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Force Graph

Time limit: *2000 ms*
Memory limit: *128 MB*

You are given a graph with N nodes and M edges. Every node has a point in the cartesian plane associated with it.

Between every pair of points, there's a repulsion force acting: if the nodes associated with the points are connected by an edge, the force has a magnitude of $F1 * dist$. Otherwise, if the nodes are not connected by an edge, the force has a magnitude of $F2 * dist$ (where $dist$ represents the Euclidian distance between the points). The direction of the force is determined by the straight line connecting the points. All of these $N * (N - 1)/2$ pairs of forces act simultaneously and independent of one another.

Compute the resultant force acting on each point.

Standard input

The first line contains four integer values N, M, $F1$ and $F2$.

Each of the next M lines contains two integer values, representing two nodes that share an edge.

Each of the next N lines contains two integer values, representing the coordinates of the points.
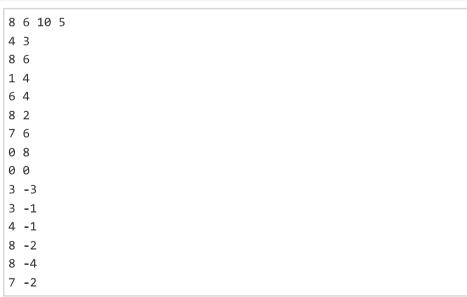
Standard output

The output should consist of N lines. On each line you should output two integer values, the coordinates of the bound vector acting on each point. It can be proved that these values are integers given the constraints.

Constraints and notes

- $1 \leq N \leq 10^5$
- $0 \leq M \leq 3 * 10^5$
- The nodes are numbered from 1 to N
- $0 \leq F1, F2 \leq 10^6$
- The coordinates of the points are between -10^6 and 10^6.
- No two points share the same coordinates.

Input	Output
3 1 3 2 1 2 1 0 1 3 1 2	0 -13 0 11 0 2

Input	Output
8 6 10 5 4 3 8 6 1 4 6 4 8 2 7 6 0 8 0 0 3 -3 3 -1 4 -1 8 -2 8 -4 7 -2	-180 390 -200 35 -45 -105 -55 -45 -5 -15 185 -50 155 -145 145 -65