CO1	1.	In the Midpoint line algorithm, the initial value of d was a+0.5b. Will it be a problem? If yes, then show how you can resolve the issue? If not, state the reason.	05
CO3	2.	Suppose, the starting point of a line is (p, q). While drawing the line using the DDA Algorithm, Slope of the line was 0.6. If p has been increased 4 times. What will be the endpoint of the line?	05
CO4	3.	Find out the first 6 pixels of the line segment starting from (6, 3) to (36, 23) using the midpoint line drawing algorithm.	10

1. Yes, this will be a problem since we do not know the value of a and b. Figuring out the values will resolve the issue. Let's assume,

$$dy = y_0 - y_1 \; ; \; dx = x_0 - x_1$$

$$m = \frac{y_0 - y_1}{x_0 - x_1} = \frac{dy}{dx}$$

In the equation, $y = mx + c$,

$$y = \left(\frac{dy}{dx}\right)x + c$$

$$\Rightarrow y\,dx = x\,dy + c\,dx \quad [\text{multiplied by } dx]$$

$$\Rightarrow x\,y\,dx - x\,dy - c\,dx = 0$$

$$\Rightarrow x\,dy - y\,dx + c\,dx = 0 \quad \Rightarrow 2x\,dy - 2y\,dx + 2c\,dx = 0$$

Comparing the equation we get

$$a = 2dy$$
$$b = -2\,dx$$

putting it into the equation,

$$d_{\text{initial}} = a + 0.5\,b = 2dy - 2(0.5)\,dx = 2dy - dx$$

This also resolves the issue with fraction.

2. $m = 0.6$; P increased 4 times

Since $m < +1$ and $m > -1$

we will increase p by +1 while increasing q by m

p(+1)	q(+m)	q(round off)	pixel
p+1	q+m		(p+1, q+m)
p+2	q+2m		(p+2, q+2m)
p+3	q+3m		(p+2; q+3m)
p+4	q+4m		(p+4, q+4x0.6) = (p+4, q+2.4) = (p+4, q+2)

The endpoint will be (p+4, q+2.4)

rounded off

3. $dx = 36 - 6 = 30$; $2dy - 2dx = 2 \times 20 - 2 \times 30 = -20$ (NE)

$dy = 23 - 3 = 20$; $2dy = 2 \times 20 = 40$ (E)

dinit = $2dy - dx = 40 - 30 = 10$

x	y	d	NE/E	d new	pixel
6	3	10	NE	-10	(6,3)
7	4	-10	E	30	(7,4)
8	4	30	NE	10	(8,4)
9	5	10	NE	-10	(9,5)
10	6	-10	E	30	(10,6)
11	6	30	NE	10	(11,6)

The first 6 pixels will be (6,3), (7,4), (8,4), (9,5), (10,6), (11,6)

1/2

CO1	1.	Explain in short what is the benefit of Midpoint Line Algorithm over DDA? [1 line is enough to describe the exact reason].	03
CO1	2.	Suppose, the starting point of a line is (p, q). While drawing the line using the Midpoint Line drawing algorithm, the East pixel has been chosen 6 times and the North-East pixel has been chosen 10 times. What will be the endpoint of the line?	05
CO1	3.	Find out the first 6 pixels of the line segment starting from (-10, -3) to (60, 57) using midpoint line drawing algorithm	12

(1)

DDA algorithm solves the multiplication problem but still have round off problem. Midpoint Line algorithm solves the round off problem.

3

(2)

If East pixel have been choosen 6 times $(p+6, q)$

If North-east have been choosen 10 times $(p+16, q+10)$

∴ The end point will be $(p+16, q+10)$ (Ans:)

5

(3)

Given,

(-10, -3)

(60, 57)

$\therefore dy = 57 - (-3) = 60$

$\therefore dx = 60 - (-10) = 70$

$\therefore dinit = 2dy - dx = (2 \times 60) - 70 = 50$

$d > 0$ NE	$d < 0$ E
$d_{new} = d + 2dy - 2dx$	$d_{new} = d + 2dy$
$\therefore 2dy - 2dx = -20$	$\therefore 2dy = 2 \times 60 = 120$

x	y	d	NE/E	dnew	Pixels
-10	-3	50	NE	30	(-10, -3)
-9	-2	30	NE	10	(-9, -2)
-8	-1	10	NE	-10	(-8, -1)
-7	0	-10	E	110	(-7, 0)
-6	0	110	NE	90	(-6, 0)
-5	1	90	NE	70	(-5, 1)

(Ans.)