

## Problem G - Growing Organism

While Daniel has returned to the arcade, David is still by the beach.

David finds a weird organism that vaguely resembles mold in a tidal pool that grows in a very particular fashion. At every time step, every part of the organism grows outwards.

David wants to know how much area and perimeter the organism will cover over a few time steps.

The organism can be modelled as a simple rectilinear figure with no holes for the purpose of this problem. It expands in all four directions by distance  $d$  every time step, meaning that if point  $(x, y)$  was covered by the organism at time  $t$ , then at time  $t + 1$  the entire square  $[x - d, x + d] \times [y - d, y + d]$  would be covered with organism.

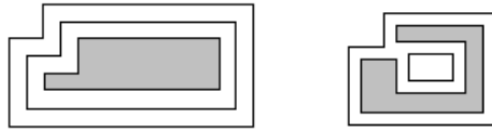


Figure 1: Some initial shapes of the organism along with the shape after several steps of growth

### Input

The first line of the input contains a single integer  $T$ , indicating the number of test cases.

Each test case begins with three integers  $n, m, d$  ( $4 \leq n \leq 100$ ,  $1 \leq m \leq 20$ ,  $1 \leq d \leq 10^5$ ), representing respectively the number of vertices, the number of time steps, and the amount of growth per time step.

The next line contains  $2n$  integers  $x_1, y_1, x_2, y_2, \dots, x_n, y_n$  ( $0 \leq x_i, y_i \leq 10^7$ ) describing the initial shape of the organism, with the vertices in clockwise order. The  $i$ -th vertex is at  $(x_i, y_i)$ .

It is guaranteed that at any time step, there will not be two parallel sides that intersect, even at point, i.e. the situations below will not occur.

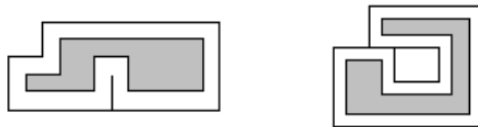


Figure 2: Situations that will not occur in input to simplify implementation

### Output

For each test case, output two lines. The first line contains  $m$  integers indicating the length of the perimeter after each time step. The second line contains  $m$  integers indicating the additional area covered by the organism after each time step.

## Sample Input

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```
5
6 2 10
30 40 110 40 110 10 10 10 10 20 30 20
10 1 7
25 50 75 50 75 0 5 0 5 30 25 30 25 10 65 10 65 40 25 40
14 4 2
1 7 13 7 13 0 0 0 0 5 1 5 1 1 6 1 6 3 7 3 7 1 12 1 12 6 1 6
4 4 1
0 1 10000000 1 10000000 0 0 0
4 4 1
0 10000000 1 10000000 1 0 0 0
```

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## Sample Output

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```
340 420
3000 3800
380
2660
64 72 88 104
147 130 160 192
20000010 20000018 20000026 20000034
20000006 20000014 20000022 20000030
20000010 20000018 20000026 20000034
20000006 20000014 20000022 20000030
```

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