

GCPC 2026 Presentation of Solutions

German Collegiate Programming Contest 2026

The GCPC Jury

June 13, 2026

GCPC 2026 Jury

- **Andreas Grigorjew**
University of Warsaw, CPUIm
- **Konrad Letz**
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- **Niklas Mohrin**
Hasso-Plattner-Institut, Potsdam
- **Jannik Olbrich**
Ulm University, CPUIm
- **Erik Sünderhauf**
Technical University of Munich
- **Lucas Schwebler**
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- **Leonard Weininger**
RWTH Aachen
- **Christopher Weyand**
MOIA GmbH, CPUIm
- **Yidi Zang**
Karlsruhe Institute of Technology, CPUIm
- **Michael Zündorf**
Karlsruhe Institute of Technology, CPUIm

GCPC 2026 Test Solvers

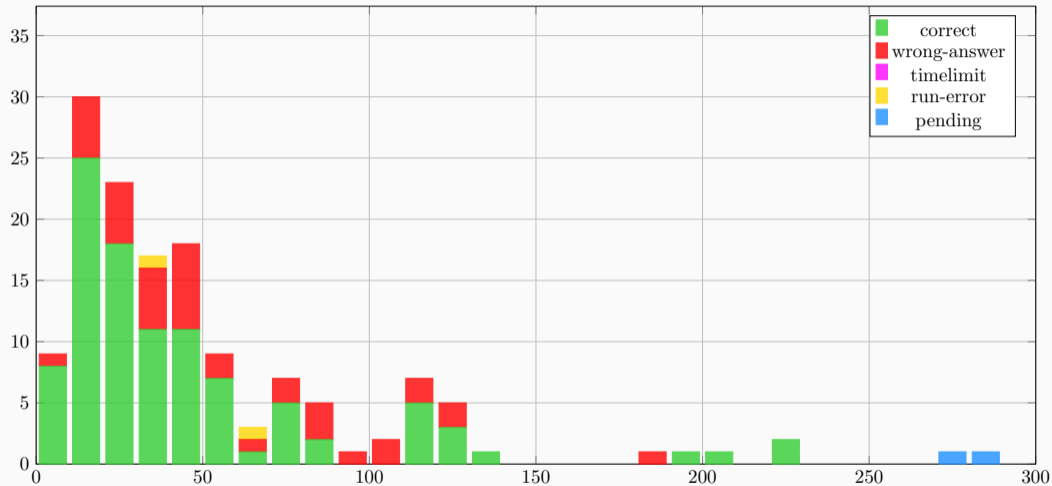
- **Michael Ruderer**
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University of Vienna, CPUIm

L: Lyrical Leisure

Problem author: Lucas Schwebler



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Problem

Construct a string of length n with longest palindromic substring of length k .

L: Lyrical Leisure

Problem author: Lucas Schwebler

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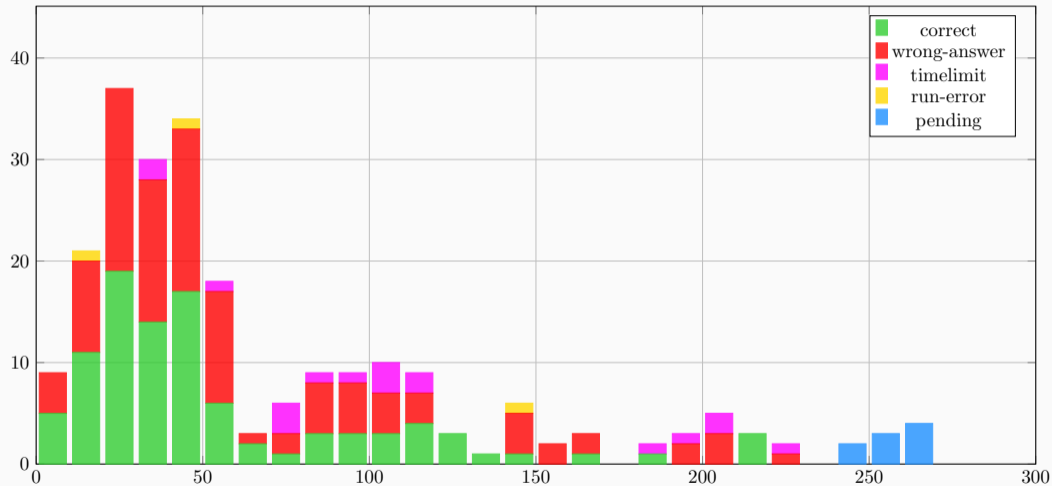
Construct a string of length n with longest palindromic substring of length k .

Solution

- Repeat character "a" k times as palindromic substring.
- Fill suffix with bcdbcdbcd...
- Python golf: `("a"*k+"bcd"*n)[:n]`

F: Fighting Fraud

Problem author: Christopher Weyand



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- Determine if each item is picked up and later dropped off exactly once.

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- Group the tasks by item.

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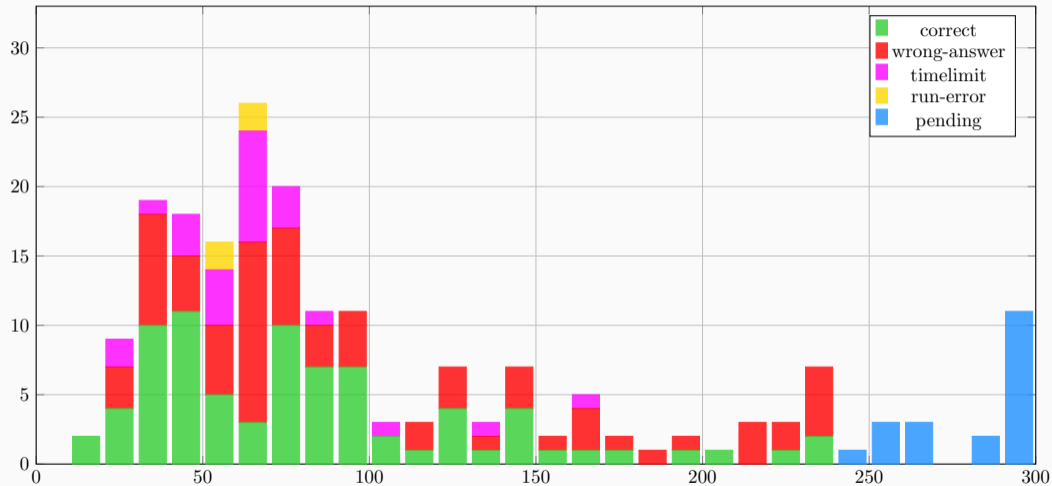
- Given a list of tasks that either pick up or drop off an item.
- Determine if each item is picked up and later dropped off exactly once.

Solution

- Group the tasks by item.
- Check that each group consists of exactly two tasks, a pickup followed by a drop-off.

C: Crosses and Circles

Problem author: Konrad Letz



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Win tic-tac-toe on a large (59×42) grid when going first.

Solution

- Play the first move somewhere with enough space around it, for example near the center.

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Solution

- Play the first move somewhere with enough space around it, for example near the center.
- After the judge's first move, choose a direction such that the adjacent cell and both completion cells are still free.
- Play the adjacent cell in that direction.
- The two possible completion cells are now two different winning threats. The judge can block at most one, so play the other one.

I: Incremented Itinerary

Problem author: Niklas Mohrin

Problem

Given an undirected graph. Is there a path from vertex 1 to vertex n that is exactly one edge longer than a shortest path?

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Solution 1

- Let $D = \text{dist}(1, n)$.
- **Observation:** Any path from 1 to n of length $D + 1$ must contain an edge $\{u, v\}$ such that the prefix from 1 to u and the suffix from v to n are shortest paths (possibly $u = 1$ or $v = n$).
- Otherwise, the path would have length at least $D + 2$.

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- Otherwise, the path would have length at least $D + 2$.
- Therefore it suffices to check whether there exists an edge $\{u, v\}$ with

$$\text{dist}(1, u) + 1 + \text{dist}(v, n) = D + 1.$$

- To check this efficiently, precompute all distances from 1 and from n using two BFSs.
- Time complexity: $\mathcal{O}(n + m)$.

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Given an undirected graph. Is there a path from vertex 1 to vertex n that is exactly one edge longer than a shortest path?

Solution 2

- Use two states $(v, 0)$ and $(v, 1)$ per vertex.
- States (u, i) and (v, j) are connected iff there is an edge $\{u, v\}$.

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- States (u, i) and (v, j) are connected iff there is an edge $\{u, v\}$.
- Run a BFS on these states starting from $(1, 0)$, with the following restriction:
 - States $(v, 1)$ can only be visited if reached at distance exactly one longer than the distance to $(v, 0)$.

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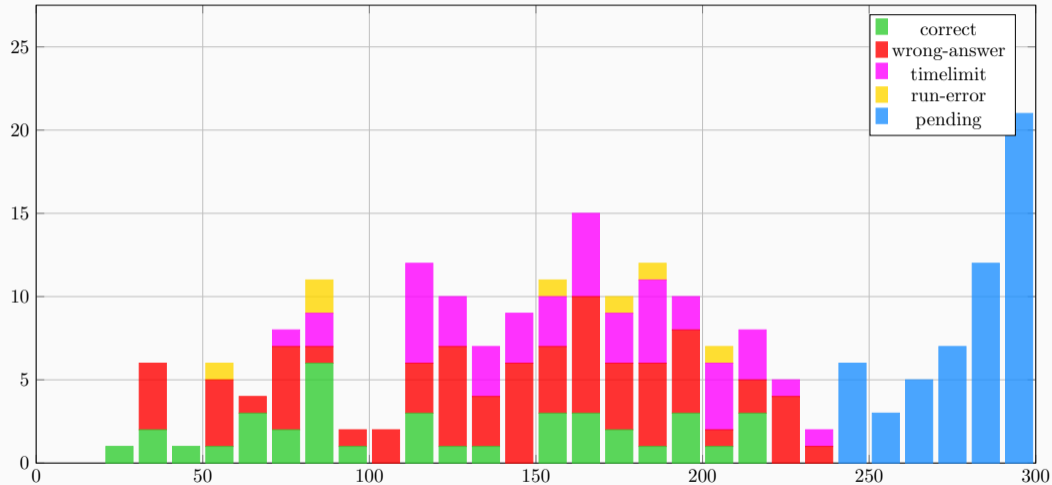
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- States (u, i) and (v, j) are connected iff there is an edge $\{u, v\}$.
- Run a BFS on these states starting from $(1, 0)$, with the following restriction:
 - States $(v, 1)$ can only be visited if reached at distance exactly one longer than the distance to $(v, 0)$.
- Finally, check if $(n, 1)$ is visited.
- Time complexity: $\mathcal{O}(n + m)$.

B: Bye Bye Bilbo

Problem author: Jannik Olbrich



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Given a directed tree, find a minimal subset of nodes, such that every node has distance less than k to this subset.

Solution

- Solve the problem greedily. Consider a node with maximum depth u .

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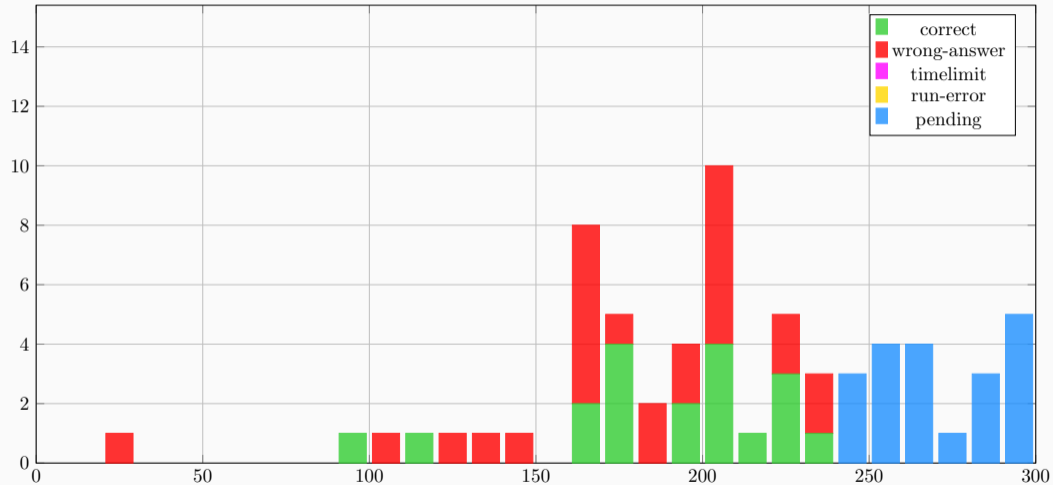
Given a directed tree, find a minimal subset of nodes, such that every node has distance less than k to this subset.

Solution

- Solve the problem greedily. Consider a node with maximum depth u .
- Walk up $k - 1$ steps to the node v and add v to the subset.
- Remove the subtree rooted at v and repeat all the steps.

K: Keeping Cows

Problem author: Yidi Zang



K: Keeping Cows

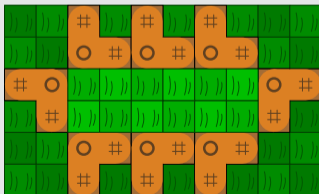
Problem author: Yidi Zang

Problem

- Place corner-fences into a 100×100 grid.
- Create a connected fenced area of exactly $1 \leq a \leq 5000$ cells.

Solution

- There are many different constructions of varying implementation difficulty.
- Determine minimum h with $(h - 1) \cdot 80 \geq a$ (one extra row).
- Fence a $h \times 80$ rectangle area.

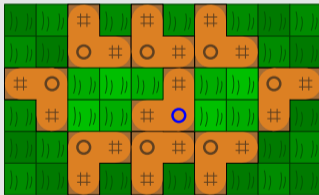


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Case $h = 2$

- If $h = 2$, then $a \leq 80$, and place a (blue) block as shown below.
- Notice that left component is odd, right is even.
- Move middle block left or right to increase the relevant component by 2.
- All $a \leq 80$ are achievable this way.

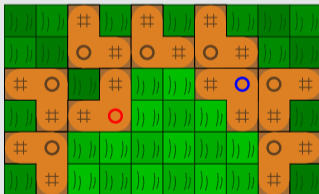


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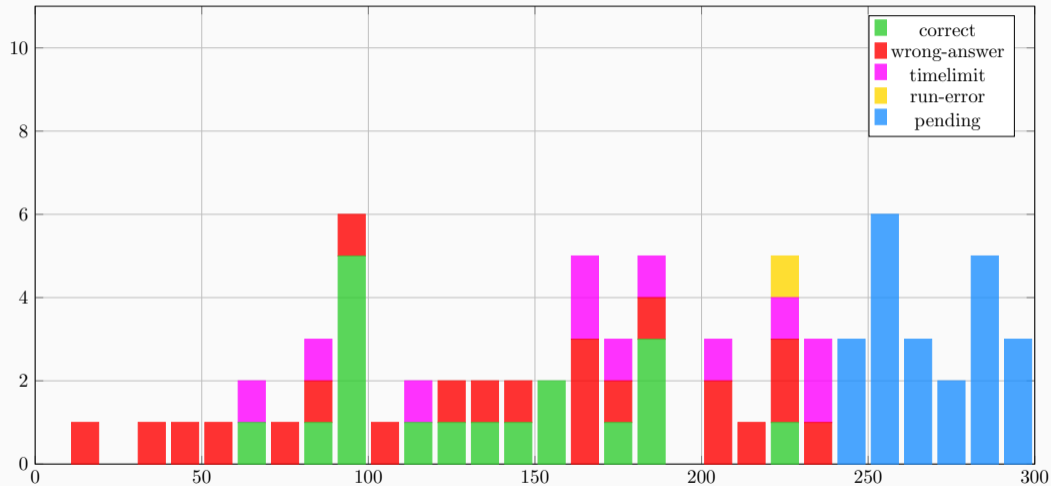
Case $h > 2$

- By construction, our rectangle has $80 \leq x \leq 160$ cells too much.
- Place the right piece (blue) to reduce field by 3.
- Place the left piece (red) to reduce field by 4.
- Use up to 3 blue pieces, and then as many red pieces as necessary.
- One can (easily) show that $80 \leq x \leq 160$ reduction is always possible.



A: Attracting Attendees

Problem author: Leonard Weininger



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Given n bands and m fans and connections between them, select some of them such that:

- each band is connected to at least c fans
- each fan is connected to at least half of the bands they were initially connected to

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- each band is connected to at least c fans
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Solution

- initially consider all bands and fans
- if a band has less than c fans left you must discard it
- if a fan has less than half of its bands remaining you must discard them

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- if nothing must be discarded the remaining bands and fans are a valid solution

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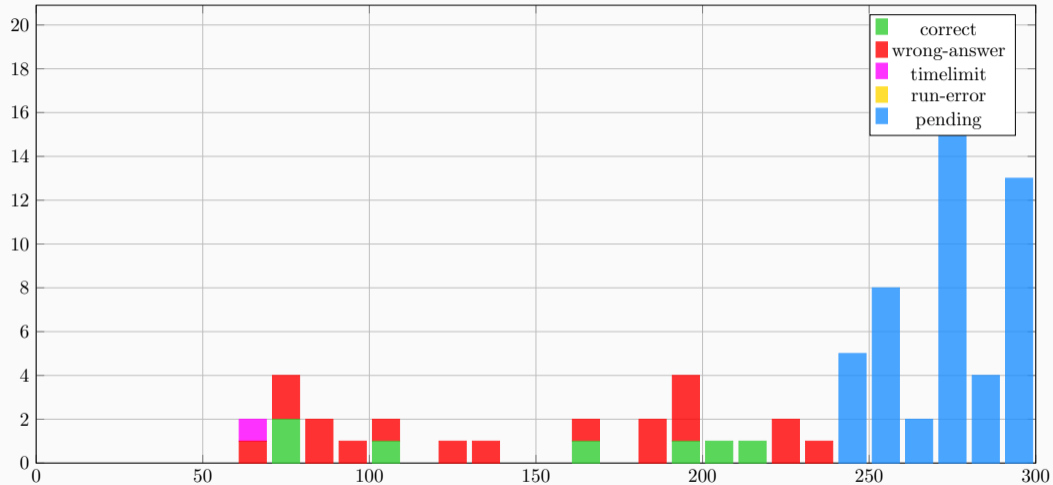
- each band is connected to at least c fans
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Solution

- initially consider all bands and fans
- if a band has less than c fans left you must discard it
- if a fan has less than half of its bands remaining you must discard them
- if nothing must be discarded the remaining bands and fans are a valid solution
(this is actually the largest possible solution)

E: Egocentric Expedition

Problem author: Michael Zündorf



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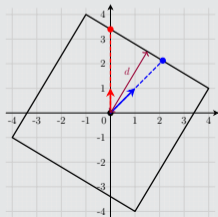
Problem author: Michael Zündorf

Problem

- Find the area of a hidden arbitrarily rotated square.
- Ask two query directions and receive the distances from square center to edge.

Solution

- Query two directions 45 degrees apart, i.e. $(0, 1)$ and $(1, 1)$.
- Assume the two points in those directions lie on one side of the square.
- Calculate minimum distance d to that side (line), the answer is $(2d)^2$.
- Why is this correct?

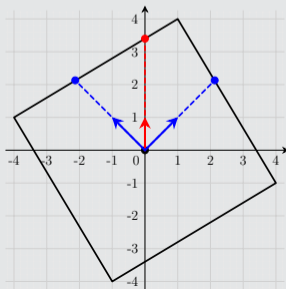


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Solution

- Why is this correct?
- Note that a square has 90 degree rotation symmetry.
- Specifically, direction $(-1, 1)$ gives the same distance as $(1, 1)$.
- Notice that either $(0, 1)$ and $(1, 1)$ lie on the same side, or $(0, 1)$ and $(-1, 1)$.
- So assuming $(0, 1)$ and $(1, 1)$ on same side results in correct area.



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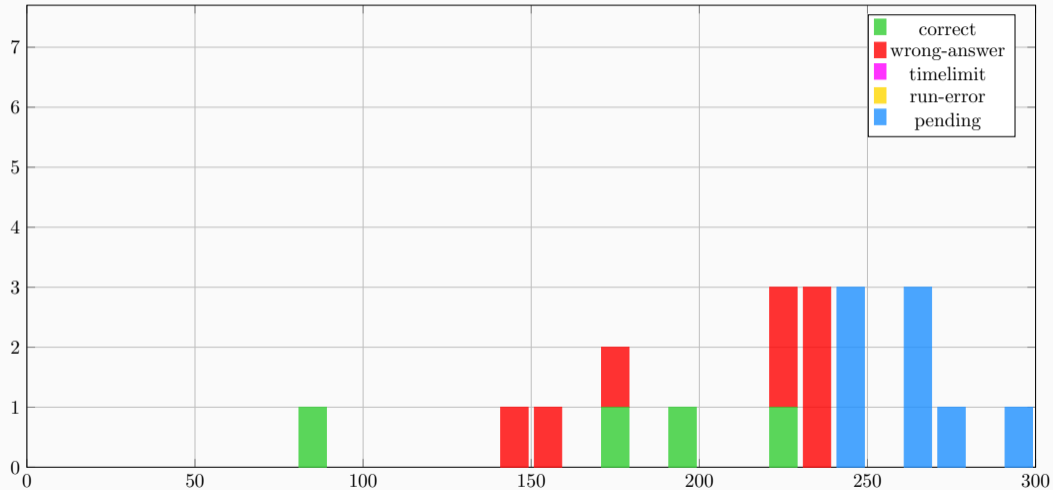
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Wrong Solution

- Just using two very close directions does not work, with given constraints, there can always be a corner in between.

M: Mirror Magic

Problem author: Erik Sünderhauf



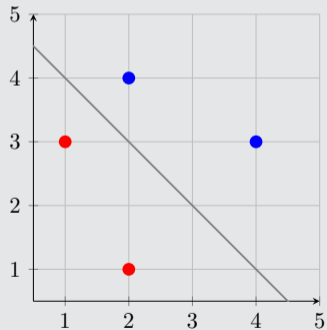
M: Mirror Magic

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Given two sets of points A and B . Determine whether there is a symmetry line separating A and B , i.e., mirroring A along that line results in B .

Solution



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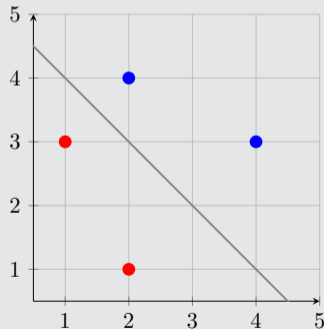
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- Compute the Center of Mass (COM) for both sets:

$$c_A = \left(\sum_{p \in A} p \right) / |A|$$



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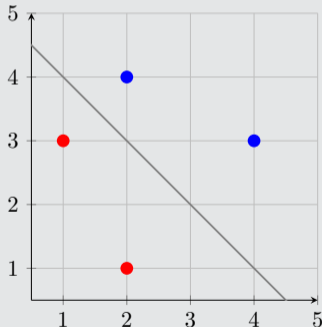
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- If there is a symmetry line, it
 - goes through $(c_A + c_B)/2$, and
 - is perpendicular to $c_A - c_B$



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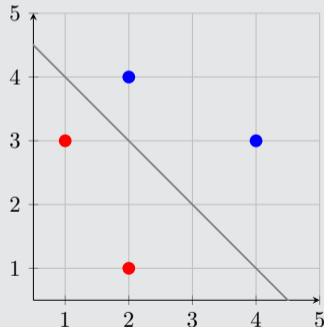
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→ Check that

- $c_A \neq c_B$,
- mirroring A results in B , and
- all points in A lie strictly one side of the mirror line



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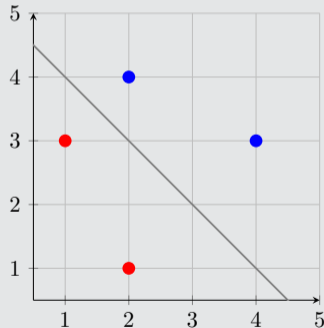
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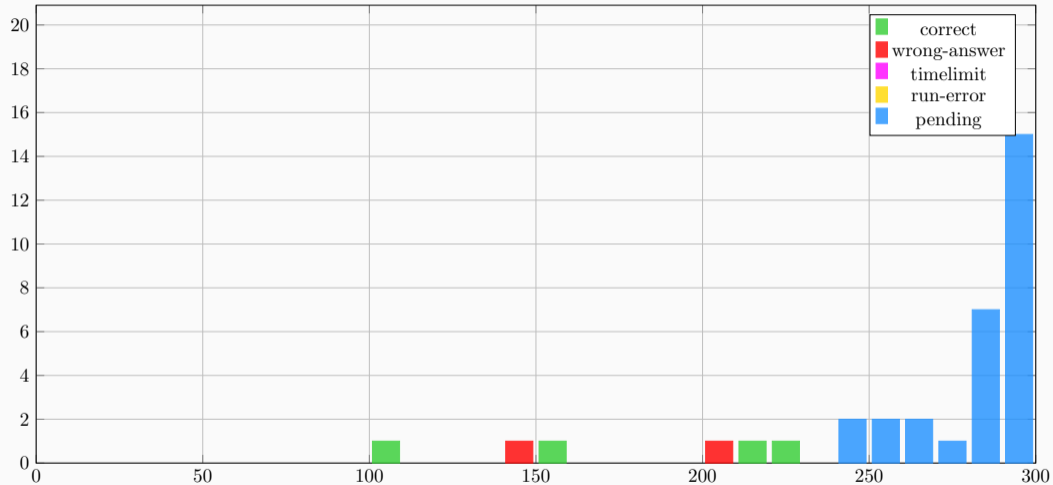
Possible pitfalls:

- Rounding after mirroring without checking for integer coordinates
- Sorting for comparing the mirrored A with B
- Missing one of the checks
- float instead of (long) double



D: Delphi Danger

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Find n infinite binary strings s_i , which satisfy prophecies of the form

- $s_u[t] \neq s_v[t]$
- t is the smallest index with the above property

Minimize the number of 1's in those strings.

Solution

- Iterate over t in decreasing order and process all prophecies with the current t

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- Strings have to be identical for all further prophecies \rightarrow merge each connected components into a single node

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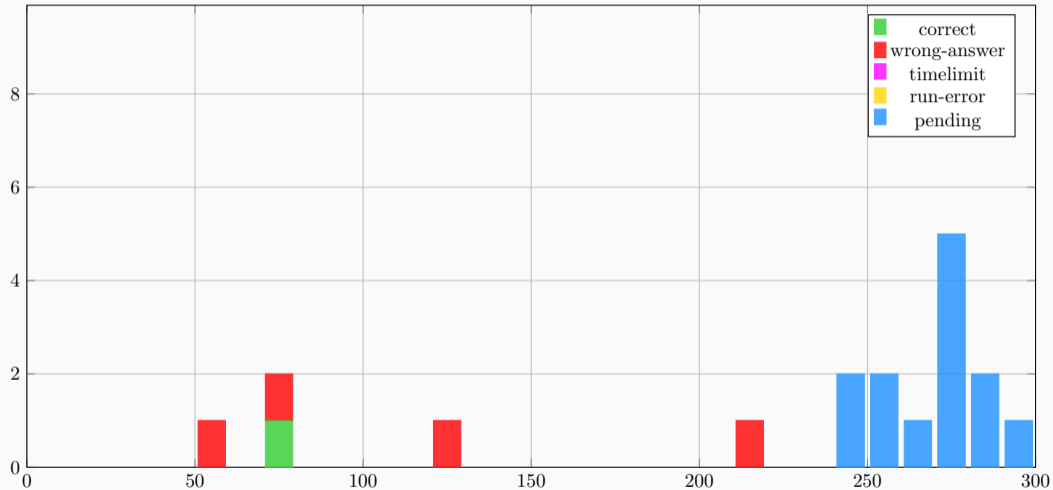
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- Greedily assign a 1 to the smaller part of each component.
- Strings have to be identical for all further prophecies \rightarrow merge each connected components into a single node
- Complexity: $\mathcal{O}(m \log m + n)$ for sorting and checking bipartiteness

J: Junior Joining

Problem author: Yidi Zang



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Problem

- Given $2n$ recruits with attack a_i , defense d_i , and home city c_i .
- Assign them into n pairs, maximize sum over fighting power.
- Fighting power of a pair (i, j) is
$$\begin{cases} a_i + d_j, & \text{if } c_i \neq c_j, \\ a_i + d_j + c_i, & \text{if } c_i = c_j \end{cases}$$

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Solution

- Instead of pairing, partition recruits into two groups of n , attacking and defending.
- Without city bonus, it is optimal to sort by $a_i - d_i$ and split in half.
- Therefore, for all recruits of one city, sort by $a_i - d_i$.

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- Without city bonus, it is optimal to sort by $a_i - d_i$ and split in half.
- Therefore, for all recruits of one city, sort by $a_i - d_i$.
- Initially, split each city in half to maximize city bonus.
- If there is an odd number of recruits, ignore the middle one.
- Use middle ones to fill both groups to n .
- For each recruit, calculate attack-defense difference to move to other group.
- Subtract c_i city bonus if they were not middle one.
- As long as it is worth it, swap the best recruit of both groups.
- The resulting partition is optimal, calculate the answer.

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Proof Sketch

- We start with optimal city bonus.
- Whenever we move one (not middle), we lose one city bonus pairing.

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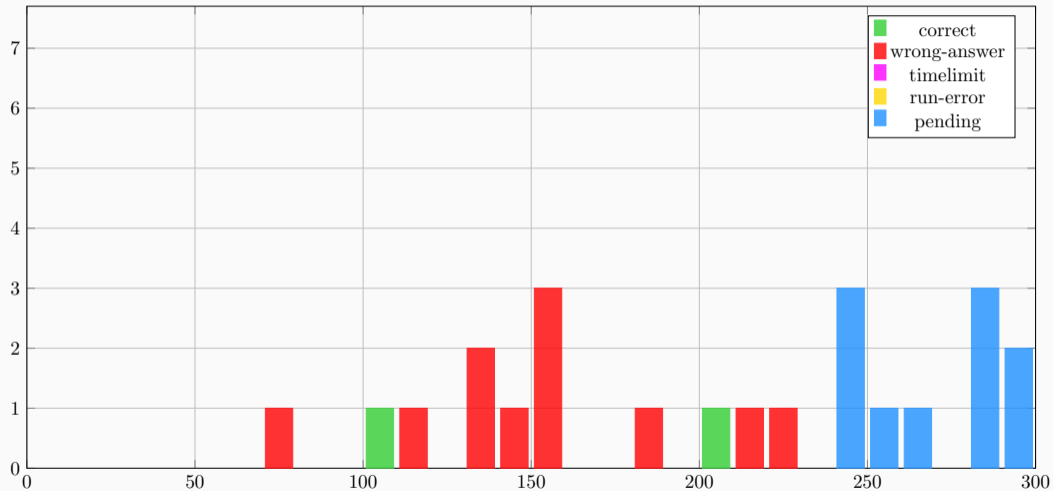
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Proof Sketch

- We start with optimal city bonus.
- Whenever we move one (not middle), we lose one city bonus pairing.
- If a recruit from a city c moves from group A to B , no one from c will move from B to A .
- The middle always moves before any other from their city moves.
- Notice that for each city, the recruits are always at an optimal assignment (no swap is better).
- If a better optimal solution were to exist, at least two of different cities are swapped.
- At the end of our process, no two such people can exist.

G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang



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- Check if one operation is sufficient:
 - Let s be the sorted version of t .
 - Build the graph G with directed edges $s_i \rightarrow t_i$.

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 - Otherwise \rightarrow one operation suffices, construct Euler cycle

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 - Otherwise \rightarrow one operation suffices, construct Euler cycle
- Two operations are always sufficient!

G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

Lemma

Every permutation is the composition of two cycles.

Proof by picture



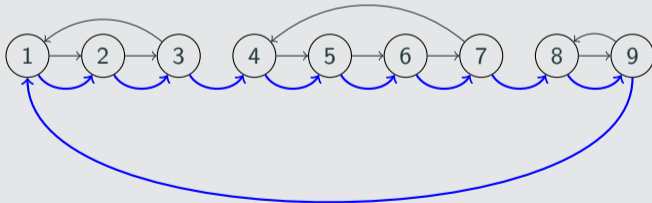
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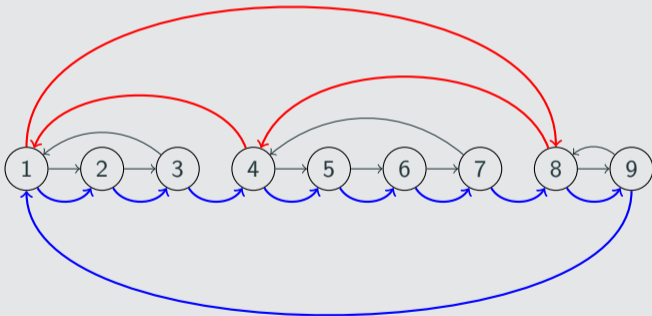
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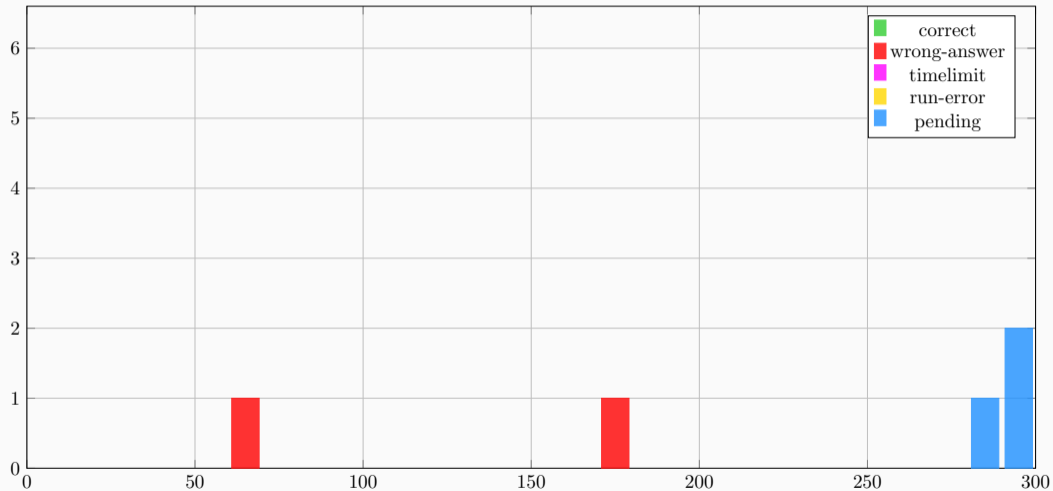
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H: Historical Hits

Problem author: Lucas Schwebler



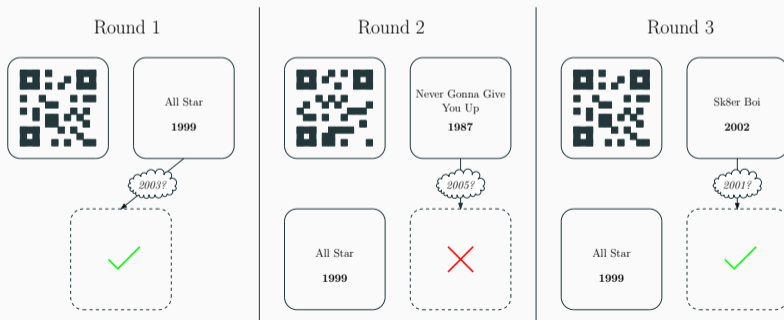
H: Historical Hits

Problem author: Lucas Schwebler

Problem

Find the expected number of correct guesses in a single player game of Hitster (random card order).

- $n \leq 3000$ songs, release year a_i , guess b_i
- a_i are distinct!



H: Historical Hits

Problem author: Lucas Schwebler

Solution

- Suppose that card i is drawn first.

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- Suppose that card i is drawn first.
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Solution

- Suppose that card i is drawn first.
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- Two independent subproblems: cards with $a_j, b_j < a_i$ and cards with $a_j, b_j > a_i$.

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- Challenge: Solve the problem with duplicate a_i allowed.

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- 942 secret test cases (≈ 72 per problem)

Random facts

Jury work

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On average 19.9 lines per problem

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- The minimum number of characters the jury needed to solve all problems is

$$709 + 250 + 84 + 688 + 140 + 255 + 968 + 1475 + 522 + 389 + 513 + 56 + 626 = 6675$$

On average 513 characters per problem

Europe Women's Programming Contest 2026

- Women and non-binary students
- For newcomers and experienced competitors
- Online qualifier: Saturday, July 4, 2026
- Onsite finals: August 21 - 24, 2026

ewpc.icpc.global:

