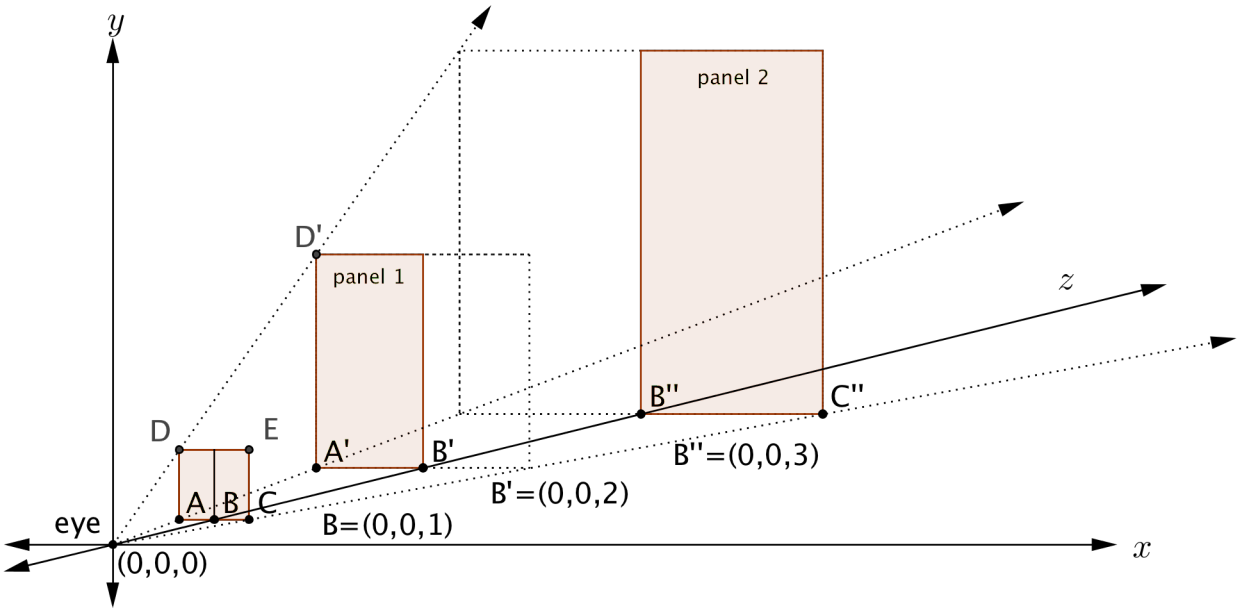
Creating a simple anamorphism onto multiple surfaces



Suppose we want to create two panels, labeled panel 1 and panel 2 in the figure above, so that when viewed from the eye position at (0,0,0), they appear to be a square, namely the square $ADEC$.

1) Point B is located halfway between A and C and is at (0,0,1). If the square is one unit wide, that means point A is at $(-1/2, 0, 1)$. Where is point C, D and E located?

2) If B' is at (0,0,2), then where is A' located? Hint: use similar triangles.

3) If B'' is at (0,0,3), then where is C'' located?

4) Use D to find D'. Hint: A' and D' share the same x-coordinate.

This shows that we can place two panels, one of size 1×2 and another of size $3/2 \times 3$ at these locations, and when we look at these panels through the eye point, they will appear to line up to a perfect square. We can break a picture up into smaller grids and place them at many more locations for a more impressive anamorphism.

Answer key:

1) Point C is at $(1/2, 0, 1)$, D at $(-1/2, 1, 1)$ and E at $(1/2, 1, 1)$.

2) By similar triangles OBA and $OB'A'$, we see that $\overline{A'B'}$ must have length 1. So A' is at $(-1, 0, 2)$.

3) By similar triangles OBC and $OB''C''$, we see that $\overline{B''C''}$ must have length $3/2$. So A' is at $(3/2, 0, 3)$.

4) We know that $\overline{A'D'}$ has length 2, since $\overline{A'B'}$ has length 1. So it must be at $(-1, 2, 2)$.