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CSC 263 Tutorial 8 Winter 2019

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Solve the following problem. Write code if you like.

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Tricky Elevator

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Imagine you are working in a very tall building. One day, when you enter the

elevator, you notice something different: Most of the buttons in the elevator

are gone, with only two left. One button says "Up by U" where U is an integer,and the other button says "Down by D" where D is another integer. With an educated mind you guess that "Up by U" means you'll go up by U floors (or not moving at all if there aren't enough floors above) if you press the button, and "Down by D" means that you'll go down by D floors (or not moving at all if there aren't enough floors below). The building has in total N floors. You are currently at floor X and you want to go to floor Y. Being a CSC263 trained computer scientist, you immediately take out your laptop to write a program that can compute the **shortest sequence** of button pushes that will take you from floor X to floor Y; or if it is not possible at all, the program will output the message "TAKE THE STAIRS!"

Input:

The input consists of one line with five numbers separated by space, namely

N X Y U D, where 1 <= X, Y <= N <= 5,000,000 and 0 <= U, D <= 5,000,000.也就是这栋楼一共有5，000，000层楼。 The floor indices start from 1, e.g., if N = 10, then X and Y will be in [1,10]. All numbers are integers. The values of X and Y are always different.

Output:

Print the minimum number of button pushes needed in order to get from floor X

to floor Y; or, if it is impossible to go from floor X to Y, print "TAKE THE

STAIRS!"

Sample test cases:

10 1 10 2 1，起始点1楼，结束点10楼。只能上2楼和下1楼。

Output:一次上2楼上4次，上到9楼，下一楼，回到8楼，再上2楼。

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Input:

10 2 3 2 2，起始点2楼，结束点3楼。只能上2楼和下2楼。

Output:

TAKE THE STAIRS!（这里难道是因为N=10和终点-起始点的值不符吗）

What if we require that you output the sequence of button pushes? BFS

answer:

Solution idea:  
  
Graph: directed graph  
  
Each vertex is a floor  
  
An edge A -> B means you can go from A to B in one button push, i.e., A + U = B or A - D = B.  
  
If A + U > N or A - D < 1, no edge.