

ACM South Central Region 2000 Programming Contest

Louisiana State University

Problem #7: Sisco's Galaxy

Introduction

The Dominion War has ended and Benjamin Sisco has convinced the Wormhole Aliens to allow the Federation unlimited access to the wormhole that connects Alpha Quadrant and Delta Quadrant. In his discussions with the aliens, Sisco learned that there are other Wormholes that exist throughout the galaxy. He has also convinced the aliens to identify the locations of these wormholes and allow the Federation access to them.

The galaxy has now been fully mapped, and The Federation has determined that a new navigational system needs to be built to take advantage of the new charts. Of particular interest to The Federation is how long a particular trip will take. Your team has been tasked with writing that part of navigational system.

The map of the galaxy is 2-dimensional and has been split up into a regular grid of sectors. The first sector is sector 1. Sectors are numbered left to right, bottom to top. It takes one day to travel from one sector to another. It also takes one day to travel through a wormhole from one sector to another. Travel can take place by three types of moves, each of which uses one day:

1. A horizontal move (left or right)
2. A vertical move (up or down)
3. A move that traverses a worm hole from one of the endpoints to the other endpoint.

You can **not** travel to sectors diagonally.

Your specific task will be to construct a system that can determine the minimum number of days it will take to get from a specified starting sector to a specified target sector.

Input

The input will consist of a non-empty series of input sets. Each input set will follow the following format:

<Size of the galaxy>

<WormholeName>, <Wormhole endpoint #1>, <Wormhole endpoint #2>

.
.
.

Trip, <Sector the trip begins in>, <Sector the trip ends in>

The size of the galaxy is in the format **<Number1>x<Number2>**. **Number1** and **Number2** may be equal, but they do not have to be equal. **Number1** represents the number of *rows*, **Number2** represents the

number of *columns*. Both **Number1** and **Number2** will be greater than 0 and less than or equal to 100.

The list of Wormholes is of variable length (0-20 wormholes). Wormholes can be traversed in either direction. **<WormholeName>** may contain alphanumeric characters as well as spaces and underscores.

The single Trip line of the input set specifies the start and end sectors for the trip that the system should chart a course for.

All commas in the input are followed by exactly one space.

Each input set will be separated from the next with a single blank line. There will not be a blank line at the beginning of the input, but there will be an endline just before the end of input.

(Note: The below corresponds to the first example in the sample data. Wormholes exist such that you can travel from 3 to 5 and from 42 to 51.)

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Output

For each input set, there will be a single line in the output. This line will indicate the minimum number of days (≥ 0) it will take to get from the starting sector to the ending sector and will have the following format:

Trip from <start sector> to <end sector> takes <days> days

Sample Input

10x10

Wormhole1, 3, 5

Wormhole2, 21, 50

Wormhole3, 90, 100

Trip, 1, 49

100x100

The OSU Wormhole, 1, 5

The OU Wormhole, 39, 2005
The LSU Wormhole, 3021, 9765
The UL-LA Wormhole, 50, 2005
The Baylor Wormhole, 2205, 3001
Trip, 45, 3021
100x10
The quick trip, 56, 67
Trip, 55, 67

Sample Output

Trip from 1 to 49 takes 4 days
Trip from 45 to 3021 takes 29 days
Trip from 55 to 67 takes 2 days