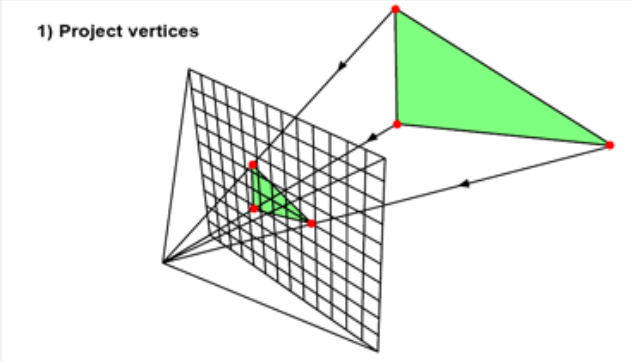
CS 418: Interactive Computer Graphics
In-class Worksheet: Introduction to Rasterization

You Are the Rendering Engine

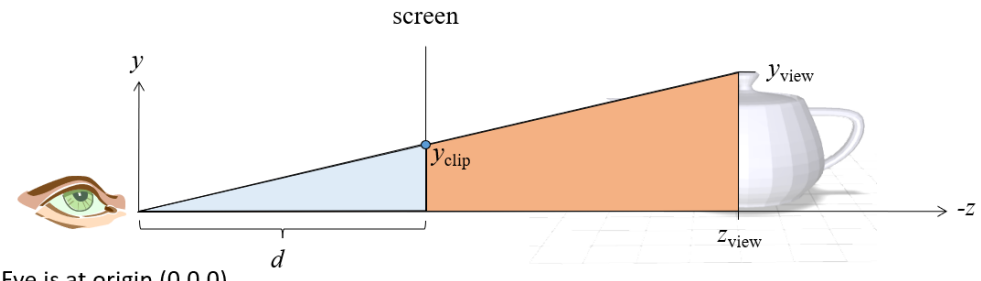
1. Projection

Imagine we construct a digital model of a scene with a single triangle. In our world coordinate system, the vertices of the triangle are at:
(-4, 4,-4), (4,4,-4), (4,-4,-8)

We place the eyepoint at (0,0,0) and will use perspective projection.
What are the coordinates when projected onto the image plane z = -1?



How to Compute a Perspective Projection for the y coordinate



Eye is at origin (0,0,0)
Screen is distance d from the eye.
Looking down negative z-axis.

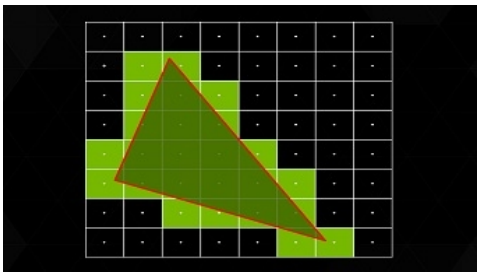
$$\frac{y_{clip}}{d} = \frac{y_{view}}{-z_{view}}$$

The two triangles are *similar*
(two angles are obviously congruent)

$$y_{clip} = d\,\frac{y_{view}}{-z_{view}} = \frac{y_{view}}{-z_{view}/d}$$

This means corresponding sides
are in the same proportions

2. Rasterization



The raster (set of pixels we are generating) is an 8x8 grid of pixels centered on (0,0,0) with the bottom left corner at (-2,-2,-1) and the top right corner at (2,2,-1) in world coordinates.

Suppose that we call 2D pixel coordinates the ***viewport coordinates.*** The bottom left pixel has viewport coordinates (0,0). Which pixels will be lit up for the triangle? You can find this by drawing on the grid below and coloring in any pixels the triangle crosses.