Assignment 7

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NOTE that the following two problems are almost the same problem. You choose one problem to solve.

Problem

Assume you want to hike across the Shenandoah park, from the north point to the south point. You have the map of the hiking trail. You can carry two liters of water, and you can hike m miles before running out of water. You will start with two full liters of water. Your official park map shows all the places at which you can refill his water and the distances between these locations. Your goal is to minimize the number of water stops along your route across the park. Give an efficient method by which you can determine which water stops you should make. Prove that your strategy yields an optimal solution, and give its running time.

Problem

During Covid-19, you stay at home and want to repair some holes on the drywalls. The problem is formulated as below: You have n points on the real line. These n points (imagine they are small dots with infinitely small size) have their distances to the origin as $\{x_1, x_2, \ldots, x_n\}$. *You are using some coins (or pads) to cover these points. The coins are with the same radius* 1. *Design an algorithm which minimizes the number of coins used to cover all points. Prove that your algorithm is correct.*