

Dynamic Programming

Task 5.

You are supervising highway construction. The whole project has been divided into six sections, built by subcontractors. Taking into account terrain features, in each section of equal width, the cost of construction of one unit long in the i -th section (it might be interpreted as the cost per kilometer) is different, equal to C_i .

You need to plan the highway layout, minimizing the construction costs, i.e. define the initial and end point coordinates for each subcontractor (in the example shown in the figure below (not an actual solution to this problem) it would be (4,0) to (1,2) for the first subcontractor, (1,2) to (2,2) for the second subcontractor, (2,2) to (3,2) for the third subcontractor, (3,2) to (4,1) for the fourth subcontractor, (4,1) to (5,1) for the fourth and (5,1) to (6,0) for the last subcontractor. In any way, the highway must start at (0,4) and end at (6,0).

Solve the problem, assuming that the road sections start and end at integer coordinates.

Write the program for solving this problem, for which input data includes unit costs C_1 and the number of feasible points in the vertical direction grid (e.g. 5 means that there are 5 feasible coordinates: 0,1,2,3,4; 10 means that there are 10 feasible coordinates: 0, 0.5, 1, 1.5,...,3.5, 4.0, etc.). Show the solutions, obtained with the program for 5, 10 and 50 points.

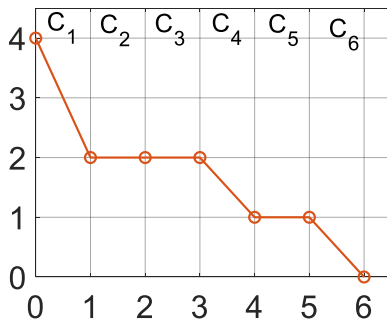


Figure 1 – Sample problem solution

i	1	2	3	4	5	6
C_i	2	3	6	1	2	7

Table 1 – unit costs