Chef and Cycled Cycles

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Chef recently learned about finding shortest paths in a bidirectional graph. He has following types of graphs with him and would like to find shortest paths between some given pair of vertices.

There are **N** cycles in the graph. Let us enumerate them cycle number **1** to **N**. The **i**-th cycle contains A_i nodes enumerated from **1** to A_i.

The nodes of a single cycle are connected to each other in cyclic fashion, i.e. the 1st node is connected to 2nd, 2nd to 3rd, and so on till the last node is connected to the 1st node. All of these edges are weighed.

The cycles are also connected to each other via an edge in a similar cyclic order. The **i**-th cycle is connected to **i % N + 1**-th cycle via an edge. This edge is between some vertex v_1 of **i**-th cycle and vertex v_2 of **i % N + 1**-th cycle and is a weighted edge.

You are given **Q** queries, each containing four integers v_1, c_1, v_2, c_2. You have to find the weight of shortest path between the v_1-th vertex of c_1-th cycle, and v_2-th vertex of c_2-th cycle.

Input

The first line of the input contains an integer **T** denoting the number of test cases.

First line of each test case contains two space separated integers **N, Q** denoting the number of cycles in the graph and the number of queries.

Next **N** lines contain the description of the cycles.

The **i**-th line describes **i**-th cycle. First it contains an integer A_i denoting the number nodes in the **i**-th cycle followed by A_i integers denoting the weight of edges of the cycle. First integer denotes the weight of edge from node **1** to node **2**, from **2** to **3** and so on. Last integer denotes the weight of the edge from node A_i to node **1**.

Next **N** lines describe connections between adjacent cycles. The **i**-th line contains three space separated integers v_1, v_2, **w** denoting that there is an edge of weight **w** between the v_1-th node of **i**-th cycle and v_2-th node of the **i % N + 1**-th cycle.

Next **Q** lines describe the queries. Each query is given by four space separated integers v_1, c_1, v_2, c_2

Output

For each query, output a single integer corresponding to the weight of minimum weight of shortest path.

Constraints

- $1 \le T \le 5$
- $1 \le N, Q \le 10^5$
- $1 \le A_i \le 10^5$
- $1 \le A_1 + A_2 + ... + A_N \le 10^5$
- $1 \le$ **weight of edges** $\le 10^3$
- For each query, $c_1 != c_2$

Subtasks

- **Subtask #1 (10 points)**: $1 \le A_1 + A_2 + ... + A_N \le 10^3$, $1 \le Q \le 10^3$.
- **Subtask #2 (15 points)**: All the edges are of weight = 1.
- **Subtask #3 (20 points)**: $c_1 = 1$ for all the queries.
- **Subtask #4 (55 points)**: **Original constraints**

Example

```
Input:
1
3 3
3 1 2 2
2 1 2
3 1 4 1
2 1 2
2 1 5
3 1 3
2 1 1 2
1 1 1 2
3 1 3 3

Output:
2
3
5
```

Explanation

Example case 1.

Here is the description of the graph.

There are **3** cycles.

```
Cycle 1: 3 nodes. Edges: (1, 2) = 1, (2, 3) = 2, (3, 1) = 2.
Cycle 2: 2 nodes. Edges: (1, 2) = 1, (2, 1) = 2.
Cycle 3: 3 nodes. Edges: (1, 2) = 1, (2, 3) = 4, (3, 1) = 1.
```

Connections between adjacent cycles:

```
Cycle 1 node 2 is connected to Cycle 2 node 1 with edge of weight
2.
Cycle 2 node 2 is connected to Cycle 3 node 1 with edge of weight
5.
Cycle 3 node 3 is connected to Cycle 1 node 1 with edge of weight
3.
```

Queries

Best path from node **2** cycle **1** to node **1** cycle **2** is of the cost 2.

Best path from node **1** cycle **1** to node **1** cycle **2** is: edge **(1, 2)** of cycle **1** + edge **(2, 1)** between cycles **1** and **2**.

Best path from node **3** cycle **1** to node **3** cycle **3** is: edge **(3,1)** of cycle **1** + edge **(3, 1)** between cycles **3** and **1**.

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