Highway Tolls

In Japan, cities are connected by a network of highways. This network consists of N cities and M highways. Each highway connects a pair of distinct cities. No two highways connect the same pair of cities. Cities are numbered from 0 through $N-1$, and highways are numbered from 0 through $M-1$. You can drive on any highway in both directions. You can travel from any city to any other city by using the highways.

A toll is charged for driving on each highway. The toll for a highway depends on the **traffic** condition on the highway. The traffic is either **light** or **heavy**. When the traffic is light, the toll is A yen (Japanese currency). When the traffic is heavy, the toll is B yen. It's guaranteed that $A < B$. Note that you know the values of A and B.

You have a machine which, given the traffic conditions of all highways, computes the smallest total toll that one has to pay to travel between the pair of cities S and T ($S \neq T$), under specified traffic conditions.

However, the machine is just a prototype. The values of S and T are fixed (i.e., hardcoded in the machine) and not known to you. You would like to determine S and T. In order to do so, you plan to specify several traffic conditions to the machine, and use the toll values that it outputs to deduce S and T. Since specifying the traffic conditions is costly, you don't want to use the machine many times.

Implementation details

You should implement the following procedure:

```
find_pair(int N, int[] U, int[] V, int A, int B)
```

- `N`: the number of cities.
- `U` and `V`: arrays of length M, where M is the number of highways connecting cities. For each i ($0 \leq i \leq M-1$), the highway i connects the cities `U[i]` and `V[i]`.
- `A`: the toll for a highway when the traffic is light.
- `B`: the toll for a highway when the traffic is heavy.
- This procedure is called exactly once for each test case.
- Note that the value of M is the lengths of the arrays, and can be obtained as indicated in the implementation notice.

The procedure `find_pair` can call the following function:

```
int64 ask(int[] w)
```

- The length of `w` must be M. The array `w` describes the traffic conditions.
- For each i ($0 \leq i \leq M-1$), `w[i]` gives the traffic condition on the highway i. The value of `w[i]` must be either 0 or 1.
  - `w[i] = 0` means the traffic of the highway i is light.
  - `w[i] = 1` means the traffic of the highway i is heavy.
- This function returns the smallest total toll for travelling between the cities S and T, under the traffic conditions specified by `w`.
- This function can be called at most 100 times (for each test case).

`find_pair` should call the following procedure to report the answer:

```
answer(int s, int t)
```

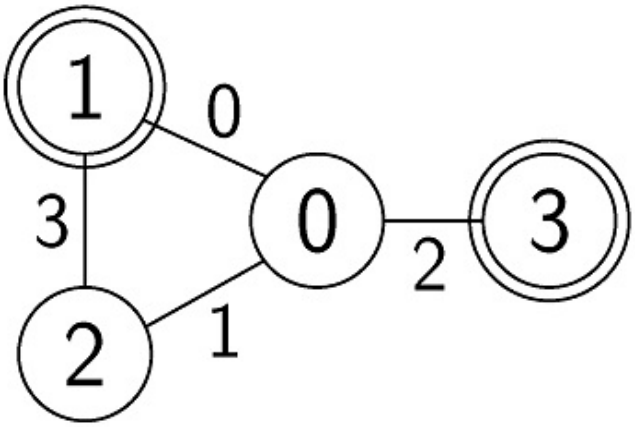
- `s` and `t` must be the pair S and T (the order does not matter).
- This procedure must be called exactly once.

If some of the above conditions are not satisfied, your program is judged as **`Wrong Answer`**. Otherwise, your program is judged as **`Accepted`** and your score is calculated by the number of calls to `ask` (see Subtasks).

Example

Let $N = 4$, $M = 4$, $U = [0, 0, 0, 1]$, $V = [1, 2, 3, 2]$, $A = 1$, $B = 3$, $S = 1$, and $T = 3$.

The grader calls `find_pair(4, [0, 0, 0, 1], [1, 2, 3, 2], 1, 3)`.



In the figure above, the edge with number i corresponds to the highway i. Some possible calls to `ask` and the corresponding return values are listed below:

Call	Return
`ask([0, 0, 0, 0])`	2
`ask([0, 1, 1, 0])`	4
`ask([1, 0, 1, 0])`	5
`ask([1, 1, 1, 1])`	6

For the function call `ask([0, 0, 0, 0])`, the traffic of each highway is light and the toll for each highway is 1. The cheapest route from $S = 1$ to $T = 3$ is $1 \to 0 \to 3$. The total toll for this route is 2. Thus, this function returns 2.

For a correct answer, the procedure `find_pair` should call `answer(1, 3)` or `answer(3, 1)`.

The file `sample-01-in.txt` in the zipped attachment package corresponds to this example. Other sample inputs are also available in the package.

Constraints

- $2 \leq N \leq 90\,000$
- $1 \leq M \leq 130\,000$
- $1 \leq A < B \leq 1\,000\,000\,000$
- For each $0 \leq i \leq M - 1$
  - $0 \leq U[i] \leq N - 1$
  - $0 \leq V[i] \leq N - 1$
  - $U[i] \neq V[i]$
- $(U[i], V[i]) \neq (U[j], V[j])$ and $(U[i], V[i]) \neq (V[j], U[j])$ $(0 \leq i < j \leq M - 1)$
- You can travel from any city to any other city by using the highways.
- $0 \leq S \leq N - 1$
- $0 \leq T \leq N - 1$
- $S \neq T$

In this problem, the grader is NOT adaptive. This means that S and T are fixed at the beginning of the running of the grader and they do not depend on the queries asked by your solution.

Subtasks

1. (5 points) one of S or T is 0, $N \leq 100$, $M = N - 1$
2. (7 points) one of S or T is 0, $M = N - 1$
3. (6 points) $M = N - 1$, $U[i] = i$, $V[i] = i + 1$ $(0 \leq i \leq M - 1)$
4. (33 points) $M = N - 1$
5. (18 points) $A = 1$, $B = 2$

6. (31 points) No additional constraints

Assume your program is judged as **Accepted**, and makes X calls to `ask`. Then your score P for the test case, depending on its subtask number, is calculated as follows:

- Subtask 1. $P = 5$.
- Subtask 2. If $X \leq 60$, $P = 7$. Otherwise $P = 0$.
- Subtask 3. If $X \leq 60$, $P = 6$. Otherwise $P = 0$.
- Subtask 4. If $X \leq 60$, $P = 33$. Otherwise $P = 0$.
- Subtask 5. If $X \leq 52$, $P = 18$. Otherwise $P = 0$.
- Subtask 6.
  - If $X \leq 50$, $P = 31$.
  - If $51 \leq X \leq 52$, $P = 21$.
  - If $53 \leq X$, $P = 0$.

Note that your score for each subtask is the minimum of the scores for the test cases in the subtask.

Sample grader

The sample grader reads the input in the following format:

- line 1: $N\ M\ A\ B\ S\ T$
- line $2 + i$ ($0 \leq i \leq M - 1$): $U[i]\ V[i]$

If your program is judged as **Accepted**, the sample grader prints `Accepted: q`, with `q` the number of calls to `ask`.

If your program is judged as **Wrong Answer**, it prints `Wrong Answer: MSG`, where `MSG` is one of:

- `answered not exactly once`: The procedure `answer` was not called exactly once.
- `w is invalid`: The length of `w` given to `ask` is not M or `w[i]` is neither 0 nor 1 for some i ($0 \leq i \leq M - 1$).
- `more than 100 calls to ask`: The function `ask` is called more than 100 times.
- `{s, t} is wrong`: The procedure `answer` is called with an incorrect pair `s` and `t`.