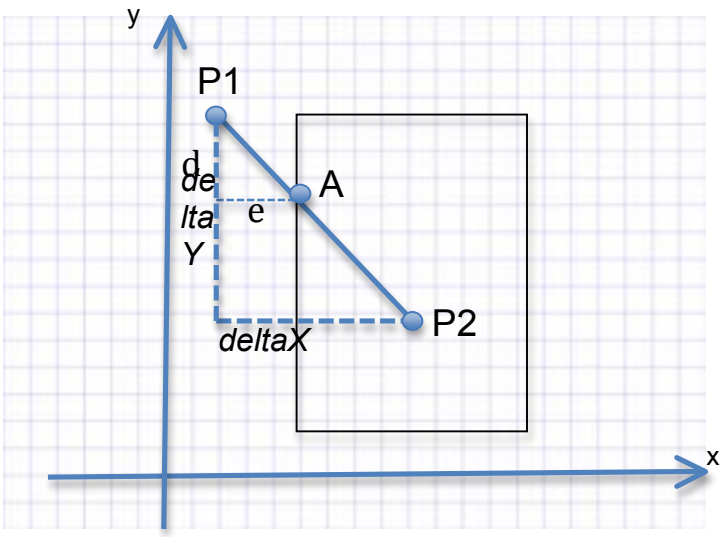
CSCI 4250/5250 Cohen-Sutherland Clipping

- **The algorithm:** https://www.cs.mtsu.edu/~cen/4250/private/lectures/ClippingAlg.html
- **Deriving the clipping equations:**



Clip from the left : given $A.x = W.left, compute A.y$:

$$\frac{d}{deltaY} = \frac{e}{deltaX}$$

$$\frac{d}{e} = \frac{deltaY}{deltaX} = \frac{P1.y - P2.y}{P2.x - P1.x} = -\frac{P1.y - P2.y}{P1.x - P2.x} = -k$$

$$d = P1.y - A.y$$

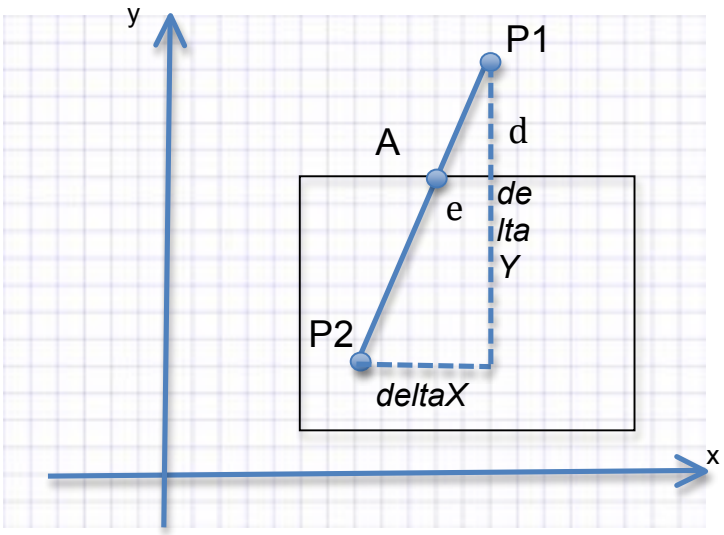
$$e = A.x - P1.x$$

$$\frac{P1.y - A.y}{A.x - P1.x} = -k$$

$$P1.y - A.y = -k * (A.x - P1.x)$$

$$A.y - P1.y = k * (W.left - P1.x)$$

$$A.y = P1.y + k * (W.left - P1.x)$$



Clip from the top, given $A.y = W.top$, compute $A.x$:

$$\frac{d}{deltaY} = \frac{e}{deltaX}$$

$$\frac{d}{e} = \frac{deltaY}{deltaX} = \frac{P1.y - P2.y}{P1.x - P2.x} = k$$

$$d = P1.y - A.y$$

$$e = P1.x - A.x$$

$$\frac{P1.y - A.y}{P1.x - A.x} = k$$

$$\frac{P1.x - A.x}{P1.y - A.y} = \frac{1}{k}$$

$$P1.x - A.x = \frac{1}{k} * (P1.y - A.y)$$

$$P1.x - A.x = \frac{1}{k} * (P1.y - W.top)$$

$$A.x = P1.x - \frac{1}{k} * (P1.y - W.top)$$

$$A.x = P1.x + \frac{1}{k} * (W.top - P1.y)$$

- **Clipping equations:**

(clip from left: A.y=P1.y + k*(W.left - P1.x)
from right: A.y=P1.y + k*(W.right - P1.x)
from above: A.x=P1.x+1/k *(W.top - P1.y)
from below: A.x=P1.x+1/k*(w.bottom - P1.y)
k is the slope of the line that connects P1 and P2)

- **Practice Problem:**
  Given a window (50, 120, 0, 100), apply the Cohen-Sutherland Clipping algorithm to determine the segment of line that will be displayed on screen:
  - p1(50, 40), p2(100, 20)
  - p1(10, 120), p2(70, 120)
  - p1(10, 170), p2(100, 0)
  - P1(20, -10) and P2(200, 200)