Greedy Method

1 Problems

Problem 1: Non-Attacking Kings

Place the greatest possible number of kings on an 8x8 chessboard so that no two kings are placed on adjacent — vertically, horizontally, or diagonally — squares.

Problem 2: Knight's Shortest Path

What is the minimum number of moves needed for a chess knight to go from one corner of a 100x100 board to the diagonally opposite corner?

Problem 3: Averaging Down

There are 10 identical vessels, one of them with a pints of water and the others empty. You are allowed to perform the following operation: take two of the vessels and split the total amount of water in them equally between them. The object is to achieve a minimum amount of water in the vessel containing all the water in the initial set up by a sequence of such operations. What is the best way to do this?

Problem 4: Rumor Spreading

There are n people, each in possession of a different rumor. They want to share the news with each other by sending electronic messages. What is the minimum number of messages they need to send to guarantee that every one of them gets all the rumors? Assume that a sender includes all the rumors he or she knows at the time the message is sent and that a message may only have one addressee.

2 Challenge Problems

Problem 5: Efficient Rook

The rook in chess can move either horizontally to any square that is in the same row or vertically to any square that is in the same column as its current position. What is the minimum number of moves needed for

the rook to pass over all the squares of an n x n chessboard? (Here, a tour does not have to start and end at the same square; the squares where it starts and ends are considered passed over by default.)

Problem 6: Bachet's Weights

Find an optimal set of n weights w_1, w_2,... , w_n so that it would be possible to weigh on a two-pan balance scale any integral load in the largest possible range from 1 to W, assuming the following:

(a) Weights can be put only on the free pan of the scale.

(b) Weights can be put on both pans of the scale.

Problem 7: Super-Egg Testing

A firm has invented a super-strong egg. For publicity purposes, it wants to determine the highest floor in a 100-story building from which such an egg can fall without breaking. The firm has given a tester two identical eggs to experiment with. Of course, the same egg can be dropped multiple times unless it breaks. What is the minimum number of droppings that is guaranteed to determine the highest safe floor in all cases?