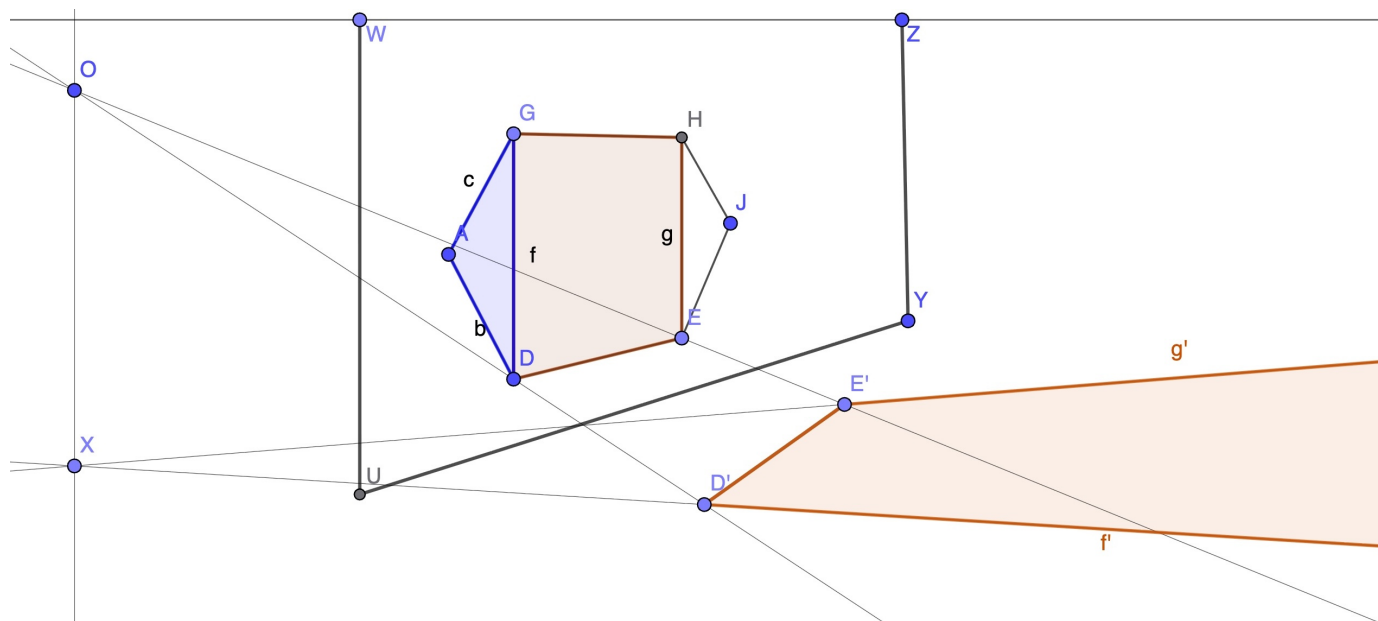**Problem 3 solution:**

Part (a): Let O denote the top of the lamp. Then O, D, D' are collinear in real life, hence also in the perspective drawing shown. The same is true of O, E and E'. Therefore, we can locate O on the drawing as the intersection of lines DD' and EE'. It will appear to be just within the region where there is a wall, though of course it is behind the wall, not on it.

Let X denote the base of the lamp. The lamp stem OX is vertical, hence parallel to the wall. In particular it is parallel to segment f, hence in the plane α determined by the point O and the segment f. The shadow f' is also in α, and is in the plane β of the floor as well. Hence f' intersects the vertical line through O at X, in other words, to draw X, we can intersect the vertical line through O with the line f'.

Alternatively: Lines f' and g' define the plane of the floor and each must pass through X (as above), therefore $X = f' \cap g'$.