bf hints on Problems E10.1 and E10.2

The key to both homework problems E10.1 and E10.2 is to understand the drawing in Figures G and H on page 165. In Figure G, let O denote the position of the observer. Name the lengths on $\triangle OTV_R$ as $|OT| = d$, $|TV_R| = y$ and $|OV_R| = h_R$, as in Figure F (plus I gave a name to $|TV_R|$).

Now ask yourself:

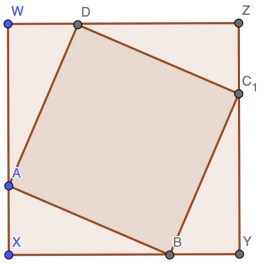
1. The point D_R is supposed to be the vanishing point for which line in the cube? (this question is already in the textbook)
2. What is the angle $\angle V_R O D_R$?
3. What are the lengths of $\triangle OV_R D_R$?

Now in Figure G, you know D_R is somewhere on the vanishing line that is vertical and goes through V_R. But where? If you have correctly identified the lengths of $\triangle OV_R D_R$, you will know how far down the point D_R should be from V_R. Why do the support lines and circles drawn in Figure G accomnplish this?

If you can answer these questions, and similarly for D_L, you will have constructed two important vanishing lines, and the rest of the construction in Figure I is easy.

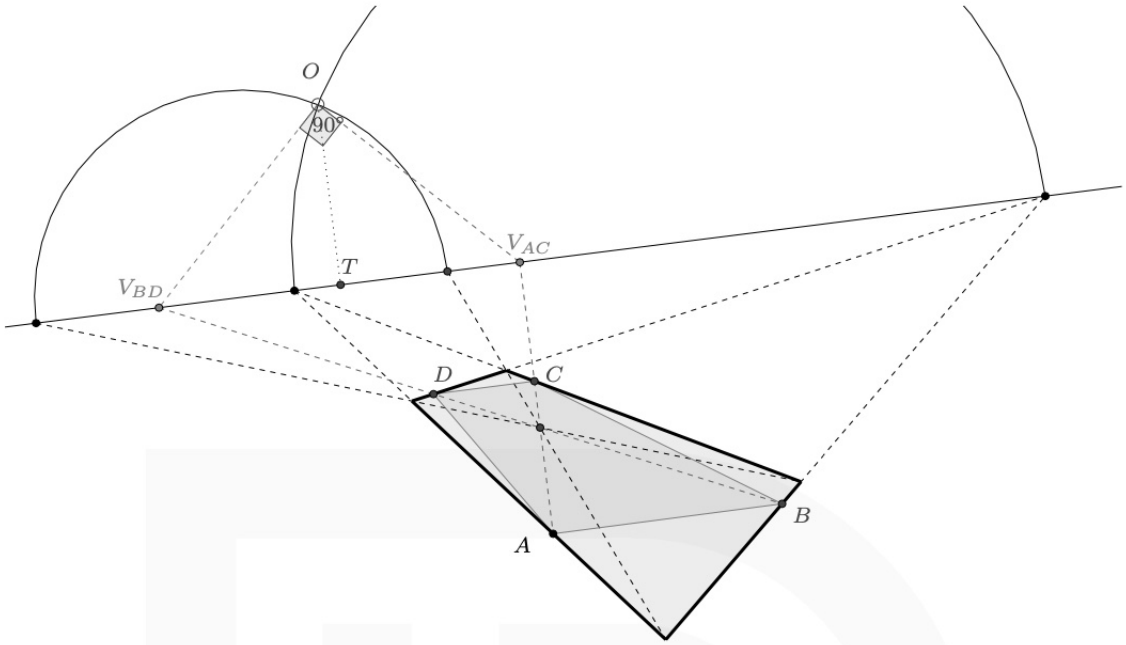
Now, back to E10.1.

For E10.1, first note (I didn't realize this at first!) that the inscribed square is not supposed to be symnmetrically inscribed at the endpoints. Instead, it could be just a small rotation, such as this



Call the outer square WXYZ and the inner one ABCD.

1. What point is easiest to find: B, C or the center of ABCD?
2. What point is next easiest?
3. Where is the diagonal vanishing point of the diagonal AC?
4. The hard part: where is the vanishing point of the other diagonal? A picture is included to help at the top of the next page. Look near the point O to see what's going on.



Lastly, we solve E10.2. (1) Call the three squares the **dark** square, the **dashed** square and the **light** square. Just to be clear, you are given the dark square, viewed in two-point perspective, and its viewing target, but you are not given the dashed square or the light square. Those are what you have to find.

1. Using the dark square, find these things: the vanishing point for one pair of parallel edges of the dark square; the vanishing point of the other pair of edges; the vanishing line for the plane of the square; the two vanishing points for the two diagonals of the dark square; the viewing distance and viewing target.

2. The light square and the dashed square contain the vertical line through the common center point of the three squares. Can you use this to find the vanishing line for the light plane and the dashed plane?

3. The hard part: use a method similar to the one in the previous problems (Figures F and G, and the inscribed square problem) to locate where on these vanishing lines you can find the vanishing point for a certain pair of parallel edges on the dashed square. Do the same for a pair of parallel edges on the light square. Intersecting these, you should be able to locate the top point. You're almost done! If you still have energy, repeat this last step to locate the bottom point.