



Software Technical Test

Objective

Below are two programming problems. Please read both problems then create a program to solve ONE of the problems. Though Bridge values polyglot developers, we request that you use C# for your solution. You may not use any external libraries to solve this problem, but you may use external libraries or tools for building or testing purposes, such as NUnit.

System security is important to us and certain file extensions will be blocked for security purposes – you should NOT include any executables, such as .exes or .msis. We need to be able to run and build your code, so please submit your code as a zipped file of source code and supporting files, without any compiled code.

Please include a brief explanation of your design and assumptions, along with your code, as well as instructions on how to run your application.

We assess a number of things including the design of your solution and your programming skills. While these are small problems, we expect you to submit what you believe is production-quality code – code that you'd be able to run, maintain, and evolve, including any tests that you would normally write as part of the development process. You don't need to gold plate your solution; however we are looking for something more than a bare-bones algorithm.

As a general rule, we allow three days from the date that you receive these instructions to submit your code, but you may request more time if needed. If you have any questions about the code as it relates to your interview process, please contact us.

Problem 1 - Teacher Computer Retrieval

Within each global region (e.g. East Africa), the IT team is responsible for retrieving teacher computers that are broken and returning them to HQ for repair and replacement. Because of road conditions, construction, and one-way traffic, the routes are defined in a single direction – a direct route from Rongai to Kiserian does not imply the existence of a direct route from Kiserian to Rongai. If both of these routes do happen to exist, they are distinct and are not necessarily the same distance.

The purpose of this program is to provide the IT team with information about possible routes between academies to help plan their teacher computer retrievals. To do this, the IT team will need to be able to calculate:

1. The distance along certain routes.
2. The number of different routes between two academies.
3. The shortest route between two academies.

The input to the program should consist of tuples, consisting of the starting academy, ending academy, and the directed distance between the academies. A given route should never appear more than once, and for a given route, the starting and ending academy will not be the same academy. For the test input, the academies are named A to E. A route from A to B with a distance of 3 is represented as AB3. For questions where no route exists, output 'NO SUCH ROUTE'.

The program should then be able to answer the following questions:

1. The distance of the route A-B-C.
2. The distance of the route A-E-B-C-D.
3. The distance of the route A-E-D.
4. The number of trips starting at C and ending at C with a maximum of 3 stops. In the sample data below, there are two such trips: C-D-C (2 stops) and C-E-B-C (3 stops).
5. The number of trips starting at A and ending at C with exactly 4 stops. In the sample data below, there are three such trips: A to C (via B, C, D); A to C (via D, C, D); and A to C (via D, E, B).
6. The length of the shortest route (in terms of distance to travel) from A to C.
7. The length of the shortest route (in terms of distance to travel) from B to B.
8. The number of different routes from C to C with a distance of less than 30. In the sample data, the trips are: CDC, CEBC, CEBDC, CDCEBC, CDEBC, CEBCEBC, CEBCEBCEBC.

Test Input

AB5, BC4, CD8, DC8, DE6, AD5, CE2, EB3, AE7

Expected Test Output

1. 9
2. 22
3. NO SUCH ROUTE
4. 2
5. 3
6. 9
7. 9
8. 7

Problem 2 - Retraining Scheduler

Bridge is reconsidering how it runs its retraining sessions for existing academy managers and teachers. At these sessions, staff learn about new Bridge policies, teaching techniques, changes to billing policies, and updates to academy tech. Historically, all of the sessions have been mandatory, but Bridge is interested in experimenting with having one day that is conference style, where attendees can choose between different tracks, depending on what is most interesting to them.

The training team has requested a tool to help them schedule the different modules that will be available on the elective training day.

- There will be multiple 'tracks', depending on the number of topics being covered.
- Each track will have a morning and afternoon session, with lunch in between.
- There is an open sharing session at the end of the day, where teachers and academy managers can exchange stories and experiences.
- The morning session begins at 9 AM and continues until noon.
- The afternoon session begins at 1 PM and must finish in time for the sharing session.
- The sharing session should begin after 4 PM, but also no later than 5 PM, and it should last until 5:30 PM.
- Talk lengths can be defined either in minutes or as 'lightning' (which means a 5-minute talk).
- To make things simpler, the training team has agreed that talk titles won't have numbers in them.

Note that depending on how you choose to complete this problem, your solution may give a different ordering or combination of talks into tracks.

Test Input

Session Name	Duration
Organising Parents for Academy Improvements	60min
Teaching Innovations in the Pipeline	45min
Teacher Computer Hacks	30min
Making Your Academy Beautiful	45min
Academy Tech Field Repair	45min
Sync Hard	lightning
Unusual Recruiting	lightning
Parent Teacher Conferences	60min
Managing Your Dire Allowance	45min
Customer Care	30min
AIMs - 'Managing Up'	30min
Dealing with Problem Teachers	45min
Hiring the Right Cook	60min
Government Policy Changes and Bridge	60min
Adjusting to Relocation	45min
Public Works in Your Community	30min
Talking To Parents About Billing	30min
So They Say You're a Devil Worshipper	60min
Two-Streams or Not Two-Streams	30min
Piped Water	30min

Expected Test Output (One Possibility)

Track 1

Time	Session Name	Duration
09:00AM	Organising Parents for Academy Improvements	60min
10:00AM	Teaching Innovations in the Pipeline	45min
10:45AM	Teacher Computer Hacks	30min
11:15AM	Making Your Academy Beautiful	45min
12:00PM	Lunch	
01:00PM	Parent Teacher Conferences	60min
02:00PM	Academy Tech Field Repair	45min
02:45PM	Managing Your Dire Allowance	45min
03:30PM	Customer Care	30min
04:00PM	AIMs - 'Managing Up'	30min
04:30PM	Public Works in Your Community	30min
05:00PM	Sharing Session	

Track 2

Time	Session Name	Duration
09:00AM	Hiring the Right Cook	60min
10:00AM	Government Policy Changes and Bridge	60min
11:00AM	Talking To Parents About Billing	30min
11:30AM	Two-Streams or Not Two-Streams	30min
12:00PM	Lunch	

01:00PM	Dealing with Problem Teachers	45min
01:45PM	Adjusting to Relocation	45min
02:30PM	Piped Water	30min
03:00PM	So They Say You're a Devil Worshipper	60min
04:00PM	Sync Hard	lightning
04:05PM	Unusual Recruiting	lightning
05:00PM	Sharing Session	

Good Luck!