

1988 年美国大学生数学建模竞赛 MCM 试题

1988 MCM A: The Drug Runner Problem

Two listening posts 5.43 miles apart pick up a brief radio signal. The sensing devices were oriented at 110 degrees and 119 degrees, respectively, when the signal was detected; and they are accurate to within 2 degrees. The signal came from a region of active drug exchange, and it is inferred that there is a powerboat waiting for someone to pick up drugs. It is dusk, the weather is calm, and there are no currents. A small helicopter leaves from Post 1 and is able to fly accurately along the 110 degree angle direction. The helicopter's speed is three times the speed of the boat. The helicopter will be heard when it gets within 500 ft of the boat. This helicopter has only one detection device, a searchlight. At 200 ft, it can just illuminate a circular region with a radius of 25 ft.

1. Develop an optimal search method for the helicopter.
2. Use a 95% confidence level in your calculations.

1988 MCM B: Packing Railroad Flatcars

Two railroad flatcars are to be loaded with seven types of packing crates. The crates have the same width and height but varying thickness (t , in cm) and weight (w , in kg). Table 1 gives, for each crate, the thickness, weight, and number available [table omitted]. Each car has 10.2 meters of length available for packing the crates (like slices of toast) and can carry up to 40 metric tons. There is a special constraint on the total number of C_5, C_6, and C_7 crates because of a subsequent local trucking restriction: The total space (thickness) occupied by these crates must not exceed 302.7 cm. Load the two flatcars (see Figure 1) so as to minimize the wasted floor space [figure omitted].