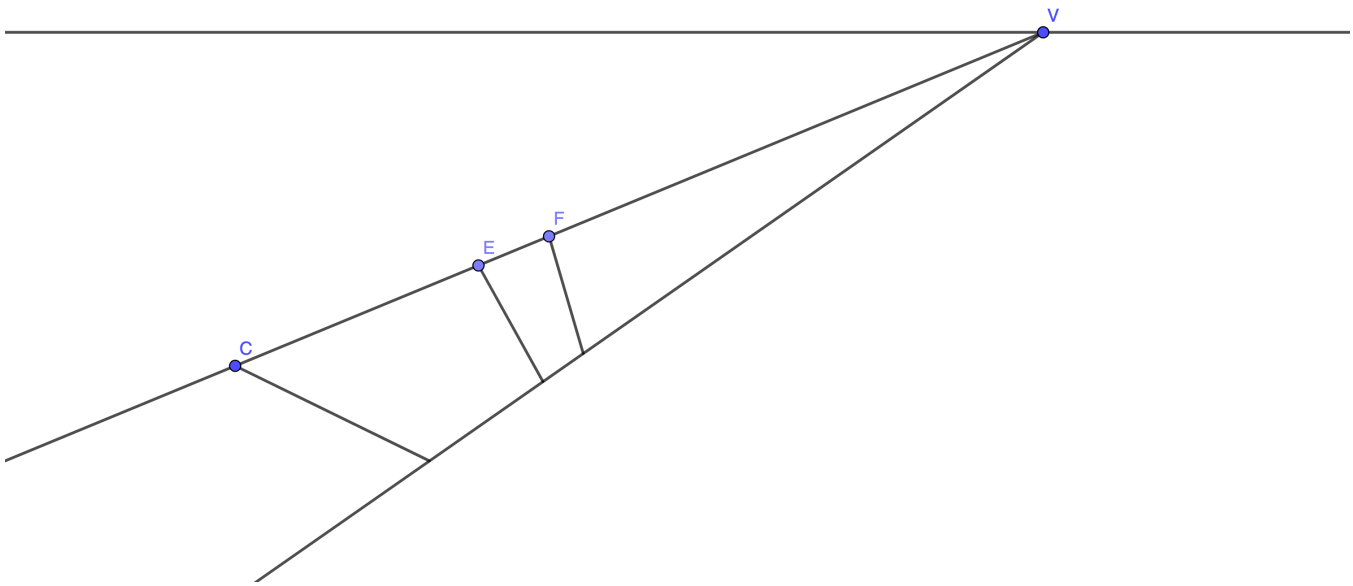
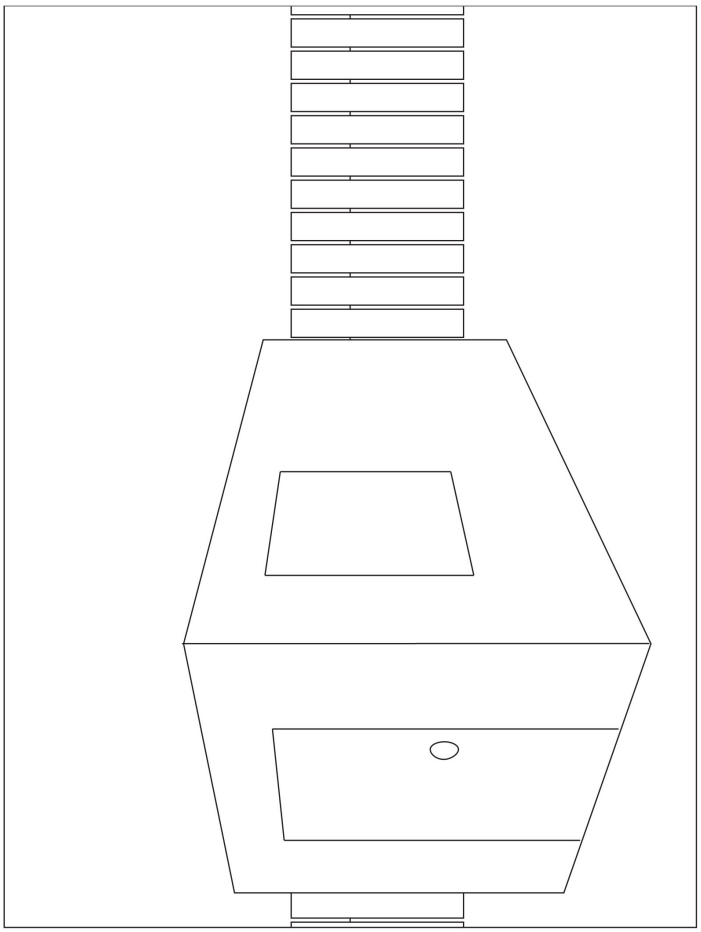
Math 0025: Geometry and Art practice problems, Fall 2025

Note: the total time we would expect you to take on these problems is about 3-4 hours. We will calibrate our exam to be doable in 2 hours.

1. A walk tiled with rectangular tiles is shown vanishing into the distance. Determine whether the first tile is twice the size of the second tile in real life. There are two very different approaches, one with intersections, one with measurement. Try to find both!



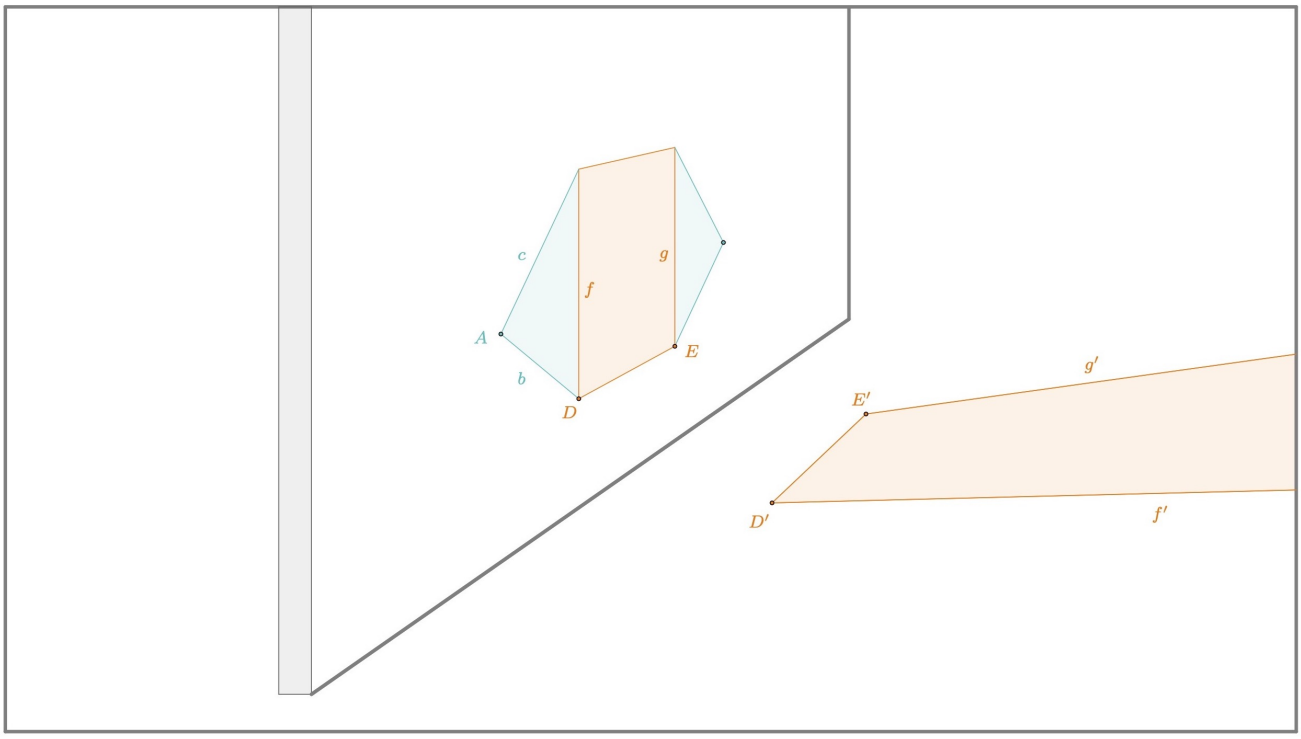
2. The figure (oriented in Landscape) shows a sketch of a house in two-point perspective. Add a second window, on the same wall as the first, so that the two windows are symmetrically placed within the wall they are on. Show and explain all construction lines.



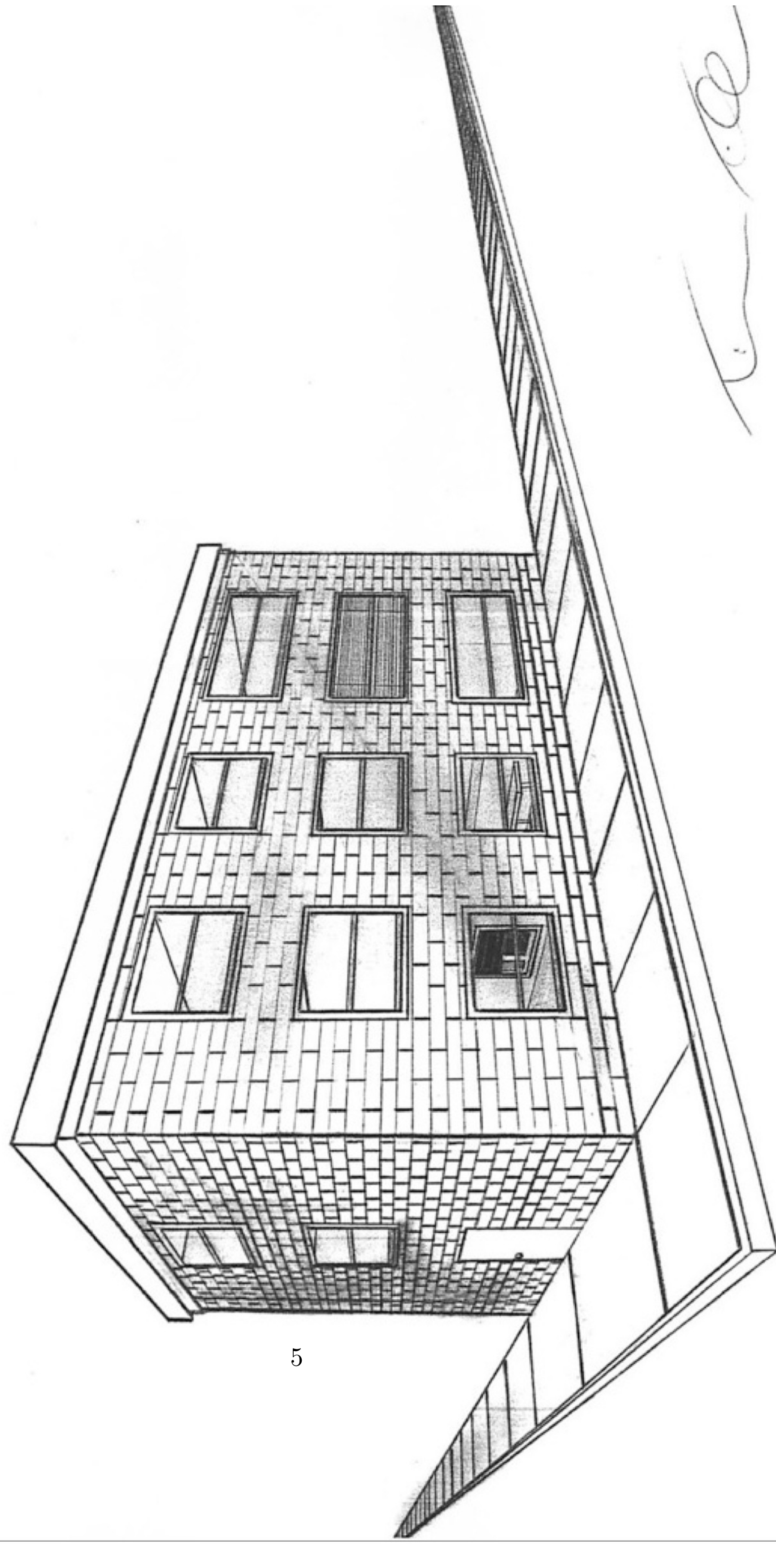
3. The figure shows a wall with a hexagonal stained glass window. The rectangle in the center is done in amber while the side triangles are colored blue. A floor lamp on the other side of the wall casts an image on the floor, the amber part of which is shown, up to where it runs off the page.

   (a) Locate both the top of the lamp (the source of the light) and the base of the lamp on the floor. You can ignore the thickness of the wall.

   (b) Draw the patch of light cast by the lamp through one of the two blue triangles.



4. The figure on the facing page shows a final project done by a Franklin and Marshall student. The nearest sidewalk tile can be assumed to be a real life square. Locate the viewing target and construct the viewing distance.



5. The quadrilateral $BCE'D'$ is a perspective image of a rectangle, with vanishing points A and G. Its diagonals intersect at F. We should use primes for all these points, but it's a hassle, so we're only using primes where we want to refer to the real-life points as well. The ray GF intersects BD' at H and CE' at I. Quadrilateral $HICB$ has diagonals that intersect at J, and the ray GJ intersects CE' at K. The line segment $D'K$ intersects BE' at L and the ray KL intersects $D'E$ at M'.

   Recalling that $D'E'$ is the perspective image of a side DE of a real life rectangle, the point M on DE that maps to M' divides DE in what proportions? [Hint: use Ceva's theorem on the real life triangle $\triangle CDE$.]