

MACM 203 Assignment 6

Spring 2025

This assignment is due Tuesday March 11th at 10pm. Upload your solutions to Crowdmark. Write your solutions as a single Matlab Live Script and export the script to PDF. Write the course number and assignment number as the title of the Matlab Live Script, followed by the table of contents, and then create a section for each part of the question.

Keep in mind that your assignment, including the source code, is a document that will be read in order to be marked. It has to be very clear and properly formatted.

Your Matlab code must be general enough to solve any other instance of the same problem *without modification*.

Assignments should be written individually. You can discuss in groups, but you have to write your assignment yourself. In case of academic dishonesty SFU policies will be applied.

Preamble

This week's assignment focuses on linear optimization.

Question 1 (15 marks)

Part (a)

Download the file `a6.mat` that contains arrays S and T explained below.

A cell phone company is starting to provide service to a sparsely populated area of the shape 100×100 kilometres. Each settlement in the area must receive service. The coordinates of the settlements are stored in the array S . The cell phone company identified locations where cell towers can be built. These locations are stored in the array T . The coordinates in arrays S and T are given in kilometres. Plot a map of the area in which blue circles denote settlements and red circles denote sites where towers can be built.

Part (b)

Each tower that will be built will serve a circular area with centre at the tower and radius 25 kilometres. It is required that each settlement receives service from at least one tower. Under these constraints, the cell phone company wants to *minimize the number of towers that will be built*. Formulate this optimization problem in Matlab and use Matlab to solve it. Explain your solution. Print the optimal (minimal) number of towers that will be built. List the locations where towers will be built.

Part (c)

Display your optimal solution obtained in part (b) graphically, by plotting a map of the area in which blue circles denote settlements and red circles denote sites where towers will be built.