

# COMP 182: Algorithmic Thinking

## 20 February 2014\*

You are given a set of cities, along with the pattern of highways between them, in the form of an undirected graph  $g = (V, E)$ . Each stretch of highway  $e \in E$  connects two of the cities, and you know its length in miles,  $\ell_e$ . You want to get from city  $s$  to city  $t$ . There's one problem: your car can only hold enough gas to cover  $L$  miles. There are gas stations in each city, but not between cities. Therefore, you can only take a route if every one of its edges has length  $\ell_e \leq L$ .

1. Given the limitation on your car's fuel tank capacity, show how to determine in linear time whether there is a feasible route from  $s$  to  $t$ .
2. You are now planning to buy a new car, and you want to know the minimum fuel tank capacity that is needed to travel from  $s$  to  $t$ . Give an  $O((|V| + |E|) \log |V|)$  algorithm to determine this.

---

\*This problem is from the book Algorithms, by Dasgupta *et al*.