

# KTH Challenge 2011 Solutions

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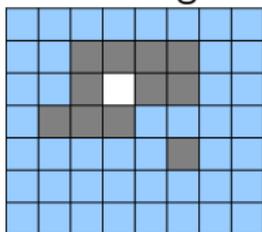
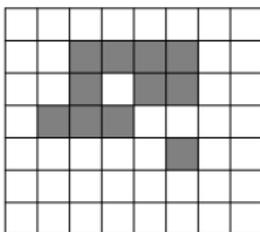
# A – Reversed Binary Numbers

- Just implement what the problem statement says.
- Can be made easier with `bitset<32>` in C++ or `Integer.toBinaryString()` in Java.

Statistics: 66 submissions, 39 correct, first at 00:03:29.

## E – Coast Length

- Surround the map from the input by empty squares. Flood it from one of the corners using a breadth-first-search.



- Time is linear in the size of the map.
- Watch out for stack size when implementing recursive Depth first search.

Statistics: 126 submissions, 17 correct, first at 0:49:43.

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- Now we have the length  $L$  and  $M$  – the order of the palindrome among length- $L$  palindromes. The left half of the palindrome is  $M$  in binary using  $L$  bits. Right half is a mirror of the left half.

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- **Accepted**

Statistics: 63 submissions, 14 correct, first at 0:20:52.

## D – Kindergarten Excursion

- If a 1 is to the left of a 0, these two have to be swapped at some point. The same is true for 2/0 and 2/1.
- Process the sequence from left to right. Keep track of the number of 1's and 2's to the left of current number and calculate the result.
- Watch out for overflow.
- Linear time solution.

Statistics: 60 submissions, 12 correct, first at 1:13:57.

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- No. Since we will use at least one 5-, 10- or 25-cent coin, we would be better off paying with 1-cent coins instead of one big coin.
- We can generalize this argument for 5- and 10-cent coin.
- We try to pay using at least  $N_1 - 24$  1-cent coins; at least  $N_5 - 4$  5-cent coins,  $N_{10} - 4$  10-cent coins and try to pay the rest with 25-cent coins.
- The total number of possibilities:  $25 \cdot 5 \cdot 5 = 625$ .
- Other solutions: dynamic programming and a greedy which tries only 2 possibilities.

Statistics: 38 submissions, ?? correct, first at 0:51:06.

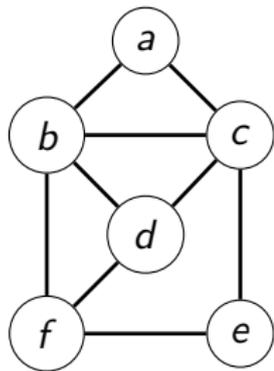
# F – Icons in the Toolbar

- We can assume that  $s_1$  is in the first row. Rearranging columns doesn't change the result, so we can assume that the first row is sorted.
- Sorting items in the second row will not increase the area.
- Optimal solution will be always of the following form, for some  $k$ .

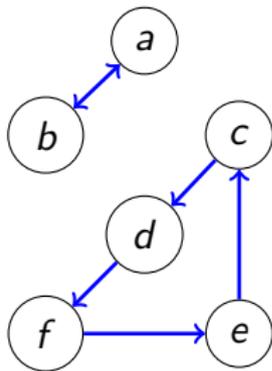
$s_1$	$\dots$	$s_k$	$s_{2k+1}$	$\dots$	$s_{2N-1}$
$s_{k+1}$	$\dots$	$s_{2k}$	$s_{2k+2}$	$\dots$	$s_{2N}$

- With some precomputation we can try each  $k$  in constant time.

Statistics: 16 submission, ?? correct, first at 2:54:54.

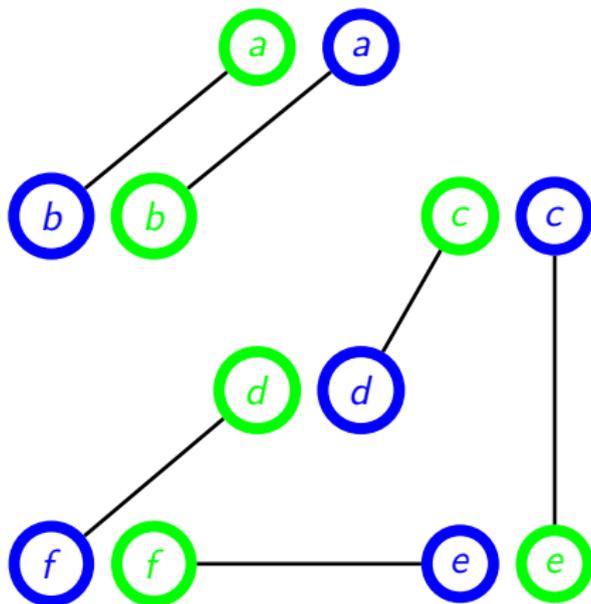


(a) Input graph



(b) A solution

- Instead of considering oriented edges, split each vertex into a green and blue vertex. Find a matching in the bipartite graph.



Statistics: 16 submissions, ?? correct, first at ??.

# This was fun! When is the next contest?

- Programmeringstävlingsverksamhet trains every two weeks at KTH, check [www.csc.kth.se/contest](http://www.csc.kth.se/contest).
- Google Code Jam and TopCoder Open start in May. Both have usually around 10000 participants.
- Nordic Championships in October, North-western Europe qualifier in November.
- You will find more info at our webpage [www.csc.kth.se/contest](http://www.csc.kth.se/contest). Subscribe to our calendar and RSS feed.