

1) Resolusi adalah istilah yang digunakan untuk menyatakan jumlah titik atau pixel yang digunakan untuk gambar.

Aspek rasio adalah angka yang menunjukkan perbandingan panjang dan lebar suatu bidang gambar yang dinyatakan sebagai panjang/lebar.

Frame Buffer adalah memori yang menyimpan informasi dari suatu image/gambar

Interlacing adalah metode untuk menampilkan image/gambar dalam raster scanned display device seperti CRT televisi analog, yang ditampilkan bergantian antara garis ganjil dan genap secara cepat untuk setiap frame.

Pixel adalah bagian terkecil dari gambar yang ditampilkan oleh perangkat. Perangkat seperti monitor, dan televisi.

2) titik A (3, -2) ; titik B (-1, 2)

o) Algoritma DDA

$$dx = X_2 - X_1 = (-1) - 3 = -4$$

$$dy = Y_2 - Y_1 = 2 - (-2) = 4$$

$$dt = n \Rightarrow |dx| = |dy| = 4$$

$$dxdt = -4/4 = -1$$

$$dydt = 4/4 = 1$$

iterasi 1

$$(3, -2) \quad x = x + dxdt = 3 + (-1) = 2$$

$$y = y + dydt = -2 + 1 = -1$$

iterasi 2

$$(2, -1) \quad x = x + dxdt = 2 + (-1) = 1$$

$$y = y + dydt = -1 + 1 = 0$$

iterasi 3

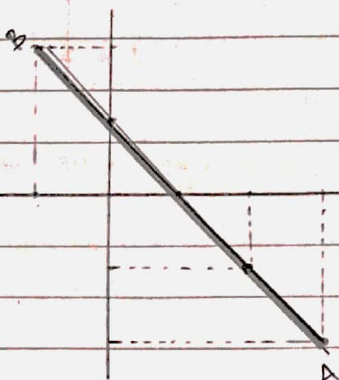
$$(1, 0) \quad x = x + dxdt = 1 + (-1) = 0$$

$$y = y + dydt = 0 + 1 = 1$$

iterasi 4

$$(0, 1) \quad x = x + dxdt = 0 + (-1) = -1$$

$$y = y + dydt = 1 + 1 = 2$$



o) Algoritma Bresenham

Hanya bisa dibuat pada garis dengan gradien  $0 < m < 1$

$$\text{gradien} = \frac{\Delta y}{\Delta x} = \frac{(2 - (-2))}{(-1 - 3)} = \frac{4}{-4} = -1$$

Maka, garis tidak bisa dibuat dengan Algoritma Bresenham

3) Diketahui

$$r = 3 ; \text{titik} \rightarrow X_c = 2 ; Y_c = -4$$

Algoritma Bresenham

K=0

$$x = 0 \quad y = r = 3$$

$$d = 3 - 2r = -3$$

K=1 ( $d \leq 0$ )

$$x = 1 \quad y = 3 \quad (Y \geq x)$$

$$d = d + 4x + 6$$

$$= -3 + 4 + 6 = 7$$

K=2 ( $d > 0$ )

$$x = 2 \quad y = 2 \quad (Y \geq x)$$

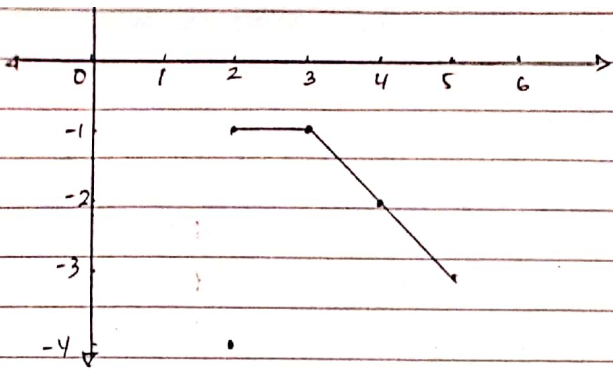
$$d = d + 4(x - y) + 10$$

$$= 7 + 4(2 - 2) + 10 = 17$$

K=3 ( $d > 0$ )

$$x = 3 \quad y = 1 \quad (Y < x)$$

K	x	y	$X_{\text{real}} = X + X_c$	$Y_{\text{real}} = Y + Y_c$
0	0	3	2	-1
1	1	3	3	-1
2	2	2	4	-2
3	3	1	5	-3



c) Translasi  $(-2, 3)$

$$A' = \begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} a \\ b \end{bmatrix}$$

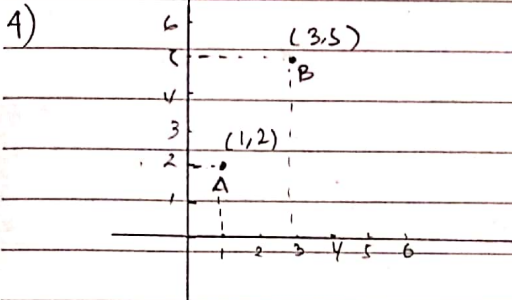
$$= \begin{bmatrix} -3/\sqrt{2} \\ 5/\sqrt{2} \end{bmatrix} + \begin{bmatrix} -2 \\ 3 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-(9+2\sqrt{2})}{\sqrt{2}} \\ \frac{5+3\sqrt{2}}{\sqrt{2}} \end{bmatrix} = \begin{bmatrix} -8,36 \\ 6,54 \end{bmatrix}$$

$$B' = \begin{bmatrix} x'_B \\ y'_B \end{bmatrix} = \begin{bmatrix} x_B \\ y_B \end{bmatrix} + \begin{bmatrix} a \\ b \end{bmatrix}$$

$$= \begin{bmatrix} -23/\sqrt{2} \\ 7/\sqrt{2} \end{bmatrix} + \begin{bmatrix} -2 \\ 3 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-(23+2\sqrt{2})}{\sqrt{2}} \\ \frac{7+3\sqrt{2}}{\sqrt{2}} \end{bmatrix} = \begin{bmatrix} -18,26 \\ 7,95 \end{bmatrix}$$



→ Skala  $(A, 2)$  pada titik pusat  $(-1, 2)$

$$A' = \begin{bmatrix} x'_A \\ y'_A \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} x_A - x_s \\ y_A - y_s \end{bmatrix} + \begin{bmatrix} x_s \\ y_s \end{bmatrix}$$

$$= \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 - (-1) \\ 2 - 2 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

$$= \begin{bmatrix} 8 \\ 0 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$$

$$B' = \begin{bmatrix} x'_B \\ y'_B \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} x_B - x_s \\ y_B - y_s \end{bmatrix} + \begin{bmatrix} x_s \\ y_s \end{bmatrix}$$

$$= \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 - (-1) \\ 5 - 2 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

$$= \begin{bmatrix} 16 \\ 6 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} 15 \\ 8 \end{bmatrix}$$

b) Rotasi  $135^\circ$

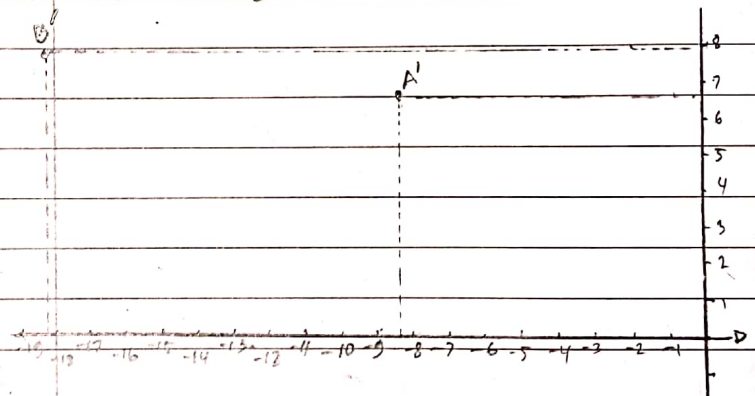
$$A' = \begin{bmatrix} x'_A \\ y'_A \end{bmatrix} = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} x_A \\ y_A \end{bmatrix}$$

$$= \begin{bmatrix} -1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & -1/\sqrt{2} \end{bmatrix} \begin{bmatrix} 7 \\ 2 \end{bmatrix}$$

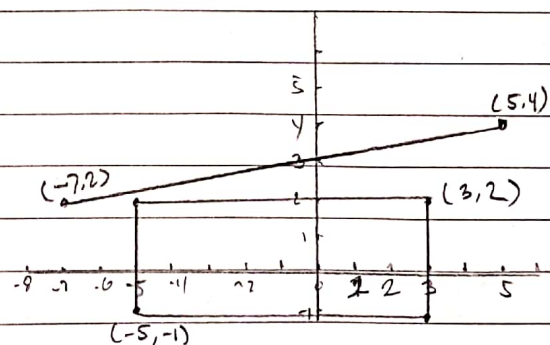
$$= \begin{bmatrix} -9/\sqrt{2} \\ 5/\sqrt{2} \end{bmatrix}$$

$$B' = \begin{bmatrix} x'_B \\ y'_B \end{bmatrix} = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} x_B \\ y_B \end{bmatrix}$$

$$= \begin{bmatrix} -1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & -1/\sqrt{2} \end{bmatrix} \begin{bmatrix} 15 \\ 8 \end{bmatrix} = \begin{bmatrix} -23/\sqrt{2} \\ 7/\sqrt{2} \end{bmatrix}$$



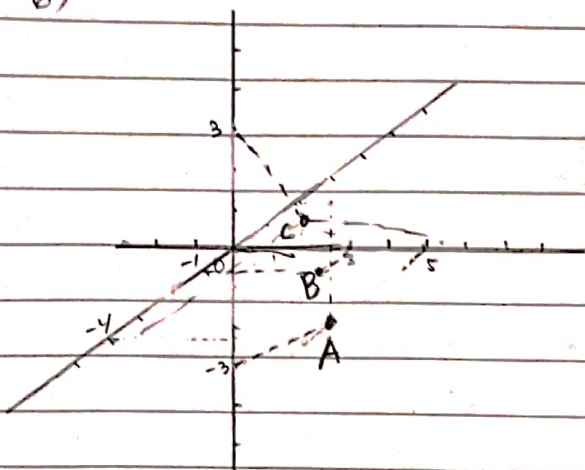
5)



Tidak ada, karena garis diluar area gambar



6)



a) Skala (2, 1, 3)

$$X' = \begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & S_z \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$A' = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 6 \end{bmatrix} \quad A'(2, -3, 6)$$

$$B' = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} 3 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \\ -3 \end{bmatrix} \quad B'(6, 0, -3)$$

$$C'(10, 3, -12)$$

$$C' = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} 5 \\ 3 \\ -4 \end{bmatrix} = \begin{bmatrix} 10 \\ 3 \\ -12 \end{bmatrix}$$

b) Translasi (1, -2, 3)

$$X' = \begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} + \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$A'' = \begin{bmatrix} 2 \\ -3 \\ 6 \end{bmatrix} + \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 3 \\ -5 \\ 9 \end{bmatrix} \quad A''(3, -5, 9)$$

$$B'' = \begin{bmatrix} 6 \\ 0 \\ -3 \end{bmatrix} + \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 7 \\ -2 \\ 0 \end{bmatrix} \quad B''(7, -2, 0)$$

$$C''(11, 1, -9)$$

$$C'' = \begin{bmatrix} 10 \\ 3 \\ -12 \end{bmatrix} + \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 11 \\ 1 \\ -9 \end{bmatrix}$$

c) Rotasi sumbu X sebesar  $45^\circ$ 

$$X' = \begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos \theta & -\sin \theta \\ 0 & \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$A''' = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/\sqrt{2} & -1/\sqrt{2} \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix} \begin{bmatrix} 3 \\ -5 \\ 9 \end{bmatrix} = \begin{bmatrix} 3 \\ -14/\sqrt{2} \\ 4/\sqrt{2} \end{bmatrix} = \begin{bmatrix} 3 \\ -9,9 \\ 2,8 \end{bmatrix}$$

$$B''' = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/\sqrt{2} & -1/\sqrt{2} \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix} \begin{bmatrix} 7 \\ -2 \\ 0 \end{bmatrix} = \begin{bmatrix} 7 \\ -2/\sqrt{2} \\ -2/\sqrt{2} \end{bmatrix} = \begin{bmatrix} 7 \\ -1,4 \\ -1,4 \end{bmatrix}$$

$$C''' = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/\sqrt{2} & -1/\sqrt{2} \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix} \begin{bmatrix} 11 \\ 1 \\ -9 \end{bmatrix} = \begin{bmatrix} 11 \\ 10/\sqrt{2} \\ -8/\sqrt{2} \end{bmatrix} = \begin{bmatrix} 11 \\ 7,1 \\ -5,7 \end{bmatrix}$$

