Programming Assignment #3

VIP card

Due: 12/30 23:59

Problem Description

There are N cities and M bidirectional roads. The i-th road connects city A_i and city B_i, and the cost of passing it is C_i.
You have a VIP card, that can let you go through any road for free. The VIP card can be used only once.
Your objective is to travel from city 1 to city N. Find the minimum possible total cost.

I/O Format

Use standard I/O. (stdin, stdout)

Input

There is only one test case per input file.
The first line contains two integers N and M.
The i-th of the next M lines contains three integers A_i, B_i and C_i each.
($1 \leq A_i, B_i \leq N, 1 \leq C_i \leq 10^4$)
It is guaranteed that the graph is connected and does not contain multiple edges or self loops.

Output

Output the minimum possible cost to travel from city 1 to city N, using the VIP card.
Remember to output a newline character after the number.

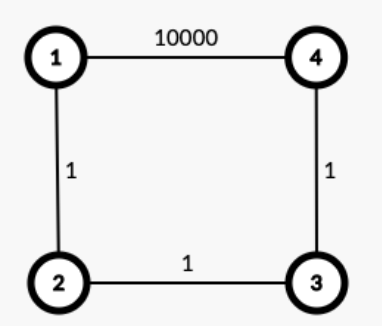
Time Limit: 2000ms per test case.

Subtask 1 (60%): $2 \leq N \leq 10, 1 \leq M \leq 20$.
Subtask 2 (10%): $2 \leq N \leq 1000, 1 \leq M \leq 2000$.
Subtask 3 (10%): $2 \leq N \leq 10^5, 1 \leq M \leq 2 \times 10^5$.
Each subtask may contain multiple test cases. You need to pass all test cases inside a subtask in order to get the score for that subtask.

Examples

Input 1

```
4 4
1 2 1
2 3 1
3 4 1
4 1 10000
```

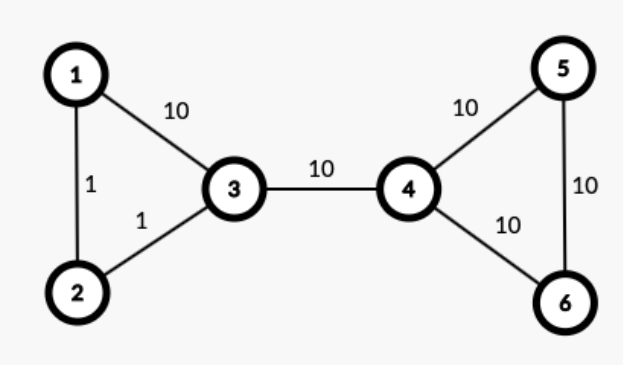


Output 1

```
0
```

Input 2

6 7
1 2 1
2 3 1
1 3 10
3 4 10
4 5 10
5 6 10
4 6 10

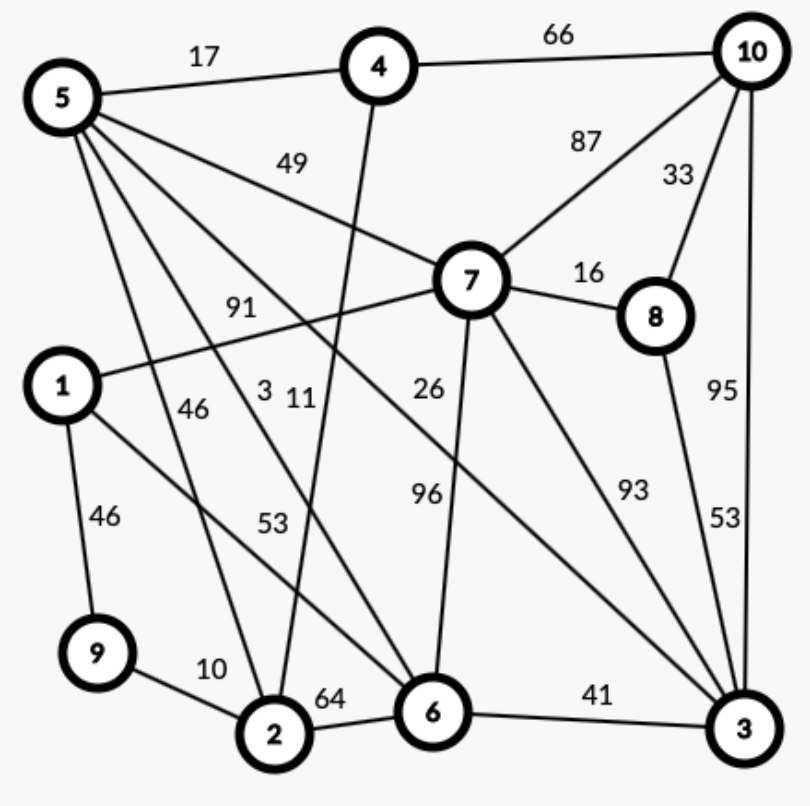


Output 2

12

Input 3

10 20
10 4 66
8 7 16
3 6 41
7 5 49
8 3 53
2 5 46
10 7 87
4 5 17
10 3 95
6 2 64
7 3 93
2 9 10
5 3 26
9 1 46
6 1 53
5 6 3
4 2 11
8 10 33
7 6 96
1 7 91



Output 3

49

Input 1: You should use the VIP card to directly travel from city 1 to city 4 for free.
Input 2: You should follow the path 1->2->3->4->6, and use the VIP card when going through the road connecting city 3 and city 4. The total cost is 1+1+10=12.
Input 3: You should follow the path 1->7->8->10, and use the VIP card when going through the road connecting city 1 and city 7. The total cost is 16+33=49.

Program Submission

1. Please use C/C++ and write your program in a single source file.
2. Your source file must be named as "<Student_ID>_hw3.cpp" and please make sure that all characters of the filename are in lower case. For example, if your student id is 123456789, the name of your program file should be 123456789_hw3.cpp.
3. Your program will be compiled in a GNU/Linux environment with:
   g++ -O2 -std=c++14 <Student_ID>_hw3.cpp
4. The source file must be uploaded directly, without compressing the file.
5. 0 points will be given to Plagiarism. NEVER SHOW YOUR CODE to others and you must write your code by yourself. If the codes are similar to other people and you cannot explain your code properly, you will be identified as plagiarism.

Report

1. Your report must contain the flowchart or the pseudo code of your program. You have to describe how your approach works.
2. You have to analyze the time complexity of your program and prove it.
3. The report filename must be "<Student_ID>_hw3.pdf". Please make sure that all characters of the filename are in lower case.

Grading Policy

You must submit both your source code and report. Remember the submission rules mentioned above, or you will be punished on your grade.

- Test cases 80%
- Report 20%