1 Arrange Toy Boxes

A small toy company, as part of its campaign, has announced an open competition to arrange a few boxes of toys in an order in a short time and win an impressive prize. Boxes with Toys are labelled (1) and Empty boxes (0). Mihika wants to participate and win a prize.

The company places N boxes, both filled with Toys (1) or Empty (0), in a row in a container. Mihika must arrange all boxes in a line/row such that all empty boxes must follow the boxes with toys i.e., first all ones (1) then all zeros (0). There can be several rounds of arrangement till all the boxes are arranged as per the rule. *In each round, Mihika, can swap empty box (0) with only with its adjacent filled box (1). A box, either with toy or empty, can swapped only once in a round.*

Given, the total number of boxes (N) and the initial order of boxes as a series of 1s and 0s, write a program to find the minimum number of rounds needed to arrange the boxes as defined above.

Input/Output

Input	Output	Comments
10 **0 1 1 1 0 1 1 0 1 1**	**7**	• The first line **10** – Total number of boxes • Second line **0 1 1 1 0 1 1 0 1 1** – Initial arrangement of boxes • • Initial arrangement [0 1 1 1 0 1 1 0 1 1] • After1st round [**1 0** 1 1 **1 0** 1 **1 0** 1] • After 2nd round [1 **1 0** 1 1 **1 0** 1 **1 0**] • After 3rd round [1 1 **1 0** 1 1 **1 0** 1 0] • After 4th round [1 1 1 **1 0** 1 1 **1 0** 0] • After 5th round [1 1 1 1 **1 0** 1 1 0 0] • After 6th round [1 1 1 1 1 **1 0** 1 0 0] • **After 7th round** **[** 1 1 1 1 1 1 **1 0** 0 0]

2 Circular Paths

There is a circle with N dots each numbered from 1 and arranged in clockwise direction. To every pair of adjacent dots, there is a cost associated that is represented as either positive or negative integer. Adjacent dots do not have any other dot(s) between them.

A person by name Minku is made to start from a dot **S** and reach another dot **E** by travelling along the circular path in such a way that it takes minimum cost to reach **E** from **S.**

Note that Minku can chose to travel in multiple paths but he cannot move through any path more than twice..

Given the total number of dots (N) on the circle, cost of path of every adjacent pair of dots, the Start Dot (S) and the End Dot (E), write a program to determine the minimum cost, Minku would incur to reach the End Dot following all the possible paths.

Input/Output

<table>
<tr><th>Input</th><th>Output</th><th>Comments</th></tr>
<tr><td>5
- 5 90 -1 -10 3
1 5</td><td>-29</td><td>

The first line 5 represents total number of dots N.
The next line -5 90 -1 -10 3 defines the cost of path between adjacent dots.
The next line 1 5 represents Starting Dot (1) and End Dot (5)
To travel from 1 and reach 5, Minku can choose many paths like,

<table>
<tr><td>1->5</td><td>3</td></tr>
<tr><td>1->2->1->5</td><td>-5-5+3 = -7</td></tr>
<tr><td>1->2->3->2->1->5</td><td>-5+90+90-5+3 = 173</td></tr>
<tr><td>1->2->1->5->4->5</td><td>-5-5+3-10-10 = -27</td></tr>
<tr><td>1->2->1->5->4->3->4->5</td><td>-5-5+3-10-1-1-10 = -29</td></tr>
<tr><td>1->2->3->4->3->2->1->5</td><td>-5+90-1-1+90-5+3 = 171</td></tr>
<tr><td>1->5->4->5</td><td>3-10-10 = -17</td></tr>
<tr><td>:</td><td>:</td></tr>
<tr><td>:</td><td>:</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
</table>

3 Catching Chambal Dacoit

The UP police got information that a dreaded dacoit, living the forest of Chambal, has looted a house in a town, Rampur. The police is now firm on nabbing this elusive dacoit and does not want to miss this opportunity. The SP got the Rampur town map to gain understanding on the possible routes the dacoit can take to escape into the forest.

The town has big main roads and small roads that lead to various villages that further lead to the forest. The main roads did not connect all the villages they are connected by kutcha roads only. The SP believed that the dacoit, in order to escape safely, would take those kutcha roads as there would be check-posts in between two villages connected by main road. So, he wanted to find out the shortest distance from Rampur to all other villages that are connected by kutcha roads.

Now, given the number of villages, starting point (Rampur), and the main roads connecting the villages, write a program to determine the shortest distance to all villages connected by small roads from the Rampur. Always follow the ascending order of villages from the starting point.

Note: The distance is calculated as the number of kutcha roads taken to travel between the villages. Also, two villages are either connected by a main road or kutcha road. No village shall have a road to itself

Input	Output	Comments

5 4
1 2
1 3
2 4
2 5
3
	2 1 1 1	• First line **5 4**, **5** represents number of villages, **4** represents the total number of main roads
		• The next 4 lines represent the connectivity between villages by main roads.
		• The 6th line **3** represents the starting village.
		• Output
		• The distance from 3 to 1 is **2**.
		  ○ Possible paths: 3->4->1, 3->5->1, 3->4->5->1
		  ○ Shortest Path: 3 -> 4 -> 1 or 3 ->5 ->1
		• The distance from 3 to 2 is **1**.
		  ○ Possible and Shortest Path: 3 -> 2
		• The distance from 3 to 4 is **1**.
		  ○ Possible and Shortest Path: 3 -> 4
		• The distance from 3 to 5 is **1**.
		  ○ Possible paths: 3->5, 3->4->5
		  ○ Shortest Path: 3 -> 5