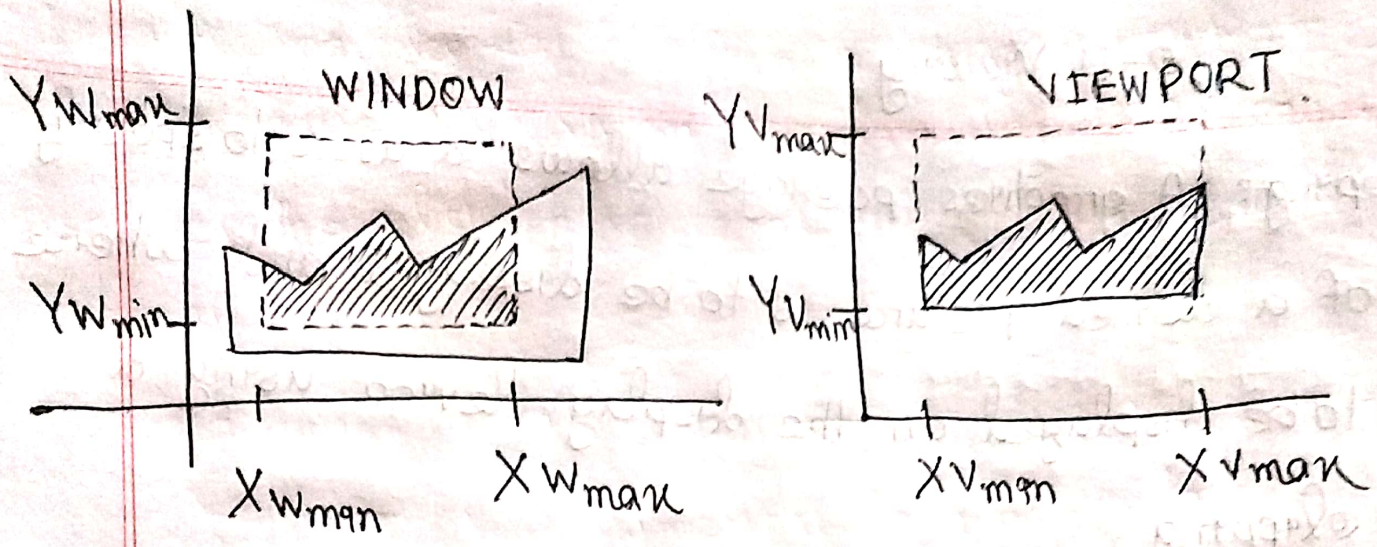
2-D Viewing

Clipping: A graphics package allows a user to specify which part of a defined picture is to be displayed and where the part is to be displayed on the display device using a concept → clipping.

World Coordinate System: Any conventional cartesian co-ordinate system, referred to as World co-ordinate system, which is a reference frame can be used to define the picture

For a 2-D picture, a view is selected by specifying a subarea of the total picture which is called window.

The This selected part (window) is then mapped to specific areas of the device co-ordinates. which is know as viewport.



Window Coordinate Device Coordinate.

1) A world co-ordinate area selected for display is called window.

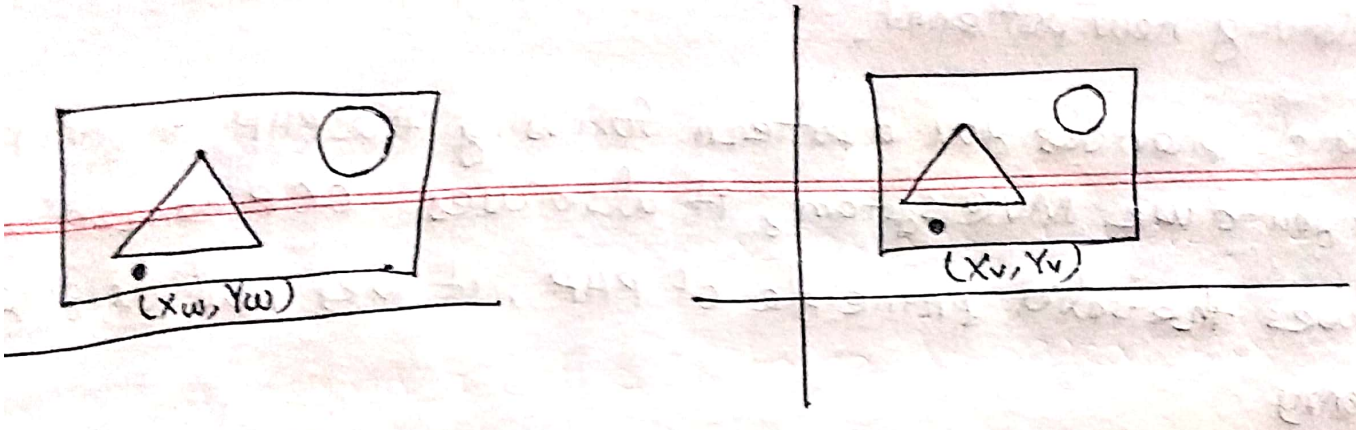
2) An area on a display device to which a window is mapped is called viewport.

Window → what is to be viewed

Viewport → where it is to be displayed.

Mapping of a part of a world coordinate scene to d co-ordinate is referred to as Viewing Transformation.

Sometimes, The 2-D viewing transformation is simply refe to as the "window to viewport" transformation or the "Windowing Transformation".



Relative position will not change. Only size will change long to window and viewport.

$$\frac{X_w - X_{W_{min}}}{X_{W_{max}} - X_{W_{min}}} = \frac{X_v - X_{V_{min}}}{X_{V_{max}} - X_{V_{min}}}$$

$$\frac{Y_w - Y_{W_{min}}}{Y_{W_{max}} - Y_{W_{min}}} = \frac{Y_v - Y_{V_{min}}}{Y_{V_{max}} - Y_{V_{min}}}$$

$$X_v - X_{V_{min}} = (X_{V_{max}} - X_{V_{min}}) \frac{X_w - X_{W_{min}}}{X_{W_{max}} - X_{W_{min}}}$$

$$= X_w - X_{W_{min}} \cdot \boxed{\frac{X_{V_{max}} - X_{V_{min}}}{X_{W_{max}} - X_{W_{min}}}}$$

↳ Scaling factor. S_x.

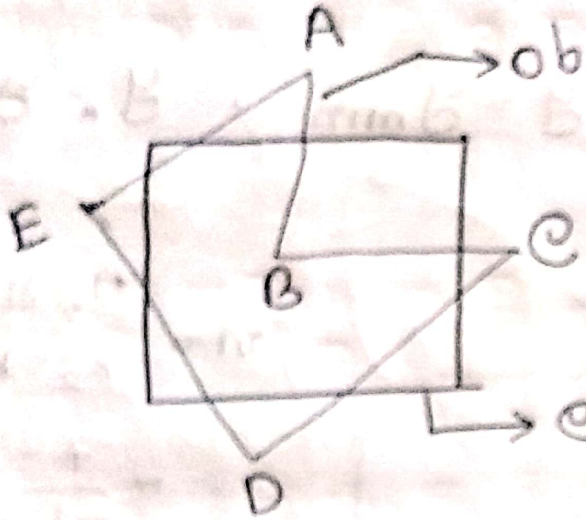
$$X_v - X_{V_{min}} = (X_w - X_{W_{min}}) \cdot S_x$$

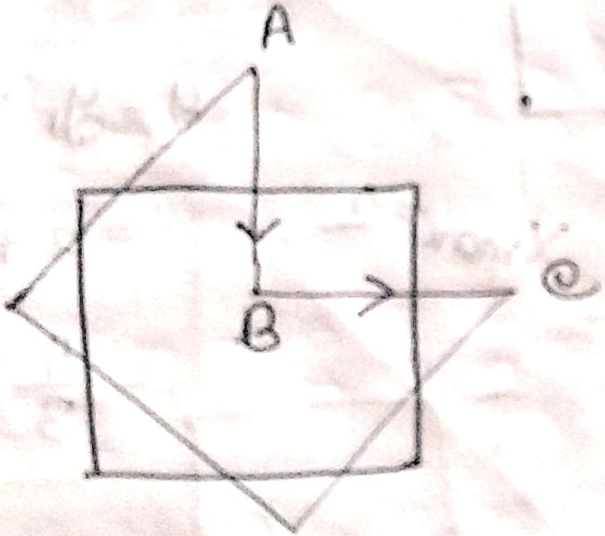
$$X_v = X_{V_{min}} + (X_w - X_{W_{min}}) \cdot S_x$$

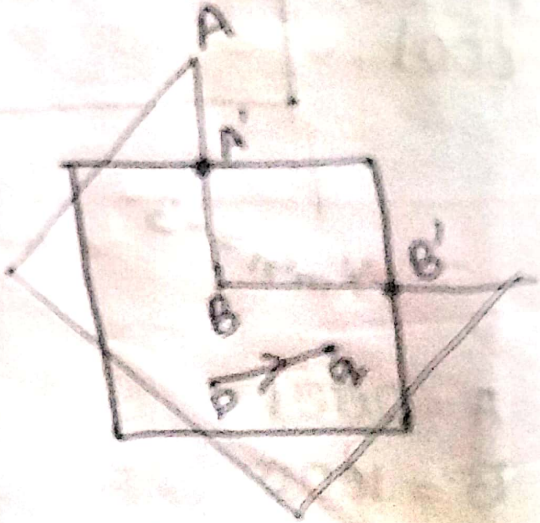
Only,

$$Y_v = Y_{V_{min}} + (Y_w - Y_{W_{min}}) \cdot S_y$$

Sutherland Hodgman Polygon clipping Algorithm







= B

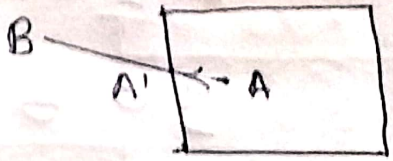
4 cases

① outside

(out - in)

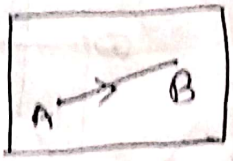
= A'B

②



= A'

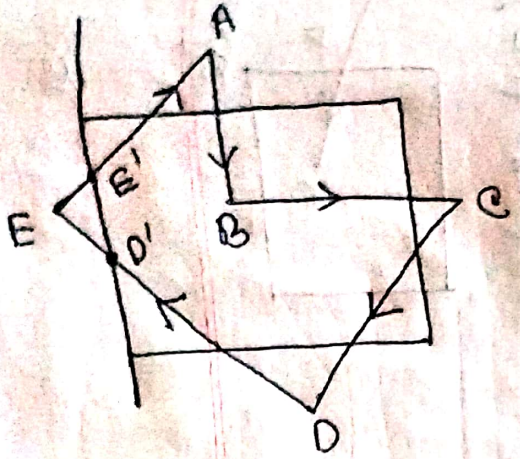
③



= B

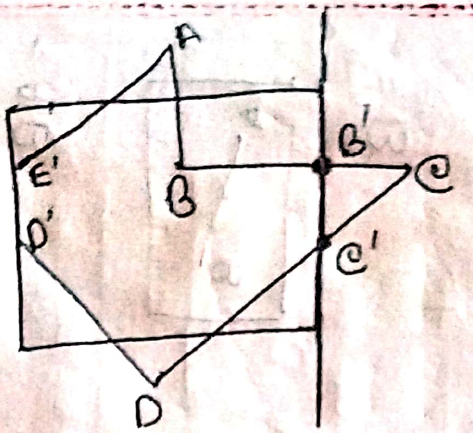
④

= Null.



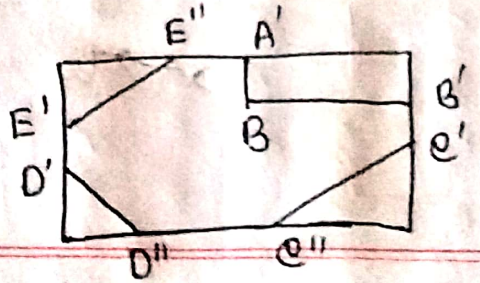
left clip

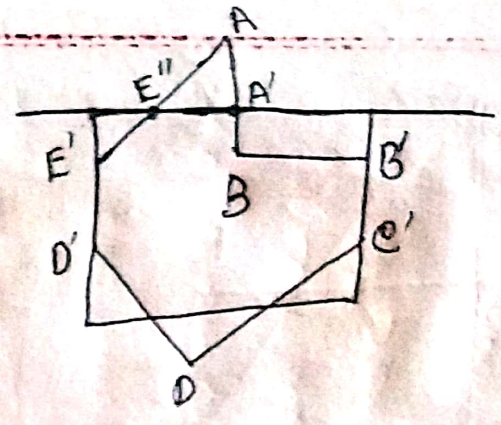
vertex	case	output
AB	in-in	B
BC	in-in	C
CD	in-in	D
DE	in-out	D'
EA	out-in	E'A



Right clip

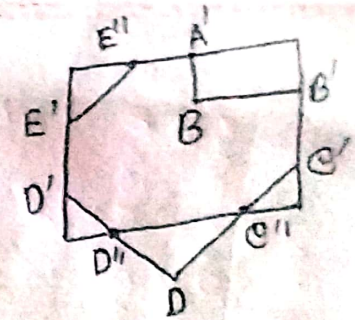
Vertex	case	Output
AB	in-in	B
BC	in-out	B'
CD	out-in	C'D
DD'	in-in	D'
D'E'	in-in	E'
E'A	in-in	A





Top clip

Vertex	case	Output
AB	out-in	A'B
BB'	in-in	B'
B'C'	in-in	C'
C'D	in-in	D
DD'	in-in	D'
D'E'	in-in	E'
E'A'	in-out	E''



Bottom clip

Vertex	case	Output
A'B	in-in	B
BB'	in-in	B'
B'C'	in-in	C'
C'D	in-out	C''
DD'	out-in	D''D'
D'E'	in-in	E'
E'E''	in-in	E''
E''A'	in-in	A'