

1. Written assignment: Printed textbook 4.5 and 4.19.
2. Coding assignment: You are given a list of  $m$  roads between a set of  $n$  cities. Each road is bi-directional between two cities and has a certain length, in the form of [city1, city2, length]. Given two cities start and destination, you want to find the shortest total length from start to destination and the number of ways you can travel from start to destination in the short total length.

For example, suppose the roads are as follows:

[Fairview, Madison, 7], [Fairview, Ashland, 2], [Ashland, Clayton, 3], [Ashland, Hudson, 3], [Madison, Hudson, 3], [Hudson, Greenville, 1], [Madison, Greenville, 1], [Clayton, Greenville, 1], [Fairview, Franklin, 5], [Franklin, Madison, 2]

Suppose the start is Fairview and the destination is Madison. Then the shortest total length from start to destination is 7 and there are 4 ways of length 7:

Fairview  $\xrightarrow{7}$  Madison

Fairview  $\xrightarrow{5}$  Franklin  $\xrightarrow{2}$  Madison

Fairview  $\xrightarrow{2}$  Ashland  $\xrightarrow{3}$  Clayton  $\xrightarrow{1}$  Greenville  $\xrightarrow{1}$  Madison

Fairview  $\xrightarrow{2}$  Ashland  $\xrightarrow{3}$  Hudson  $\xrightarrow{1}$  Greenville  $\xrightarrow{1}$  Madison

Write a program that takes a set of roads and two cities as input and prints (1) the shortest total length from start to destination, and (2) the number of different ways that have the short total length.

Use the above example as a test case for your problem. When your program is executed, it should print a single line: 7 4.

Analyze the running time of your problem in terms of  $m$  and  $n$ .