1. **Projection Transformation** (Camera Coordinates to Viewplane Coordinates)

   Let (x_c, y_c, z_c) be a point in camera coordinates and let (x_p, y_p, z_p) be its perspective projection onto the viewplane. Then

   $$x_p = -x_c/z_c, \qquad y_p = -y_c/z_c, \qquad z_p = -1.$$

2. **Clipping Equations**

   Let v_0 and v_1 be the endpoints of a line segment in the viewplane $z = -1$. If the line segment crosses the line $x = 1$, or $x = -1$, or $y = 1$, or $y = -1$ (respectively), then we solve for t in the equation

   $$\begin{aligned}(1-t)v_0 + tv_1 &= (1, y_c)\\ (1-t)v_0 + tv_1 &= (-1, y_c)\\ (1-t)v_0 + tv_1 &= (x_c, 1)\\ (1-t)v_0 + tv_1 &= (x_c, -1)\end{aligned}$$

   (respectively) to find the point v_c where the line segment should be clipped. Then use that value of t to interpolate color from v_0 and v_1 to v_c,

   $$(r(t), g(t), b(t)) = (1-t)\,(r(0), g(0), b(0)) + t\,(r(1), g(1), b(1)).$$

3. **Viewplane to Pixelplane Transformation**

   Let $(x_p,\ y_p,\ -1)$ be a point within the viewplane's view rectangle and let (x_{vp}, y_{vp}) be its transformation to the logical viewport in the renderer's pixelplane. Then

   $$x_{vp} = 0.5 + (w/2.001)(x_p + 1),$$

   $$y_{vp} = 0.5 + (h/2.001)(y_p + 1).$$

   Points (x_{vp}, y_{vp}) in the renderer's logical viewport have coordinates that satisfy

   $$0.5 \le x_{vp} < w + 0.5 \qquad \text{and} \qquad 0.5 \le y_{vp} < h + 0.5.$$

4. **Pixelplane to Pixel Transformation**

   Let (x_{vp}, y_{vp}) be a point in the renderer's logical viewport (in the pixelplane) and let (x, y) be the equivalent pixel in the framebuffer's viewport. Then

   $$x = (\texttt{int})\texttt{Math.round}(x_{vp}) - 1$$

   $$y = h - (\texttt{int})\texttt{Math.round}(y_{vp})$$

   Pixels (x, y) in a framebuffer's viewport have integer coordinates that satisfy

   $$0 \le x \le w - 1 \qquad \text{and} \qquad 0 \le y \le h - 1$$

   with the pixel $(0, 0)$ being in the upper left hand corner.