

# Black and White Tree



Nikita is making a graph as a birthday gift for her boyfriend, a fellow programmer! She drew an undirected connected graph with  $N$  nodes numbered from  $1$  to  $N$  in her notebook.

Each node is shaded in either *white* or *black*. We define  $n_W$  to be the number of white nodes, and  $n_B$  to be the number of black nodes. The graph is drawn in such a way that:

- No  $2$  adjacent nodes have same coloring.
- The value of  $|n_W - n_B|$ , which we'll call  $D$ , is minimal.

Nikita's mischievous little brother erased some of the edges and all of the coloring from her graph! As a result, the graph is now decomposed into one or more components. Because you're her best friend, you've decided to help her reconstruct the graph by adding  $K$  edges such that the aforementioned graph properties hold true.

Given the decomposed graph, construct and shade a valid connected graph such that the difference  $|n_W - n_B|$  between its shaded nodes is minimal.

## Input Format

The first line contains  $2$  space-separated integers,  $N$  (the number of nodes in the original graph) and  $M$  (the number of edges in the decomposed graph), respectively.

The  $M$  subsequent lines each contain  $2$  space-separated integers,  $u$  and  $v$ , describing a bidirectional edge between nodes  $u$  and  $v$  in the decomposed graph.

## Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq \min(5 \times 10^5, \frac{N \times (N-1)}{2})$
- It is guaranteed that every edge will be between  $2$  distinct nodes, and there will never be more than  $1$  edge between any  $2$  nodes.
- Your answer *must* meet the following criteria:
  - The graph is connected and no  $2$  adjacent nodes have the same coloring.
  - The value of  $|n_B - n_W|$  is minimal.
- $K \leq 2 \times 10^5$

## Output Format

You must have  $K + 1$  lines of output. The first line contains  $2$  space-separated integers:  $D$  (the minimum possible value of  $|n_B - n_W|$ ) and  $K$  (the number of edges you've added to the graph), respectively. Each of the  $K$  subsequent lines contains  $2$  space-separated integers,  $u$  and  $v$ , describing a newly-added bidirectional edge in your final graph (i.e.: new edge  $u \leftrightarrow v$ ).

You may print *any*  $1$  of the possible reconstructions of Nikita's graph such that the value of  $D$  in the reconstructed shaded graph is minimal.

## Sample Input 0

```
8 8
1 2
2 3
3 4
4 1
1 5
2 6
3 7
4 8
```

**Sample output 0**

```
0 0
```

**Sample Input 1**

```
8 6
1 2
3 4
3 5
3 6
3 7
3 8
```

**Sample Output 1**

```
4 1
1 5
```

**Sample Input 2**

```
5 4
1 2
2 3
3 4
4 1
```

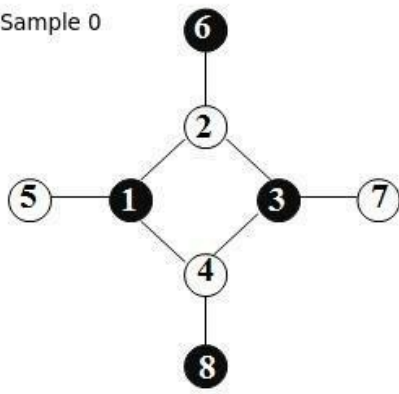
**Sample Output 2**

```
1 2
2 5
4 5
```

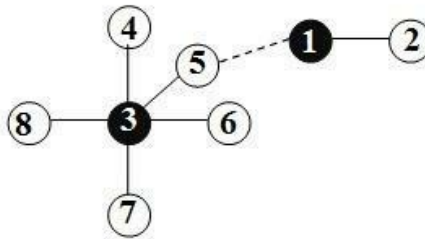
**Explanation**

In the figure below , the solid lines show the decomposed graph after Nikita's brother erased the edges, and the dotted lines show one possible correct answer:

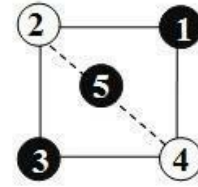
Sample 0



Sample 1



Sample 2



In *Sample 0*, no additional edges are added and  $K = 0$ . Because  $n_W = 4$  and  $n_B = 4$ , we get  $|n_W - n_B| = 0$ . Thus, we print `0 0` on a new line (there is only **1** line of output, as  $K = 0$ ).

In *Sample 1*, the only edge added is  $(5, 1)$ , so  $K = 1$ . Here,  $n_W = 6$  and  $n_B = 2$ , so  $|n_W - n_B| = 4$ . Thus, we print `4 1` on the first line. Next, we must print  $K$  lines describing each edge added; because  $K = 1$ , we print a single line describing the **2** space-separated nodes connected by our new edge: `1 5`.