"Improve by a small fraction each day: 1.01^{365} is 37.78, but 0.99^{365} is just 0.026."

Problem statement: b21-3-travelblog

Travel bloggers

time limit	memory limit	points
5 s	1 GB	100

Ivan and Jana are travel bloggers. They just arrived into the capital city of an exotic country. The country has n cities, numbered from 1 to n. The capital has the number 1. The country has m bidirectional roads. These roads are also numbered, this time from 1 to m. Each pair of cities may be connected by more than one direct road.

Our two bloggers would like to make a video about their trip to some city k. (They did not choose the value of k yet.) This video **must be as short as possible** because people today have a very short attention span.

Ivan and Jana have their specific style of videos. Their viewers expect to see it and therefore they must follow it for this video as well. Their style can be described as follows:

- For each road i in the country, Ivan and Jana have determined the length t_i of a video segment they would make about this road. (This length is the same regardless of which one of them makes the segment.)
- Ivan a Jana are going to choose some route from the capital to some city k. A route is a sequence of consecutive roads that starts in city 1 and ends in city k. The **roads** on a route **must be mutually distinct**. (The route may pass through each city multiple times. This includes the city 1 where it starts and the city k where it ends.)
- Once they have the route selected, Ivan will make a video segment about one of the roads on their route, and Jana will also make a video segment about one of those roads. (They may both do independent segments about the same road.)
- Ivan will always choose a road with the **smallest** t_i among all the roads on their route. On the other hand, Jana will always pick the road with the **largest** t_i on their route.
- Their final video will consist of those two video segments, played one after another.

Task

For each city other than the capital determine the length of the shortest video Ivan and Jana can make about their travel to that city.

(Remember that they must follow the rules on how they select the segments for their video, but for each city they may choose any valid route to travel there, so they will be looking for the route that minimizes the total length of their video.)

Input specification

The first line of input contains the numbers n and m.

The rest of input consists of m lines, each describing one road. The description of a road consists of the numbers u_i, v_i of cities it connects and the length t_i of the video segment about this road.

It is guaranteed that the road network is connected: we can use the roads to travel between any two locations.

Caution: Inputs and outputs can be big. Please make sure you are using a reasonably efficient way of dealing with I/O.

Constraints and scoring

In all inputs:

- $n \geq 1$
- $m \geq n - 1$
- For each road, $1 \leq u_i, v_i \leq n$ and $u_i \neq v_i$.
- The video segment lengths are integers satisfying $0 \leq t_i \leq 10^9$.

There are ten subtasks, as described below.

Subtask	Points	max n	max m	other constraints
1	9	$300\,000$	$300\,000$	$m = n - 1$ (road network is a tree)
2	17	$300\,000$	$300\,000$	all roads from the capital have $t_i = 0$
3	12	$300\,000$	$300\,000$	all roads from the capital have $t_i = 10^9$
4	9	10	10	graph is simple (there are no multiple edges)
5	6	20	20	graph is simple (there are no multiple edges)
6	6	2000	2000	for each road: $\lvert u_i - v_i \rvert = 1$
7	9	2000	2000	
8	8	5000	$300\,000$	
9	10	$300\,000$	$300\,000$	for each i there is a road connecting i and $i + 1$; if the roads x and y satisfy $\lvert u_x - v_x \rvert = 1$ and $\lvert u_y - v_y \rvert > 1$ then $t_x \leq t_y$
10	14	$300\,000$	$300\,000$	

Output specification

For each k from 2 to n output one line with one integer: the smallest total length of the video that Ivan and Jana may produce about their trip to city k.

Examples

input	output
3 3 1 2 2 1 3 1 2 3 1	2 2

- *If going to city 2, use roads 2 and 3 (i.e., go via city 3). Each of them will record a segment of length 1.*
- *If going to city 3, the optimal choice is to go directly.*

input	output
7 10 1 2 2 1 7 6 2 3 3 3 4 5 3 5 4 4 5 4 6 5 7 6 4 4 1 2 8 6 7 9	4 5 6 6 6 10

Below we give one optimal way of reaching each city..

- *City 2: use road 1, video length: 2+2 = 4.*
- *City 3: use roads 1 a 3, video length: 2+3 = 5.*
- *City 4: use roads 1, 3, 5, 6, video length: 2+4 = 6.*
- *City 5: use roads 1, 3, 5, video length: 2+4 = 6.*
- *City 6: use roads 1, 3, 5, 6, 8, video length: 2+4 = 6.*
- _City 7: use roads 1, 9, 2. In other words, go from city 1 to city 2, from there back to city 1 via a different road, and from there to city 7. The length of their video will be 2+8 = 10. Note that if they just went directly to city 7, the video's length would be bigger: 6+6 = 12.

input	output
4 4 1 2 2 3 2 0 2 4 3 4 3 1	3 2 2

For each of the three destinations one optimal path begins by using roads 1 and 2. By doing so we will have reached city 3 and already used a road for which the segment length is 0.