2D Liang-Barsky Clipping (Hearn and Baker)

The idea of the L-B clipping algorithm is to do as much testing as possible before computing line intersections. Consider first the usual parametric form of a straight line:

$$x = x_0 + u(x_1 - x_0) = x_0 + u\,\Delta x$$
$$y = y_0 + u(y_1 - y_0) = y_0 + u\,\Delta y$$

A point is in the clip window if

$$x_{min} \le x_0 + u\,\Delta x \le x_{max}$$
$$y_{min} \le y_0 + u\,\Delta y \le y_{max}$$

which can be expressed as the 4 inequalities

$$u\,p_k \le q_k \qquad k = 1, 2, 3, 4$$

where

$p_1 = -\Delta x$	$q_1 = x_0 - x_{min}$	(left)
$p_2 = \Delta x$	$q_2 = x_{max} - x_0$	(right)
$p_3 = -\Delta y$	$q_3 = y_0 - y_{min}$	(bottom)
$p_4 = \Delta y$	$q_4 = y_{max} - y_0$	(top)

1. A line parallel to a clipping window edge has $p_k = 0$ for that boundary.

2. If for that k, $q_k < 0$, the line is completely outside and can be eliminated.

3. When $p_k < 0$ the line proceeds outside to inside the clip window and when $p_k > 0$, the line proceeds inside to outside.

4. For nonzero p_k, $u = q_k/p_k$ gives the intersection point.

5. For each line, calculate u_1 and u_2. For u_1, look at boundaries for which $p_k < 0$ (outside $\longrightarrow$ in). Take u_1 to be the largest among (0, q_k/p_k). For u_2, look at boundaries for which $p_k > 0$ (inside $\longrightarrow$ out). Take u_2 to be the minimum of (1, q_k/p_k). If $u_1 > u_2$, the line is outside and therefore rejected.