Practice Problem (Midpoint line + 8-way Symmetry)

(i) $(-5, -100) \rightarrow (95, -35)$

$dx = 95 - (-5) = 100$

$dy = -35 - (-100) = 65$

$|dx| > |dy|$

$dx > 0, \; dy > 0$

Zone = 0 [Already Zone 0 so no need to conv

$d_{init} = 2dy - dx = 2 \times 65 - 100 = 30$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 65 - 2 \times 100 = -70$

$\Delta d_E = 2dy = 2 \times 65 = 130$

x	y	d	E/NE	d update
-5	-100	30	NE	$d = d + \Delta NE = 30 - 70 = -40$
-4	-99	-40	E	$d = d + \Delta d_E = -40 + 130 = 90$
-3	-99	90	NE	$90 + (-70) = 20$
-2	-98	20	NE	$20 - 70 = -50$
-1	-97	-50	E	$-50 + 130 = 80$
0	-97	80	NE	$80 - 70 = 10$
1	-96	10	NE	$10 - 70 = -60$
2	-95	-60	E	$-60 + 130 = 70$
3	-95	70	NE	$70 - 70 = 0$
4	-94	0	E	$0 + 130 = 130$

(ii) $(-5, 100) \rightarrow (20, 135)$

$dx = 20 - (-5) = 25$

$dy = 135 - 100 = 35$

$|dy| > |dx|$

$dx > 0, dy > 0$

$\therefore$ **zone = 1**

Convert to Zone 0:

$x = Y, y = X$

$(100, -5)$ and $(135, 20)$

$dx = 135 - 100 = 35$, $dy = 20 - (-5) = 25$

$dinit = 2dy - dx = 2 \times 25 - 35 = 15$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 25 - 2 \times 35 = -20$

$\Delta d_E = 2dy = 2 \times 25 = 50$

Original Zone

x	y	d	E/NE	d update	x = Y	y = X
100	-5	15	NE	15 + (-20) = -5	-5	100
101	-4	-5	E	-5 + 50 = 45	-4	101
102	-4	45	NE	45 - 20 = 25	-4	102
103	-3	25	NE	25 - 20 = 5	-3	103
104	-2	5	NE	5 - 20 = -15	-2	104
105	-1	-15	E	-15 + 50 = 35	-1	105
106	-1	35	NE	35 - 20 = 15	-1	106
107	0	15	NE	15 - 20 = -5	0	107
108	1	-5	E	-5 + 50 = 45	1	108
109	1	45	NE	45 - 20 = 25	1	109

(iii) (25,25) and (-12,48)

$dx = -12 - 25 = -37$

$dy = 48 - 25 = 23$

$|dx| > |dy|$

$dx < 0,\ dy > 0$

Zone = 3

Convert Zone 3 to Zone 0:

$x = -X,\ y = Y$

(-25,25) and (12,48)

$dx = 12 - (-25) = 37$, $dy = 48 - 25 = 23$

$dinit = 2dy - dx = 2 \times 23 - 37 = 9$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 23 - 2 \times 37 = -28$

$\Delta d_E = 2dy = 2 \times 23 = 46$

					Original Zone	
x	y	d	E/NE	d update	x = -X	y = Y
-25	25	9	NE	9 - 28 = -19	25	25
-24	26	-19	E	-19 + 46 = 27	24	26
-23	26	27	NE	27 - 28 = -1	23	26
-22	27	-1	E	-1 + 46 = 45	22	27
-21	27	45	NE	45 - 28 = 17	21	27
-20	28	17	NE	17 - 28 = -11	20	28
-19	29	-11	E	-11 + 46 = 35	19	29
-18	29	35	NE	35 - 28 = 7	18	29
-17	30	7	NE	7 - 28 = -21	17	30
-16	31	-21	E	-21 + 46 = 25	16	31

(iv) (5, 52) and (-18, 89)

$dx = -18 - 5 = -23$

$dy = 89 - 52 = 37$

$|dy| > |dx|$

$dx < 0, dy > 0$

∴ **Zone = 2**

Convert Zone 2 to Zone 0:

$x = Y, y = -X$

(52, -5) and (89, 18)

$dx = 89 - 52 = 37, dy = 18 - (-5) = 23$

$d_{init} = 2dy - dx = 2 \times 23 - 37 = 9$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 23 - 2 \times 37 = -28$

$\Delta d_E = 2dy = 2 \times 23 = 46$

x	y	d	E/NE	d update	Original Zone x = -Y	Original Zone y = X
52	-5	9	NE	9 - 28 = -19	5	52
53	-4	-19	E	-19 + 46 = 27	4	53
54	-4	27	NE	27 + (-28) = -1	4	54
55	-3	-1	E	-1 + 46 = 45	3	55
56	-3	45	NE	45 + (-28) = 17	3	56
57	-2	17	NE	17 + (-28) = -11	2	57
58	-1	-11	E	-11 + 46 = 35	1	58
59	-1	35	NE	35 - 28 = 7	1	59
60	0	7	NE	7 - 28 = -21	0	60
61	1	-21	E	-21 + 46 = 22	-1	61

(v) (11, 9) and (34, -9)

$dx = 34 - 11 = 23$

$dy = -9 - 9 = -18$

$|dx| > |dy|$

$dx > 0,\ dy < 0$

∴ Zone = 7

Convert Zone 7 to Zone 0:

$x = X,\ y = -Y$

(11, -9) and (34, 9)

$dx = 34 - 11 = 23,\ dy = 9 - (-9) = 18$

$dinit = 2dy - dx = 2 \times 18 - 23 = 13$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 18 - 2 \times 23 = -10$

$\Delta d_E = 2dy = 2 \times 18 = 36$

Original Zone

x	y	d	NE/E	d update	x = X	y = -Y
11	-9	13	NE	13 + (-10) = 3	11	9
12	-8	3	NE	3 - 10 = -7	12	8
13	-7	-7	E	-7 + 36 = 29	13	7
14	-7	29	NE	29 - 10 = 19	14	7
15	-6	19	NE	19 - 10 = 9	15	6
16	-5	9	NE	9 - 10 = -1	16	5
17	-4	-1	E	-1 + 36 = 35	17	4
18	-4	35	NE	35 - 10 = 25	18	4
19	-3	25	NE	25 - 10 = 15	19	3
20	-2	15	NE	15 - 10 = 5	20	2

(vi) (-49, -29) and (-107, -68)

$dx = -107 + 49 = -58$ $\quad |dx| > |dy|$

$dy = -68 + 29 = -39$ $\quad dx < 0,\ dy < 0$

$\therefore$ **Zone = 4**

Convert Zone 4 to Zone 0:

$x = -X,\ y = -Y$

(49, 29) and (107, 68)

$dx = 107 - 49 = 58,\ dy = 68 - 29 = 39$

$dinit = 2dy - dx = 2 \times 39 - 58 = 20$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 39 - 2 \times 58 = -38$

$\Delta d_E = 2dy = 2 \times 39 = 78$

x	y	d	E/NE	d update	x = -X	y = -Y
49	29	20	NE	20 - 38 = -18	-49	-29
50	30	-18	E	-18 + 78 = 60	-50	-30
51	30	60	NE	60 - 38 = 22	-51	-30
52	31	22	NE	22 - 38 = -16	-52	-31
53	32	-16	E	-16 + 78 = 62	-53	-32
54	32	62	NE	62 - 38 = 24	-54	-32
55	33	24	NE	24 - 38 = -14	-55	-33
56	34	-14	E	-14 + 78 = 64	-56	-34
57	34	64	NE	64 - 38 = 26	-57	-34
58	35	26	NE	26 - 38 = -12	-58	-35

Original Zone

(vii) (-6,9) and (34,-25)

$dy = -25 - 9 = -34$ $\quad |dx| > |dy|$

$dx = 34 + 6 = 40$ $\quad dx > 0, dy < 0$

Zone = 7

Convert Zone 7 to Zone 0:

$x = X, y = -Y$

(-6,-9) and (34,25)

$dx = 34 + 6 = 40, \quad dy = 25 + 9 = 34$

$d_{init} = 2dy - dx = 2 \times 34 - 40 = 28$

$\Delta d_{NE} = 2dy - 2dx = 2 \times 34 - 2 \times 40 = -12$

$\Delta d_E = 2dy = 2 \times 34 = 68$

Original Zone

x	y	d	E/NE	d update	x=X	y=-Y
-6	-9	28	NE	28-12=16	-6	9
-5	-8	16	NE	16-12=4	-5	8
-4	-7	4	NE	4-12=-8	-4	7
-3	-6	-8	E	-8+68=60	-3	6
-2	-6	60	NE	60-12=48	-2	6
-1	-5	48	NE	48-12=36	-1	5
0	-4	36	NE	36-12=24	0	4
1	-3	24	NE	24-12=12	1	3
2	-2	12	NE	12-12=0	2	2
3	-1	0	E	0+68=68	3	1

(viii) (15,0) and (-26,-42)

$dx = -26-15 = -41$

$dy = -42-0 = -42$

$|dy| > |dx|$

$dy<0, dx<0$

$\therefore$ Zone = 5

Convert Zone 5 to Zone 0°

$x = -Y, y = -X$

(0, -15) and (42, 26)

$dx = 42-0 = 42, \quad dy = 26+15 = 41$

$d_{init} = 2dy - dx = 2\times41 - 42 = 40$

$\Delta d_{NE} = 2dy - 2dx = 2\times41 - 2\times42 = -2$

$\Delta d_E = 2dy = 2\times41 = 82$

x	y	d	E/NE	d update	Original Zone: x=-Y	Original Zone: y=-X
0	-15	40	NE	40-2=38	15	0
1	-14	38	NE	38-2=36	14	-1
2	-13	36	NE	36-2=34	13	-2
3	-12	34	NE	34-2=32	12	-3
4	-11	32	NE	32-2=30	11	-4
5	-10	30	NE	30-2=28	10	-5
6	-9	28	NE	28-2=26	9	-6
7	-8	26	NE	26-2=24	8	-7
8	-7	24	NE	24-2=22	7	-8
9	-6	22	NE	22-2=20	6	-9