Worth: 2% **Due:** By 9:59pm on Monday 15 September

Remember to write your *full name* and *student number* prominently on your submission.

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*Please read and understand the policy on Collaboration given on the Course Information Sheet. Then, to protect yourself, list on the front of your submission **every** source of information you used to complete this homework (other than your own lecture and tutorial notes, and materials available directly on the course webpage). For example, indicate clearly the **name** of every student with whom you had discussions, the **title** of every additional textbook you consulted, the **source** of every additional web document you used, etc.*

*For each question, please write up detailed answers carefully. Make sure that you use notation and terminology correctly, and that you explain and justify what you are doing. Marks **will** be deducted for incorrect or ambiguous use of notation and terminology, and for making incorrect, unjustified, ambiguous, or vague claims in your solutions.*

You are driving on the highway, from Toronto to Vancouver. Your car is very predictable, so you know how many kilometers per litre of gas you get. You also know where all the gas stops are along the highway. Where should you stop for gas to ensure that you never run out of gas, and that you make the fewest stops along the way?

Propose **two** different greedy strategies: one of them that always gives an optimal solution and the other one that does not. It's fine if your incorrect greedy strategy is somewhat silly, in the sense that the choices it makes are "obviously" wrong. Explain clearly why your incorrect strategy is incorrect, and give a formal proof that your correct strategy works.

More formally, the problem can be stated as follows.

Input: Positive integers $k, d_1, d_2, \ldots, d_n, d$ such that $d_1 < d_2 < \cdots < d_n < d$ and $d_{i+1} - d_i \leqslant k, 1 \leqslant i < n$.

Question: Given a car which can travel k kilometers on a full tank of gas, gas station locations $d_1, \ldots, d_n$, find a minim**um** size subset $S \subseteq \{1, 2, \ldots, n\}$ such that stopping at gas stations in S allows the car to travel total distance d.