Lab5 Questions

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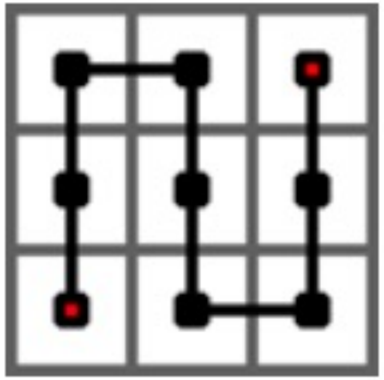
Lab5.A:Curve

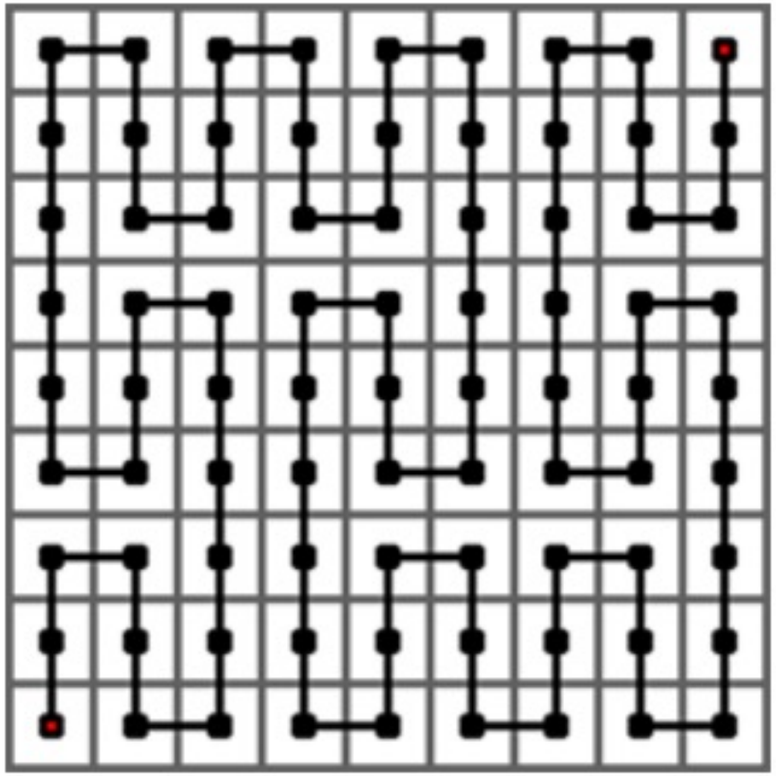
- **CC** is a specialist in geometry. Recently he found a wonderful curve, known as Peano curve, which can recursively fill square areas.
- Peano curve is defined recursively. This is the case of a 1-order Peano curve:



- It starts from (1,1) and ends at (3,3). Note that the second step is at (1,2).

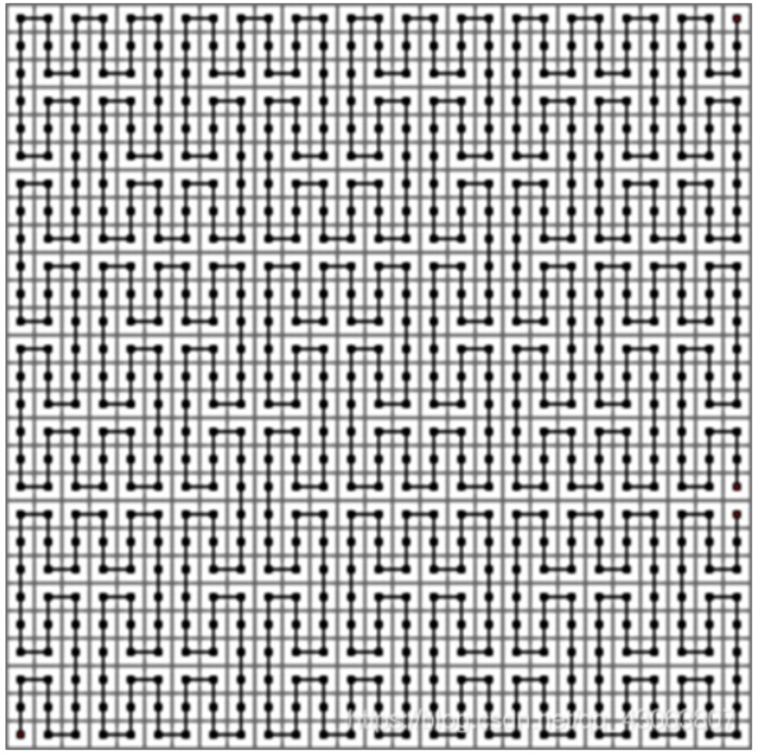
Lab5.A:Curve

- Then this is the case of a 2-order Peano curve, which is made up of 3×3 1-order Peano curves:



Lab5.A:Curve

- If you still cannot get it, this is the case of a 3-order Peano curve, which is made up of 3×3 2-order Peano curves:

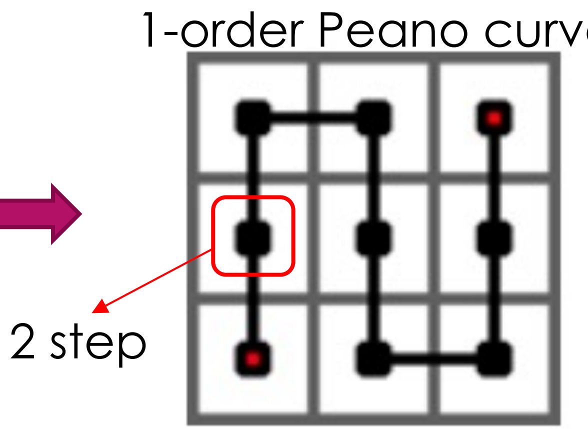


Lab5.A:Curve

- Now **CC** enters a square park of length 3^N . He wants to visit every block in a $N-order-Peano-Cureve$ way. His starts his first step at $(1{,}1)$ and finishes his walk at $(3^N, 3^N)$. Please tell him the position of his K^{th} step.

Sample Input 1

1 2

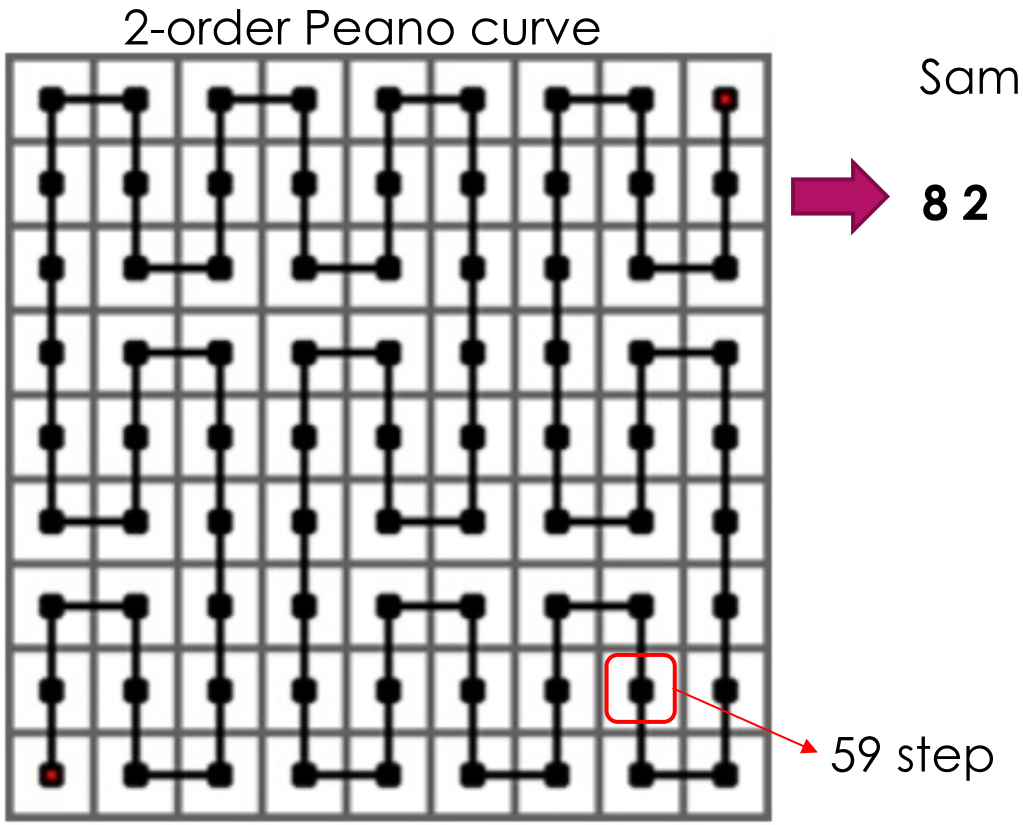


Sample Output 1

1 2

Sample Input 2

2 59



Sample Output 2

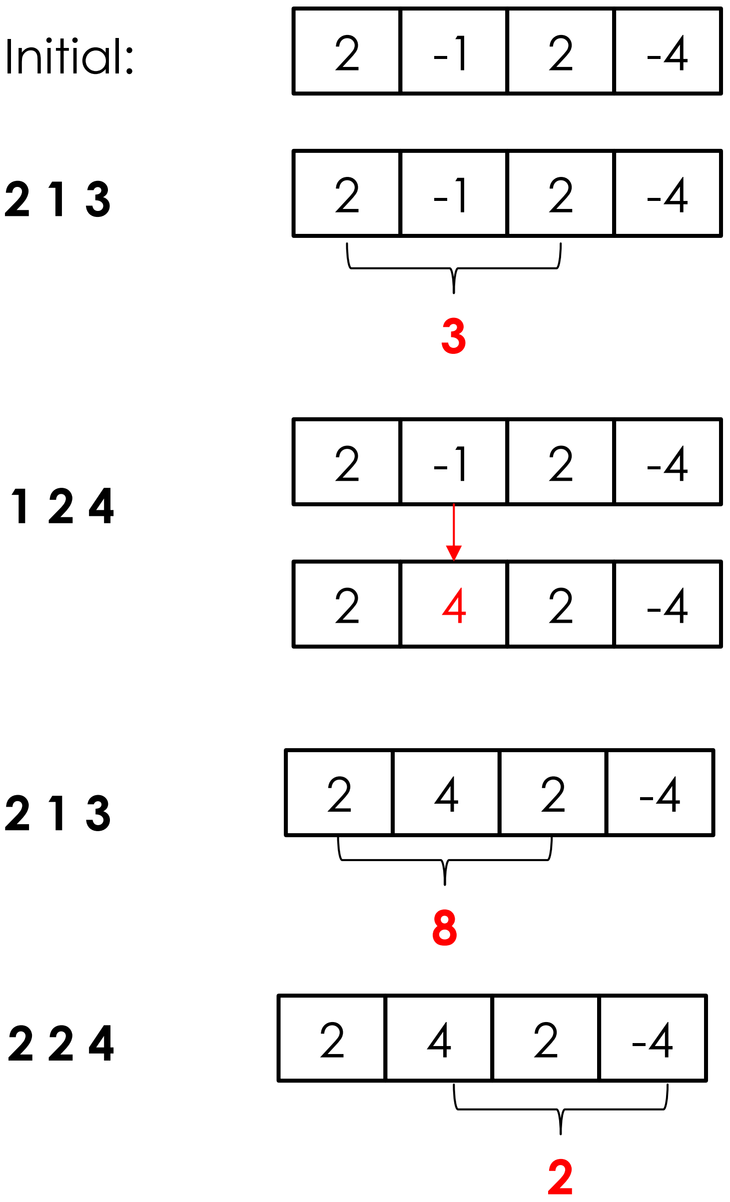
8 2

Lab5.B: Tree

- Given an array of N integers $a_1, a_2, \ldots, a_N$.
- Please support M sequential operations, each of which is one of the 2 types:
  - change a_x to y
  - calculate $\sum_{i=l}^{r} a_i$

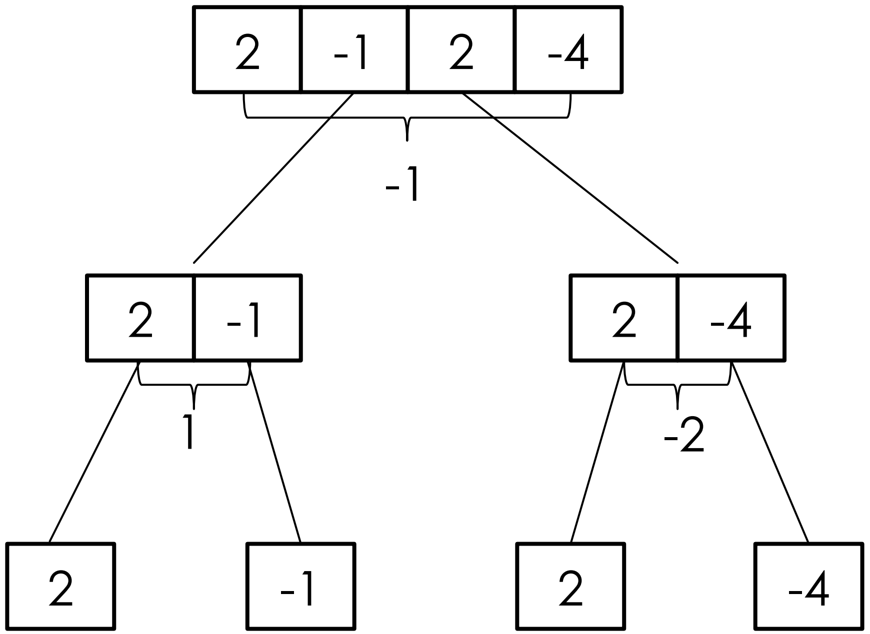
Sample Input

4 4
2 -1 2 -4
2 1 3
1 2 4
2 1 3
2 2 4



Sample Output

3
8
2



Build tree

1	2	3	4	5	6	7
l:1 r:4 sum:-1	l:1 r:2 sum:1	l:3 r:4 sum:-2	l:1 r:1 sum:2	l:2 r:2 sum:-1	l:3 r:3 sum:2	l:4 r:4 sum:-4

2 1 3 calculate $\sum_{i=1}^{3} a_i$

1	2	3	4	5	6	7
l:1 r:4 sum:-1	l:1 r:2 sum:1	l:3 r:4 sum:-2	l:1 r:1 sum:2	l:2 r:2 sum:-1	l:3 r:3 sum:2	l:4 r:4 sum:-4

Step1: search from root
(1,3) ⊂(1,4)
Left node: (1,2) ∩ (1,3) ≠ ∅ search left node
Right node: (3,4) ∩ (1,3) ≠ ∅ search right node

Step 2:
(1,3) ⊃ (1,2) ?Yes
return 1

Step 3:
(1,3) ⊃ (3,4)? No
Left node: (3,3) ∩ (1,3) ≠ ∅ search left node
Right node: (4,4) ∩ (1,3) = ∅ stop

Step 4:
(1,3) ⊃ (3,3)? Yes
return 2

1 2 4 change a_2 to 4

1	2	3	4	5	6	7
l:1 **r:4** **sum:41**	**l:1** **r:2** **sum:61**	l:3 r:4 sum:-2	l:1 r:1 sum:2	**l:2** **r:2** **sum:-41**	l:3 r:3 sum:2	l:4 r:4 sum:-4

Step1: target index = 2
Mid = (1+4)/2 = 2
Left node: target index ≤ mid ? **Yes: search left node**
No: search right node

Step 2:target index = 2
Mid = (1+2)/2 = 1
Left node: target index ≤ mid ? Yes: search left node
No: search right node

Step 3:target index = 2
Leaf node: set sum = 4

1 2 4 change a_2 to 4

Result:

1	2	3	4	5	6	7
l:1 r:4 sum:4	l:1 r:2 sum:6	l:3 r:4 sum:-2	l:1 r:1 sum:2	l:2 r:2 sum:4	l:3 r:3 sum:2	l:4 r:4 sum:-4