

## **BCT 2405 Computer Graphical systems:**

Attempt the following as build up Exercises

### **1. Using DDA line drawing Algorithm**

- A) Calculate the points between the starting point (5, 6) and ending point (13, 10). and plot the line
- B) Calculate the points between the starting point (9,1) and ending point (16, 3). and plot the line

**Solution to Calculate the points between the starting point (5, 6) and ending point (13, 10). and plot the line**

### **Solution to A**

Given-

- Starting coordinates =  $(X_0, Y_0) = (5, 6)$
- Ending coordinates =  $(X_n, Y_n) = (13, 10)$

#### **Step-01:**

Calculate  $\Delta X$ ,  $\Delta Y$  and  $M$  from the given input.

- $\Delta X = X_n - X_0 = 13 - 5 = 8$
- $\Delta Y = Y_n - Y_0 = 10 - 6 = 4$
- $M = \Delta Y / \Delta X = 4 / 8 = 0.50$

#### **Step-02:**

Calculate the number of steps.

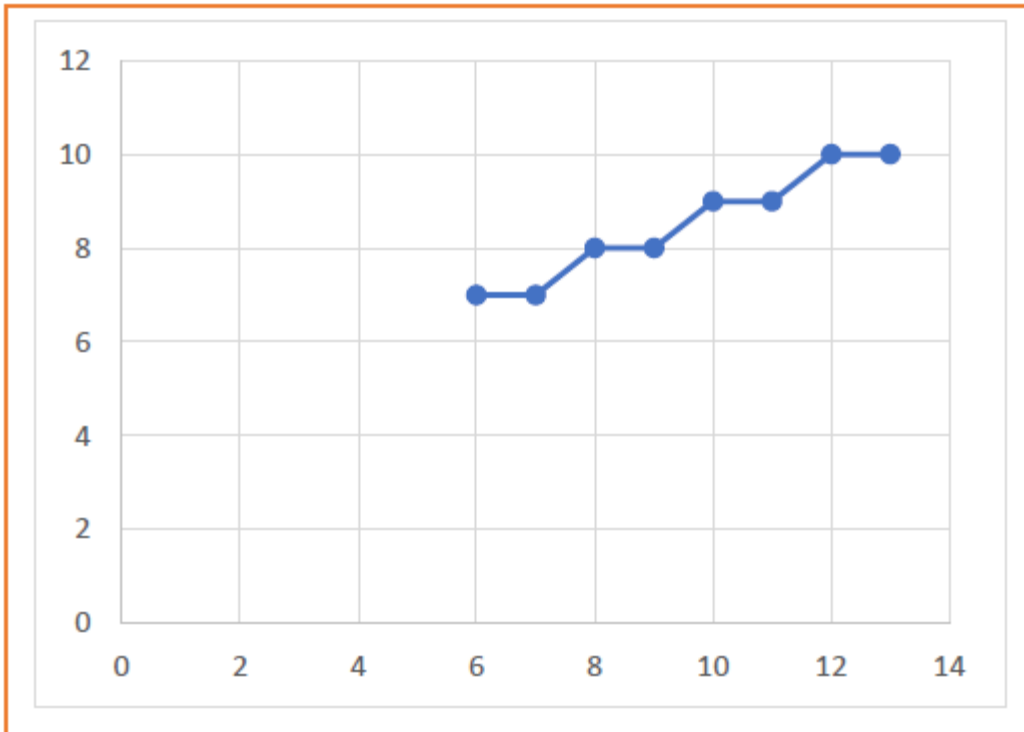
As  $|\Delta X| > |\Delta Y| = 8 > 4$ , so number of steps =  $\Delta X = 8$

### **Step-03:**

As  $M < 1$ , so case-01 is satisfied.

Now, Step-03 is executed until Step-04 is satisfied.

$X_p$	$Y_p$	$X_{p+1}$	$Y_{p+1}$	Round off ( $X_{p+1}, Y_{p+1}$ )
5	6	6	6.5	(6, 7)
		7	7	(7, 7)
		8	7.5	(8, 8)
		9	8	(9, 8)
		10	8.5	(10, 9)
		11	9	(11, 9)
		12	9.5	(12, 10)
		13	10	(13, 10)



**Please attempt B:**

**2. Using Bresenham's Line-Drawing Algorithm**

- A) Calculate the points between (20, 10) and ending coordinates (30, 18) and plot the line
- B) .Calculate the points between the starting point (10,3) and ending point (18, 4). and plot the line

## **Solution to A**

## **Solution-**

Given-

- Starting coordinates =  $(X_0, Y_0) = (20, 10)$
- Ending coordinates =  $(X_n, Y_n) = (30, 18)$

### **Step-01:**

Calculate  $\Delta X$  and  $\Delta Y$  from the given input.

- $\Delta X = X_n - X_0 = 30 - 20 = 10$
- $\Delta Y = Y_n - Y_0 = 18 - 10 = 8$

### **Step-02:**

Calculate the decision parameter.

$$P_k$$

$$= 2\Delta Y - \Delta X$$

$$= 2 \times 8 - 10$$

$$= 6$$

So, decision parameter  $P_k = 6$

### **Step-03:**

As  $P_k \geq 0$ , so case-02 is satisfied.

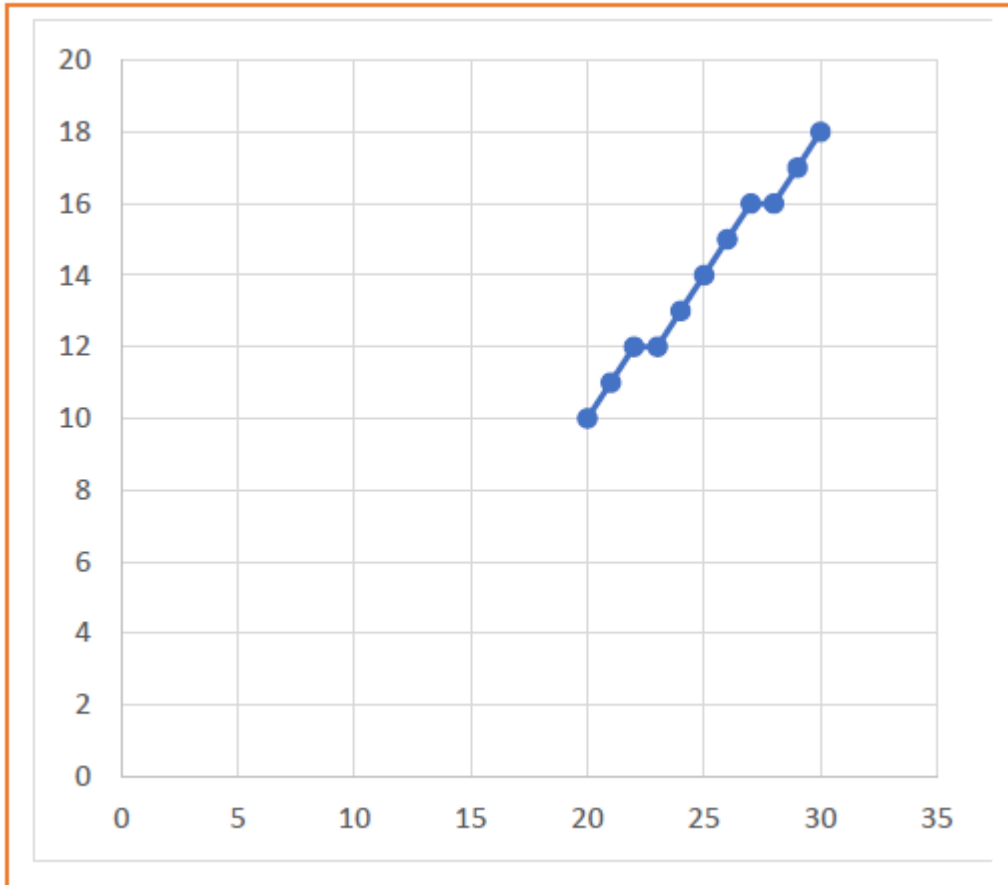
Thus,

- $P_{k+1} = P_k + 2\Delta Y - 2\Delta X = 6 + (2 \times 8) - (2 \times 10) = 2$
- $X_{k+1} = X_k + 1 = 20 + 1 = 21$
- $Y_{k+1} = Y_k + 1 = 10 + 1 = 11$

Similarly, Step-03 is executed until the end point is reached or number of iterations equals to 9 times.

(Number of iterations =  $\Delta X - 1 = 10 - 1 = 9$ )

$P_k$	$P_{k+1}$	$X_{k+1}$	$Y_{k+1}$
		20	10
6	2	21	11
2	-2	22	12
-2	14	23	12
14	10	24	13
10	6	25	14
6	2	26	15
2	-2	27	16
-2	14	28	16
14	10	29	17
10	6	30	18



### 3. Using Midpoint Line-Drawing Algorithm

- A) Calculate the points (5, 9) and ending coordinates (12, 16).and plot the line
- B) .Calculate the points between the starting point (18,17) and ending point (43, 4). and plot the line

#### **Solution to A**

Given-

- Starting coordinates =  $(X_0, Y_0) = (5, 9)$
- Ending coordinates =  $(X_n, Y_n) = (12, 16)$

#### **Step-01:**

Calculate  $\Delta X$  and  $\Delta Y$  from the given input.

- $\Delta X = X_n - X_0 = 12 - 5 = 7$
- $\Delta Y = Y_n - Y_0 = 16 - 9 = 7$

### **Step-02:**

Calculate  $D_{\text{initial}}$  and  $\Delta D$  as-

- $D_{\text{initial}} = 2\Delta Y - \Delta X = 2 \times 7 - 7 = 7$
- $\Delta D = 2(\Delta Y - \Delta X) = 2 \times (7 - 7) = 0$

### **Step-03:**

As  $D_{\text{initial}} \geq 0$ , so case-02 is satisfied.

Thus,

- $X_{k+1} = X_k + 1 = 5 + 1 = 6$
- $Y_{k+1} = Y_k + 1 = 9 + 1 = 10$
- $D_{\text{new}} = D_{\text{initial}} + \Delta D = 7 + 0 = 7$

Similarly, Step-03 is executed until the end point is reached.

$D_{\text{initial}}$	$D_{\text{new}}$	$X_{k+1}$	$Y_{k+1}$
		5	9
7	7	6	10
7	7	7	11
7	7	8	12
7	7	9	13

7	7	10	14
7	7	11	15
7		12	16

