Олимпиада по играм и алгоритмам (стажёры)

1. There is a cell X that is highlighted by invisible ink in the checked square with size of 4x4. You can choose any square size of 2x2 and figure it out if it contains X. Is it possible to find position of the X asking 5 questions?

2. There is one false coin out of four. Its weight is different but it's unknown whether it heavier or lighter. Weight of genuine coin id 5 grams. You have one 5 gram weight. How you can find false coin using 2 weightings and understand whether it heavier or lighter.

3. On the table lies 20 chocolates. Carlson and Winnie the Pooh play the following game. Per turn, you can either replace the chocolate toffee, or eat a piece of chocolate or toffee from the table. Carlson goes first. The player who can not make a move. Who will win in a particular game?

4. First, the number written on the board in 1000. After that, with the number written on the board prizvodit following operation: if the record number is the only numbers 0, 3, 6, or 9, then subtract 3 from it, otherwise it is subtracted from 1. (For example, after the first six moves on the board will be the numbers 999, 996, 993, 990, 987, 986). For what number of moves on the board get 0?

5. Display consists of lights, buttons, gathered in a square 101×101. When you click on it and all the buttons that are with her in the horizontal and vertical rows, change their state, (non-burning light bulb included, and burning off). How far the least number of clicks you can light all the light bulbs, if initially they were all off?

6. Two players at a time are entered one number in an empty cell strips 1×100 cells. The game ends when all the cells are filled. After that is sought is the longest piece of consecutive numbers, form a monotone (non-increasing or decreasing) sequence. In the process of filling the cells of the first player tries to make the length of this sequence was as much as possible, and the second - as little as possible. What is the maximum length of a monotone sequence which is obtained with the correct game both players?

Time to resolve - 4 hours (240 minutes)