Caravan

You have been promoted to road manager! No, you don't take care of a band. You oversee the construction of Bitland's roads. Bitland ~~has a series of~~ had a series of roads. Due to unfortunate circumstances we now need a new network. However, like all public planning projects, funds are tight, and you also need to make sure after building the roads, you can purchase enough wagons to carry the cargo across the network. Yes, you also need to purchase the public service vehicles, but only up to 10 wagons can be purchased.

Let me break it down for you.

Each road has a maximum weight capacity. If a wagon carrying more than the weight capacity crosses it, the road is destroyed (**note the weight of the wagon is already factored in to this amount**). The public would probably stone you with the broken road, if the road breaks happened, so we will ensure each wagon carries at most the given capacity. Unfortunately, not all roads cost the same amount to build, and our budget is not infinite.

The wagon drivers are fearful of their goods being stolen, so they wish to minimize the number of times the caravans need to travel per shipment. However, the Bitland merchants have unionized and demand their shipments be taken in an exact weight amount. The merchants do not mind, if a shipment takes multiple wagons or even multiple trips.

Lastly, any funds that are left over after construction of the roads will be used to purchase wagons. More wagons mean potentially less trips assuming the minimum weight capacity of their path from any source city to any destination city is not too low.

Your goal is to determine (based on the given road network, wagon cost, and delivery size) the lowest, maximum number of trips a caravan of wagons would need to transport goods between any pair of cities in a final network of roads. This means that a caravan from any city needs to be capable of reaching any other city.

Input Specification

The first line of input will be two positive even integers ***n*** and ***m***, representing the number of cities and the number of possible roads, respectively. The following ***m*** lines will describe a possible road. Each road description 4 integers representing the index of one of the connected cities (indexed starting at 1), the index of the other connected city (indexed starting at 1), the cost to build the road (< 10,000,000), and the weight capacity of the road (< 10,000,000) respectively. The last line of input contains 3 positive integers the budget of the project, the cost of buying a wagon, and the total weight of a complete shipment.

Output Specification

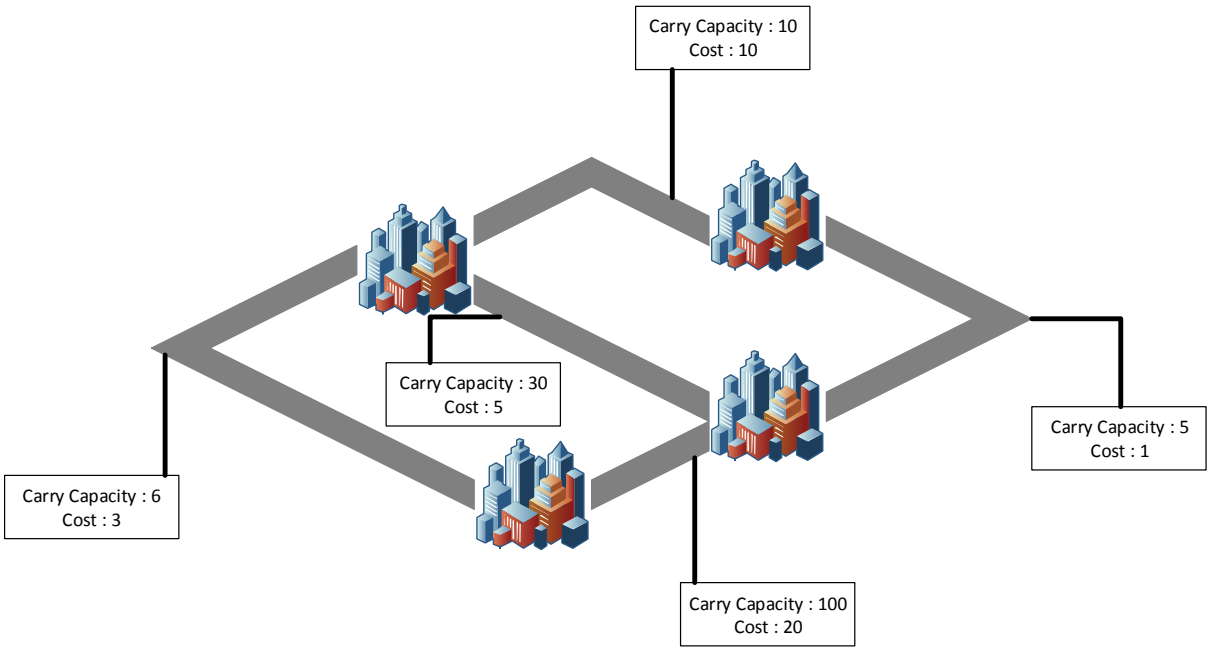
Output a single positive integer representing the lowest, maximum number of possible trips a caravan needs to take to transport goods between any pair of cities. If there is no possible way to complete the network and have a caravan for transportation print a "-1".

Input Output Example

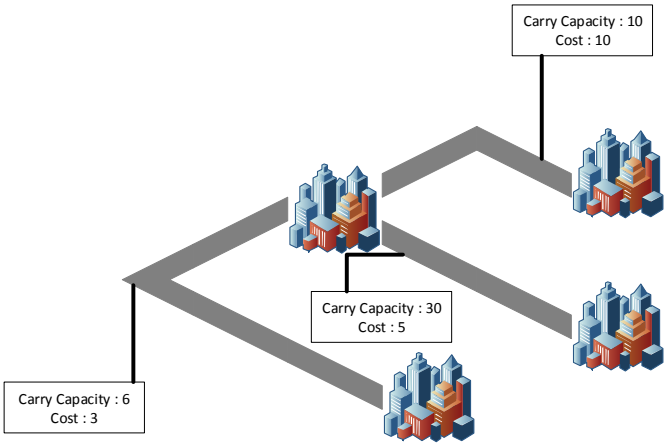
Input	Output
4 5 1 3 3 6 1 2 20 100 2 3 5 30 3 4 10 10 2 4 1 5 48 5 71	2
4 5 1 3 3 6 1 2 20 100 2 3 5 30 3 4 10 10 2 4 1 5 65 6 91	2

Explanation
Case 1:

The kingdom given is the following



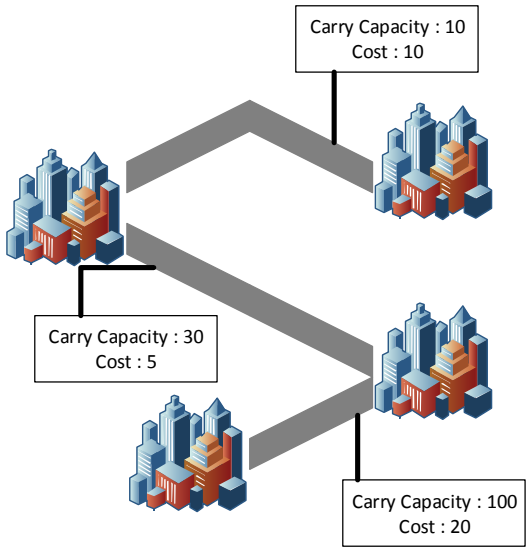
By building the following roads we will have enough money left over for 6 vehicles.



This is because we will spend 18 credits on the network and 30 credits on the vehicles which makes exactly 48 credits (our budget). By having 6 vehicles we need to only transport our goods at most twice. From city 1 to city 3 we need to take at least 2 trips, but no pair of cities will take more than 2 trips.

Case 2

We have the original kingdom description as above. This time the city raised the price of the wagon, and the weight needed to transport. To help us out they allowed us a slightly larger budget. We end up needing to purchase the following roads to enable a 2 trip transfer in the worst case (e.g. city 2 to city 3).



Grading Information

Reading from and writing to standard input – 10 points

Using minimum spanning tree code – 10 points

Comments, white space usage, and reasonable variable names – 10 points

Binary search on the road capacity – 10 points.

Your program will be tested on 12 test cases – 5 points each

No points will be awarded to programs that do not compile.

Only cases that finish within the maximum of {5 times my solution, 10 seconds} will be graded.

This is a difficult problem. The MST part of the solution will not be the hardest part. You are not comfortable with Binary Search you might need to talk to the TA's or your Instructor for help.