# 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 Quadrent and Delta Quadrent. 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. Number 1 represents the number of rows, Number 2 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

10×10
Wormhole1, 3, 5
Wormhole2, 21, 50
Wormhole3, 90 , 100
Trip, 1, 49
$100 \times 100$
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
$100 \times 10$
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

