



# Problem I

## In A Crazy City

Input: in.in

I live in a crazy city full of crossings and bidirectional roads connecting them. On most of the days, there will be a celebration in one of the crossings, that's why I call this city crazy.

Everyday, I walk from my home (at crossing  $s$ ) to my office (at crossing  $t$ ). I don't like crowds, but I don't want to waste time either, so I always choose a shortest path among all possible paths that does not visit the crossing of the celebration. If no such path exists, I don't go to work (it's a good excuse, isn't it)!

In order to analyze this "celebration effect" in detail, I need  $n$  pairs of values  $(l_i, c_i)$ , where  $l_i$  is the length of the shortest path from crossing  $s$  to crossing  $t$ , not visiting crossing  $i$ ,  $c_i$  is the number of such shortest paths (not visiting crossing  $i$ ). Could you help me? Note that if I can't go to work when celebration is held at crossing  $i$ , define  $l_i=c_i=0$ . This includes the case when there is no path between  $s$  and  $t$  even if there's no celebration at all.

Ah, wait a moment. Please don't directly give me the values - that'll drive me crazy (too many numbers!). All I need is finding some interesting conclusions behind the values, but currently I've no idea what exactly I want.

Before I know what you should calculate, please **prove** that you can indeed find all the pairs  $(l_i, c_i)$  by telling me the value of  $f(x) = (l_1+c_1x+l_2x^2+c_2x^3+l_3x^4+c_3x^5+\dots+l_nx^{2n-2}+c_nx^{2n-1}) \bmod 19880830$ , for some given  $x$ .

### Input

There will be at most 20 test cases. Each case begins with 5 integers  $n, m, s, t, q$  ( $1 \leq s, t \leq n \leq 100,000, 0 \leq m \leq 500,000, 1 \leq q \leq 5$ ).  $n$  is the number of crossings,  $m$  is the number of roads and  $q$  is the number of queries.  $s$  and  $t$  are different integers that represent my home and office, respectively. Each of the following  $m$  lines describes a road with three integers:  $u, v, w$  ( $1 \leq u, v \leq n, 1 \leq w \leq 10,000$ ), indicating a bidirectional road connecting crossing  $u$  and crossing  $v$ , with length  $w$ . There may be multiple roads connecting the same pair of crossings, but a road cannot be connecting a crossing and itself. The next line contains  $q$  integers  $x_i$  ( $1 \leq x_i \leq 10^9$ ). The last test case is following by five zeros, which should not be processed.

### Output

For each test case, print the case number and  $q$  integers  $f(x_1), f(x_2), \dots, f(x_q)$  separated by a single space between consecutive items, on one line. Print a blank line after the output of each test case.

### Sample Input

```
4 5 1 4 2
1 2 1
1 3 1
2 4 2
3 4 3
1 4 4
1 10
3 2 1 3 1
1 2 12
2 3 2
1
0 0 0 0 0
```

### Output for the Sample Input

```
Case 1: 10 132400
Case 2: 0
```

### Explanation

In the first sample,  $l_1=c_1=0, l_2=4, c_2=2, l_3=3, c_3=1, l_4=c_4=0$ . In the second sample, everything is zero.