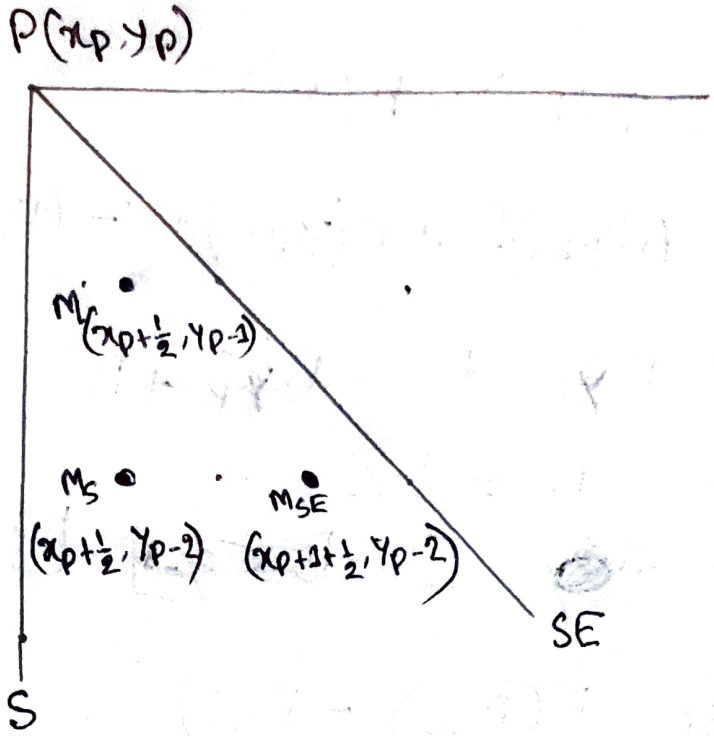
ZONE-6:



Zone-6 : $(y_1 < y_0)$ && $(x_0 <= x_1)$

Here,

$$F(P) = F(x_p, y_p) = Ax_p + By_p + C$$

$$F(M) = F(x_p + \tfrac{1}{2}, y_p - 1) = A(x_p + \tfrac{1}{2}) + B(y_p - 1) + C$$

$$F(M_S) = F(x_p + \tfrac{1}{2}, y_p - 2) = A(x_p + \tfrac{1}{2}) + B(y_p - 2) + C$$

$$F(M_{SE}) = F(x_p + 1 + \tfrac{1}{2}, y_p - 2) = A(x_p + 1 + \tfrac{1}{2}) + B(y_p - 2) + C$$

We know,

$$\text{Dinit} = F(M) - F(P)$$

$$= A(x_p + \tfrac{1}{2}) + B(y_p - 1) + C - Ax_p - By_p + C$$

$$= Ax_p + A/2 + By_p - B + C - Ax_p - By_p - C$$

$$= \frac{A}{2} - B$$

$$= \frac{dy}{2} + dx \quad [\because A = dy,\ B = -dx)$$

Again,

$$D_S = F(M_S) - F(M)$$

$$= A\left(x_p + \tfrac{1}{2}\right) + B(y_p - 2) + c - A\left(x_p + \tfrac{1}{2}\right) - B(y_p - 1) - c$$

$$= By_p - 2B - By_p + B$$

$$= -B = dx$$

$$= -$$ ∵ $[\because B = -dx]$

And,

$$D_{SE} = F(M_{SE}) - F(M)$$

$$= A\left(x_p + 1 + \tfrac{1}{2}\right) + B(y_p - 2) + c - \left\{A\left(x_p + \tfrac{1}{2}\right) + B(y_p - 1) + c\right\}$$

$$= Ax_p + A + \frac{A}{2} + By_p - 2B + c - Ax_p + \frac{A}{2} - By_p + B - c$$

$$= A - B$$

$$= dy + dx \quad [\because A = dy,\ B = -dx]$$

As fraction, DO, multiply by 2

$$D_{init} = dy + 2dx$$

$$D_S = 2dx$$

$$D_{SE} = 2dy + 2dx$$

Now, Algorithm (code segment)

```
void MidpointLine (int x0, int y0, int x1, int y1, int color)
{ int dx = x1 - x0, dy = y1 - x0, x = x0, y = y0;
  int Dinit = dy + 2 * dx ;
int Ds = 2 * dx ;
  int DSE = 2*dy + 2*dx ;
  WritePixel (x, y, color);
  while(y > y1)
  {
     if (Dinit < 0) Dinit += Ds ;
     else{ Dinit += DSE ; x++;}
     y-- ;
      writPixel (x, y, color);
  }
```