

1986 年美国大学生数学建模竞赛 MCM 试题

1986 MCM A: Hydrographic Data

The table below gives the depth Z of water in feet for surface points with rectangular coordinates X , Y in yards [table of 14 data points omitted]. The depth measurements were taken at low tide. Your ship has a draft of five feet. What region should you avoid within the rectangle $(75,200) \times (-50, 150)$?

X	Y	Z
129.0	7.5	4
140.0	141.5	8
108.5	28.0	6
88.0	147.0	8
185.5	22.5	6
195.0	137.5	8
105.5	85.5	8
157.5	-6.5	9
107.5	-81.0	9
77.0	3.0	8
162.0	-66.5	9
162.0	84.0	4
117.5	-35.5	9

1986 MCM B: Emergency-Facilities Location

The township of Rio Rancho has hitherto not had its own emergency facilities. It has secured funds to erect two emergency facilities in 1986, each of which will combine ambulance, fire, and police services. Figure 1 indicates the demand [figure omitted], or number of emergencies per square block, for 1985. The “L” region in the north is an obstacle, while the rectangle in the south is a part with shallow pond. It takes an emergency vehicle an average of 15 seconds to go one block in the N-S direction and 20 seconds in the E-W direction. Your task is to locate the two facilities so as to minimize the total response time.

1. Assume that the demand is concentrated at the center of the block and that the facilities will be located on corners.

2. Assume that the demand is uniformly distributed on the streets bordering each block and that the facilities may be located anywhere on the streets.