Delft Algorithm Programming Contest 2026

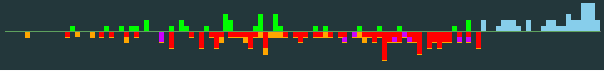
Solutions presentation

The Benelux Algorithm Programming Contest (BAPC) 2026 Jury

September 26, 2026

A: Ambagaata

Problem author: Mike de Vries



Problem: Given: dictionary with n words, messages where all vowels except maybe `y` are replaced by `a`. At most 4 letters per word are a `y`. Determine for each message whether

- it corresponds to a unique message consisting of words from the dictionary, or
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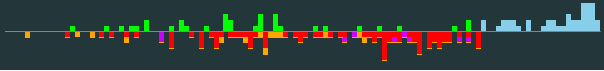

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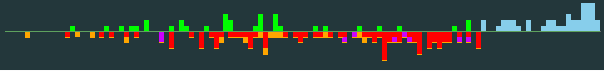

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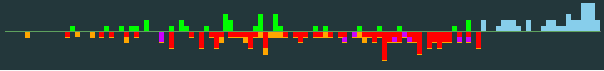

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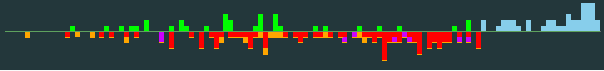

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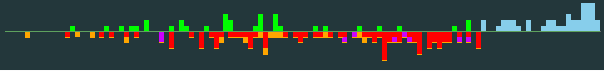

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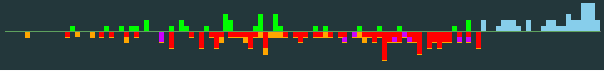

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Running time: $\mathcal{O}(2^Y D + M)$, where D is the total length of words in the dictionary, M is the total length of the messages, and Y is the maximum number of ys in a single word.

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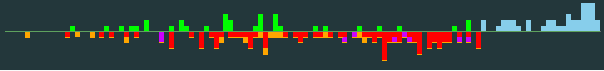

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Running time: $\mathcal{O}(2^Y D + M)$, where D is the total length of words in the dictionary, M is the total length of the messages, and Y is the maximum number of ys in a single word.

Statistics: 176 submissions, 33 accepted, 43 unknown

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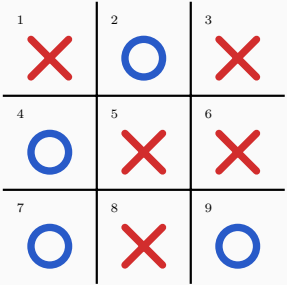
Construction for draw:



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(See also: "Crosses and Circles" from GCPC 2026)

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Statistics: 99 submissions, 68 accepted

C: Chaotic Crossing

Problem author: Reinier Schmiermann

Problem: Given an undirected graph. Each edge ij has a probability p_{ij} that it can be used during each second, and crossing an edge takes exactly one second. What is the minimum expected time to go from s to t?

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Strategy: Each vertex i has some minimum expected time E_i to go from i to B. For t, we have $E_t = 0$. For any other vertex i, each second, we only cross an edge if we can move to a vertex j with $E_j < E_i$, and if we can, then we pick the smallest E_j.

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Algebra: For example, if vertex 4 neighbors vertices $1, 2, 3$ with $E_1 < E_2 < E_3 < E_4$, we get

$$E_4 = 1 + p_{41}E_1 + (1 - p_{41})p_{42}E_2 + (1 - p_{41})(1 - p_{42})p_{43}E_3 + (1 - p_{41})(1 - p_{42})(1 - p_{43})E_4.$$

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Calculation: To calculate A_i and B_i, we initialize $A_i = 1$ and $B_i = 1$. We then iterate the neighbors j with $E_j < E_i$ in increasing order of E_j, and we increase A_i by $B_ip_{ij}E_j$ and multiply B_i by $1 - p_{ij}$. Then $E_i = \frac{A_i}{1 - B_i}$. If $B_i = 1$, then t cannot be reached.

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Statistics: 7 submissions, 1 accepted, 5 unknown

D: Dicey Decision

Problem author: Freek Henstra

Problem: Given a *Snakes and Ladders*-type board with n spaces, m shortcuts, turn limit t, and four six-sided dice to choose from. If you can pick your die first and you start playing last, what is your maximum possible probability of winning?

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Observation: The players don't interact with one another, so we can consider each player separately.

D: Dicey Decision

Problem author: Freek Henstra

Problem: Given a *Snakes and Ladders*-type board with n spaces, m shortcuts, turn limit t, and four six-sided dice to choose from. If you can pick your die first and you start playing last, what is your maximum possible probability of winning?

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Recursion: For each i, j with j from small to large, starting on space i, determine for each possible die roll the landing space k, and add $\frac{1}{6}P(i, j)$ to $P(k, j + 1)$.

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Solution part 2: For each die independently, calculate the probability of winning (with tie-break rules). For each die, determine after each turn the probability of finishing on that turn with no other player having finished yet, and after t turns, determine for each space the probability of landing there ahead of all other players.

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Running time: $\mathcal{O}(tn)$ (times #players and #sides-per-die, which are constant).

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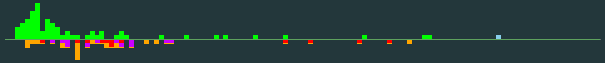
Running time: $\mathcal{O}(tn)$ (times #players and #sides-per-die, which are constant).

Statistics: 49 submissions, 3 accepted, 38 unknown

E: Exhausted Economist

Problem author: Mike de Vries



Problem: Given a list of prices that each person is willing to pay for your product, find your maximal revenue.

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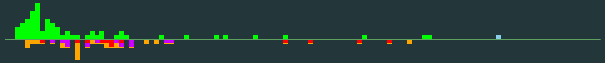

Problem: Given a list of prices that each person is willing to pay for your product, find your maximal revenue.

Observation: You should always ask a price in the list.

- Otherwise, you can increase the price without losing buyers.

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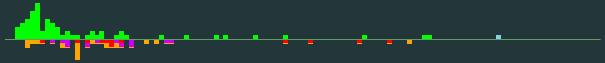

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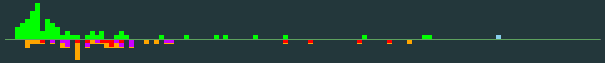

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Solution: Sort all prices from low to high.

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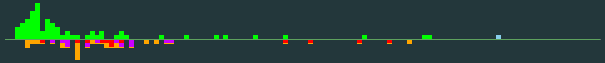

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Solution: Sort all prices from low to high.

Asking p_i gives revenue $i \cdot p_i$, where p_i is the i-th price in the sorted list.

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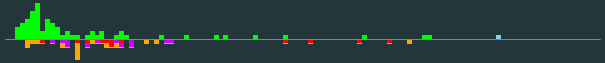

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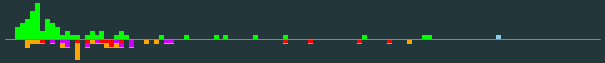

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Running time: $\mathcal{O}(n \log n)$.

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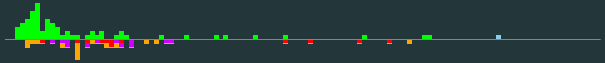

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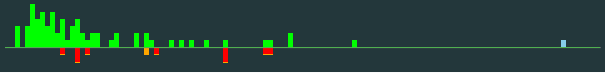
Running time: $\mathcal{O}(n \log n)$.

Statistics: 106 submissions, 66 accepted, 1 unknown

F: Football Forecast

Problem author: Reinier Schmiermann



Problem: Forecast the winner of the World Cup, based on the quality score of each team.

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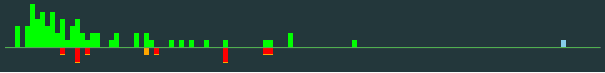

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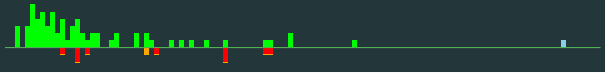

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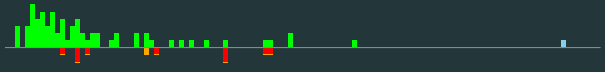

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Winner: It can be proven that the World Cup winner is the team with the highest quality score.

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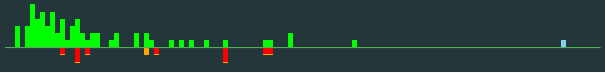

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Solution: Output the name of the team with the highest quality score.
(But the time limit is lenient enough to simulate the entire tournament.)

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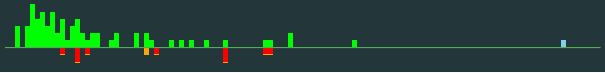

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Running time: $\mathcal{O}(n)$.

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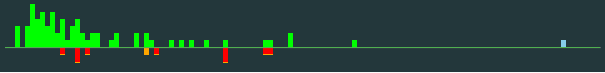

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Running time: $\mathcal{O}(n)$.

Statistics: 79 submissions, 68 accepted, 1 unknown

G: Grabbing Goods

Problem author: Jippe Hoogeveen, Mike de Vries

Problem: Given a rooted forest, two players alternate grabbing the good at one of the roots, causing the rest of its tree to split into multiple new rooted trees. Going first, and with both players playing optimally to maximize the sum of values of their grabbed goods, how much total value will you accumulate?

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Observation 1: Maximizing our own total is equivalent to maximizing the signed difference between our own total and the opponent's total, because the combined total is fixed. We may thus assume that we lose value whenever the opponent grabs a good.

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Observation 2: Consider a path of two vertices with the second value larger than the first. Then it is never advantageous to grab the first good.

Proof: The opponent can reply by grabbing the second good. As a result, it is again your turn, and besides the net loss you just made, the only change to the game is that this path is removed, so nothing is gained.

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Strategy: It follows that such paths only come into play once there are no other options remaining. We can thus use the parity of the total number of goods to determine which player has to tank the net loss of each such path, and we can then remove all such paths from the game.

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Furthermore, we can do the same whenever the last value of a path is larger than the previous, since those two goods will eventually reduce to a path of length two.

Simpler case: Consider if each rooted tree is a path.

Observation 2: We may assume that the last value of a path is never larger than the previous.

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Observation 3: Consider a path with first three values a, b, c with $b > a$. Then it can only be advantageous to grab the first good if the intention is for the opponent to grab the second good so that you can grab the third good afterwards.

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Proof: Again, the opponent can reply by grabbing the second good. As a result, it is again your turn, and besides the net loss you just made, the only change to the game is that you can now grab the third good, so that is the only possible advantage.

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Strategy: We may thus combine the first three goods into one good with value $a - b + c$.

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Strategy: We may thus combine the first three goods into one good with value $a - b + c$.

We can furthermore do the same whenever any value besides the last value of a path is larger than the previous, since the path will eventually reduce for that value to become the second value of the path.

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We can furthermore do the same whenever any value besides the last value of a path is larger than the previous, since the path will eventually reduce for that value to become the second value of the path.

Combined with Observation 2, we may thus assume that no value in any path is larger than the previous!

G: Grabbing Goods

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Simpler case: Consider if each rooted tree is a path.

Observations 2 & 3: We may assume that no value in any path is larger than the previous.

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Observation 4: Since there is never a reason to grab anything other than the good with the highest value, we can combine all the paths into a single path by sorting all the values from largest to smallest!

Observation 4: Any collection of paths reduces to a single path with its values sorted from largest to smallest.

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Strategy: Grabbing the good at the root reduces the tree to a collection of paths.

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Base case: A leaf with value a reduces to a path with a singular value a.

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Algorithm: Recursively calculate for each subtree how it reduces to a single path with its values sorted from largest to smallest.

Base case: A leaf with value a reduces to a path with a singular value a.

Recursion: For a non-leaf vertex with value a, first calculate for each child how its subtree reduces to a single path with its values sorted from largest to smallest.

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Running time: Since every value may need to get sorted n times, the total running time is $\Omega(n^2 \log n)$, which is too slow!

G: Grabbing Goods

Problem author: Jippe Hoogeveen, Mike de Vries

Algorithm: Recursively calculate for each subtree how it reduces to a single path with its values sorted from largest to smallest.

Speed-up: Store each sorted path in a binary heap data structure, and apply small-to-large merging to the heaps.

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The fact that the heaps get smaller due to the reduction step only reduces the number of times a value moves into a larger heap.

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Since heap operations cost $\mathcal{O}(\log n)$ time, the total running time is $\mathcal{O}(n(\log n)^2)$, which is fast enough!

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Even faster: With a custom heap implementation, you can insert all k elements of a heap of size k into a larger heap of size n in $\mathcal{O}(n \log(n/k))$ time.

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Combined with small-to-large merging, this results in a total running time of $\mathcal{O}(n \log n)$!

However, in practice, the difference turns out to be immeasurable. In fact, only reading the input already already takes up half the time of the $\mathcal{O}(n(\log n)^2)$ solution!

Short version

Problem: Given a rooted forest, two players alternate grabbing the good at one of the roots, causing the rest of its tree to split into multiple new rooted trees. Going first, and with both players playing optimally to maximize the sum of values of their grabbed goods, how much total value will you accumulate?

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Statistics: 4 submissions, 0 accepted, 2 unknown

H: Handing Over

Problem author: Mike de Vries

Problem: n people with wingspans $w_1, \ldots, w_n$ are seated around a table. People i and j can hand each other condiments if $w_i + w_j \geq \min(|i-j|, n-|i-j|)$. Answer q queries of the form: how many handovers are needed to pass from i to j?

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Todo: How do we determine the optimal first handovers? And how do we apply (and what even is) binary lifting?

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For the people in the original half of the array, the top of the stack gives the optimal first handover for the case that we want to move left, but the first handover is to the right. Then with binary search, you can find the optimal first handover for the case that we want to move right, and the first handover is to the right.

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Setup: We know for each person the optimal first move in each direction. If we know for each person the optimal first 2^k moves in each direction, we can combine two such sequences to form the optimal first 2^{k+1} moves in each direction.

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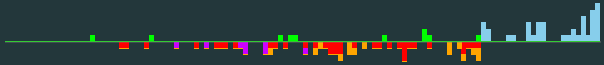
Statistics: 24 submissions, 0 accepted, 17 unknown

I: Irritating Interruption I

Problem author: Jonas van der Schaaf



Problem: Given a set of arrows on an $n \times m$ grid, calculate how many can be removed. An arrow can be removed when it points at nothing.

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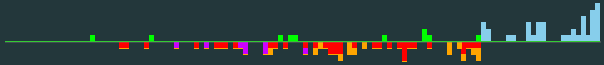

Problem: Given a set of arrows on an $n \times m$ grid, calculate how many can be removed. An arrow can be removed when it points at nothing.

Naive solution: Compute the dependency graph, then prune.

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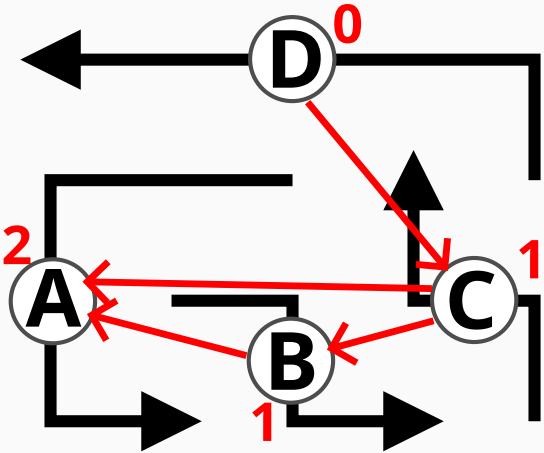

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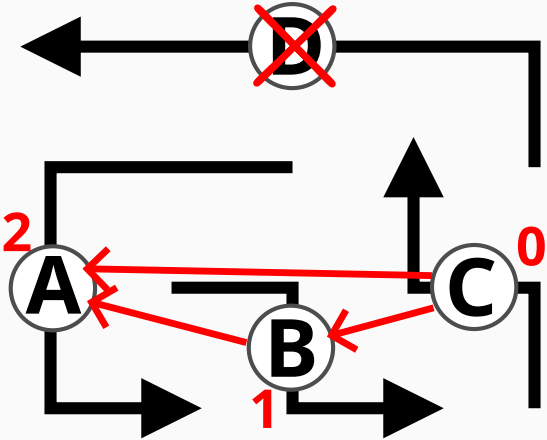

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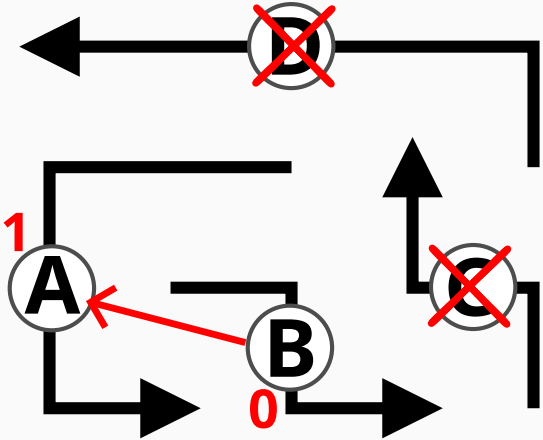

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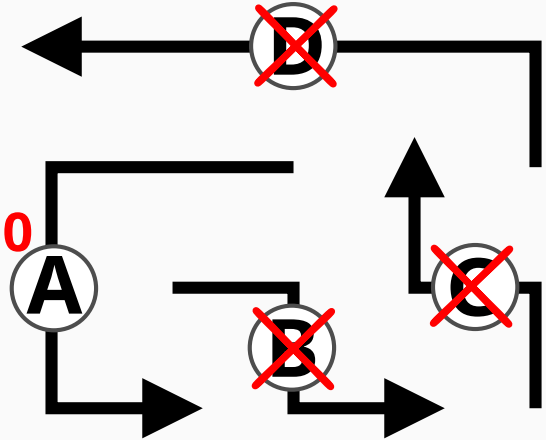

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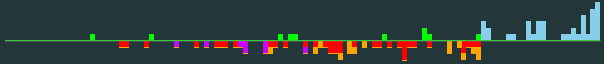

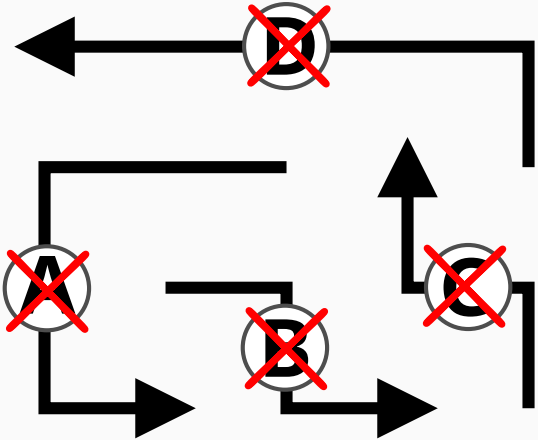

I: Irritating Interruption I

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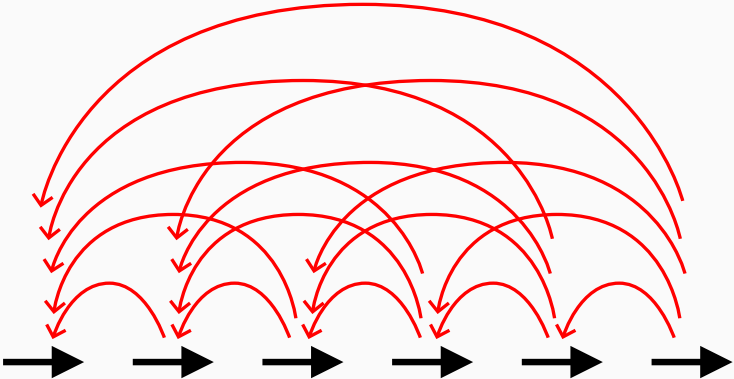
Problem: For a arrows, there may be $\mathcal{O}(a^2)$ dependencies. This leads to a running time of $\mathcal{O}(wh(w+h))$, which is too slow.



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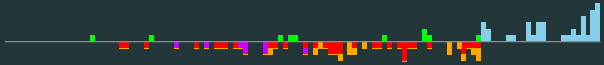
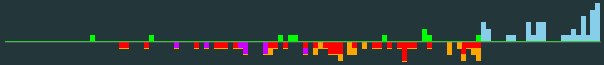


Observation: If A points at B and C, and B points at C, then the fact that A points at C is redundant.

I: Irritating Interruption I

Problem author: Jonas van der Schaaf



Observation: If A points at B and C, and B points at C, then the fact that A points at C is redundant.

Observation: If you start looking from an arrowhead and encounter another arrowhead pointing in the same direction, any arrows beyond this arrowhead will block both.

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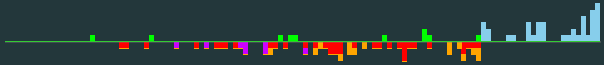

Observation: If A points at B and C, and B points at C, then the fact that A points at C is redundant.

Observation: If you start looking from an arrowhead and encounter another arrowhead pointing in the same direction, any arrows beyond this arrowhead will block both.

Fast solution: Stop looking when you encounter an arrowhead in the same direction, since all further dependencies you might find would be redundant.

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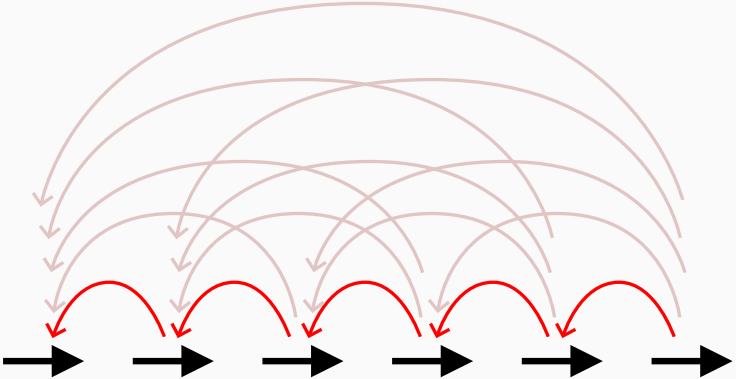

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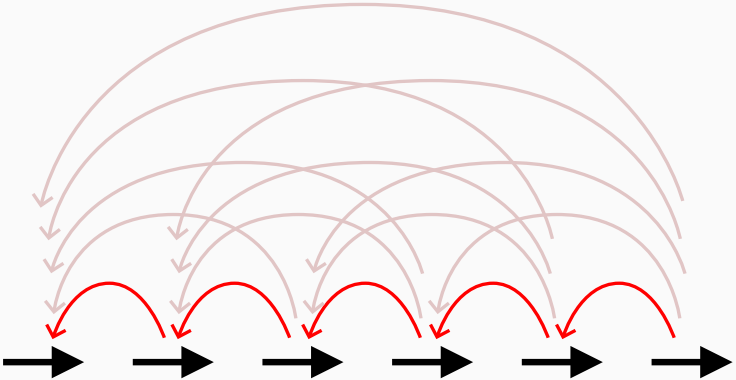
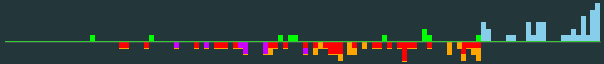


Running time: $\mathcal{O}(wh)$.



Alternative solution: Move edge bounds and remove arrows pointing outwards.

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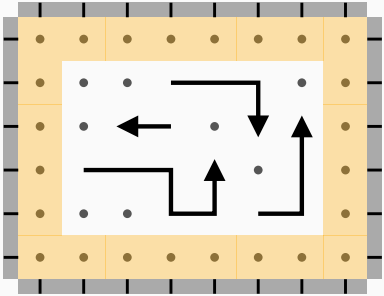

All borders start at the edges, and cells next to the edges are marked to be updated.

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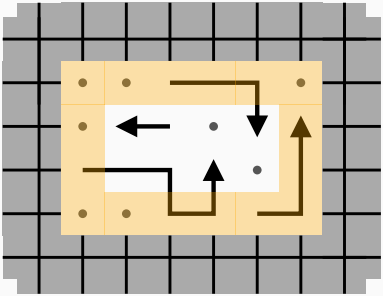

Boundaries from all sides are moved inwards as empty cells next to the boundaries are updated.

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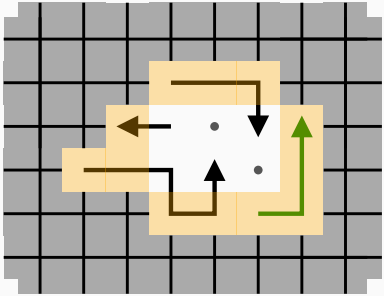

An outwards facing arrow is found.

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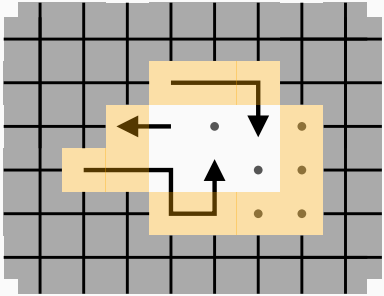

The arrow is removed, and the empty spaces are marked for updating.

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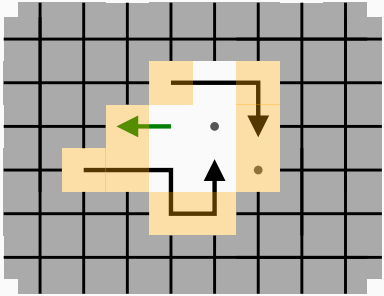

Another free arrow is found.

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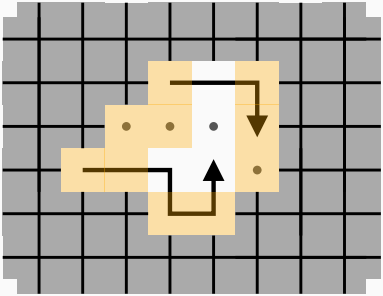

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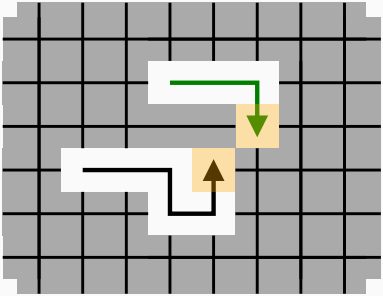

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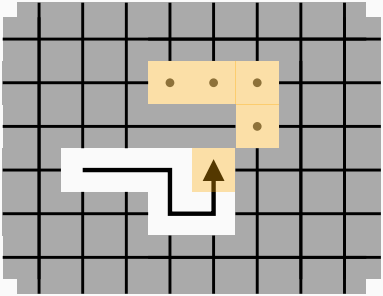

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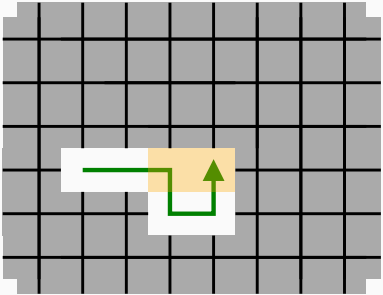

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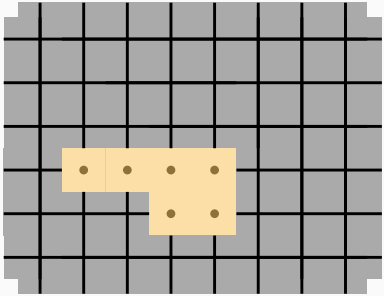

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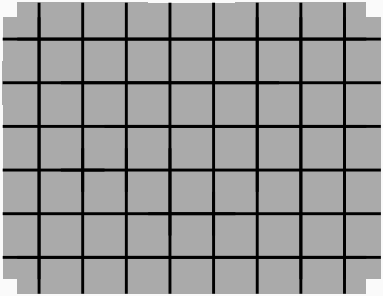

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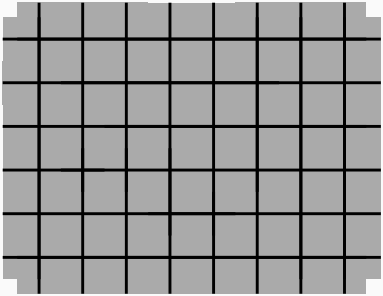

Running time: Still $\mathcal{O}(wh)$.

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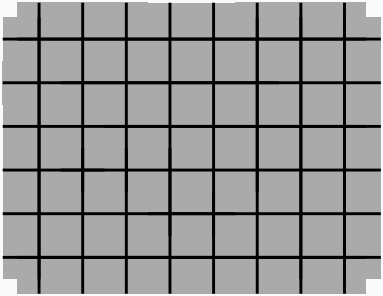

Running time: Still $\mathcal{O}(wh)$.

Statistics: 107 submissions, 10 accepted, 38 unknown

J: Joyful Jogging

Problem author: Tobias Röhr

Problem: Find the minimum number of edges to cover all cycles in a connected undirected graph.

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Equivalent problem: Find the minimum number of edges to remove to break all cycles in a connected undirected graph.

Observation: A connected graph without cycles is a tree.

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Solution: A tree has $n - 1$ edges, so the answer is $m - (n - 1)$.

The edges we would remove are the edges that are not part of a fixed spanning tree.

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Running time: We can stop reading the input once we know n and m, so $\mathcal{O}(1)$.

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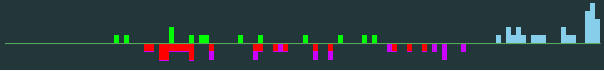
Running time: We can stop reading the input once we know n and m, so $\mathcal{O}(1)$.

Statistics: 43 submissions, 23 accepted, 11 unknown

K: Khoikhoi Dralinpome

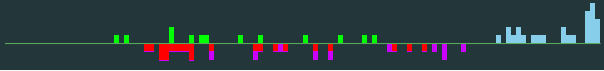
Problem author: Mike de Vries



Problem: Given a list of nouns, determine the largest dralinpome that can be made through concatenation of a subset.

K: Khoikhoi Dralinpome

Problem author: Mike de Vries



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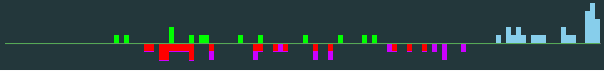
Problem author: Mike de Vries



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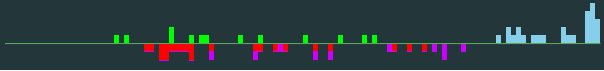

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Idea: Precompute a 26-bit letter-parity mask for each noun. We can efficiently determine whether a subset of words forms a dralinpome by XORing these masks.

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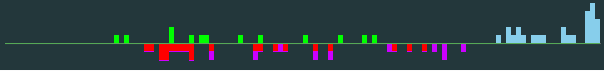

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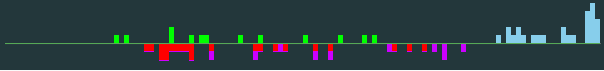

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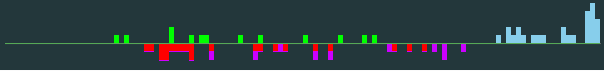

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Solution: Compute the XORed letter-parity mask for each possible subset of the first and last $n/2$ nouns separately. On the second half, XOR with 0 and $1, 2, 4, \ldots, 2^{25}$, and see if any were found on the first pass. If so, joining these subsets forms a dralinpome. This finds every possible dralinpome; return the longest one.

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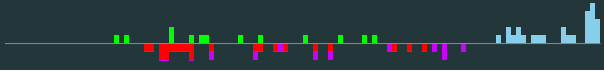
Problem author: Mike de Vries



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Running time: $\mathcal{O}((n + 26)2^{n/2})$.

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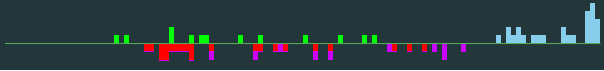

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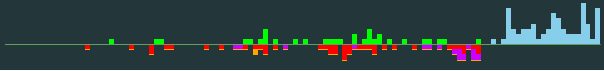
Running time: $\mathcal{O}((n + 26)2^{n/2})$.

Statistics: 72 submissions, 13 accepted, 26 unknown

L: Lock In

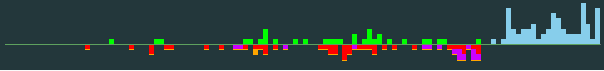
Problem author: Mike de Vries



Problem: Win the ranking game at least 1% of the time.

L: Lock In

Problem author: Mike de Vries



Problem: Win the ranking game at least 1% of the time.

Observation: For a game with n numbers to be placed, we may always assume that we must place n random numbers chosen from $1, \ldots, m$.

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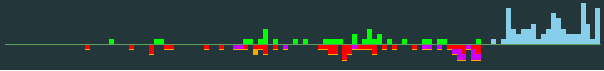

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Solution: We can determine the optimal solution recursively.

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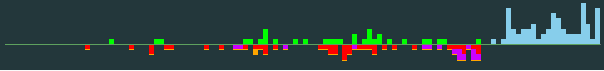

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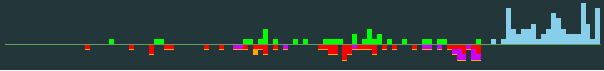

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For each of these numbers, we must compute the optimal placement, placing k at index j is given the product by the winning chance of games of size $j-1$, and $n-j$, and the chance that $j-1$ of the rest of the randomly chosen numbers are at most $j-1$.

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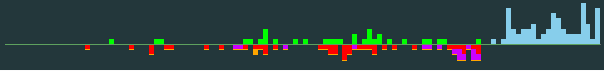

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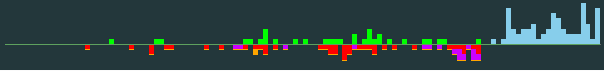
Pre-compute the optimal strategy and follow it for each game.

L: Lock In

Problem author: Mike de Vries



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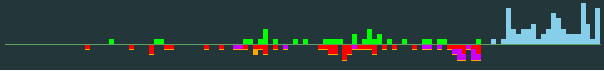

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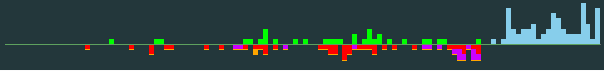

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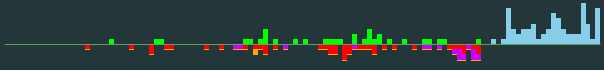

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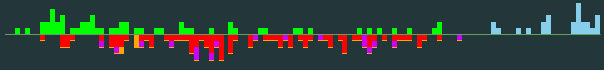
Statistics: 160 submissions, 32 accepted, 70 unknown

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



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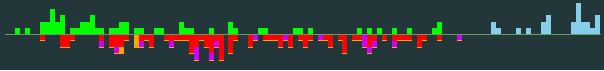

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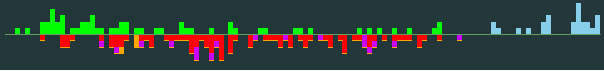

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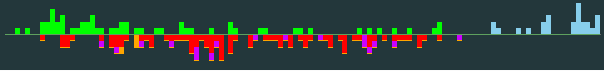

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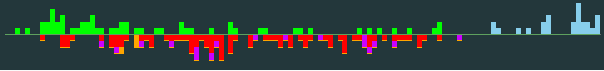

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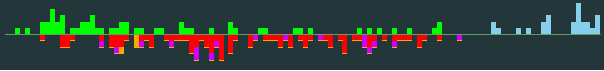

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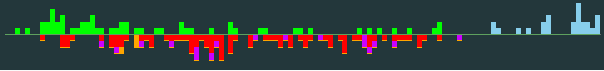

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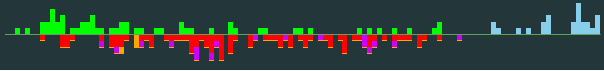

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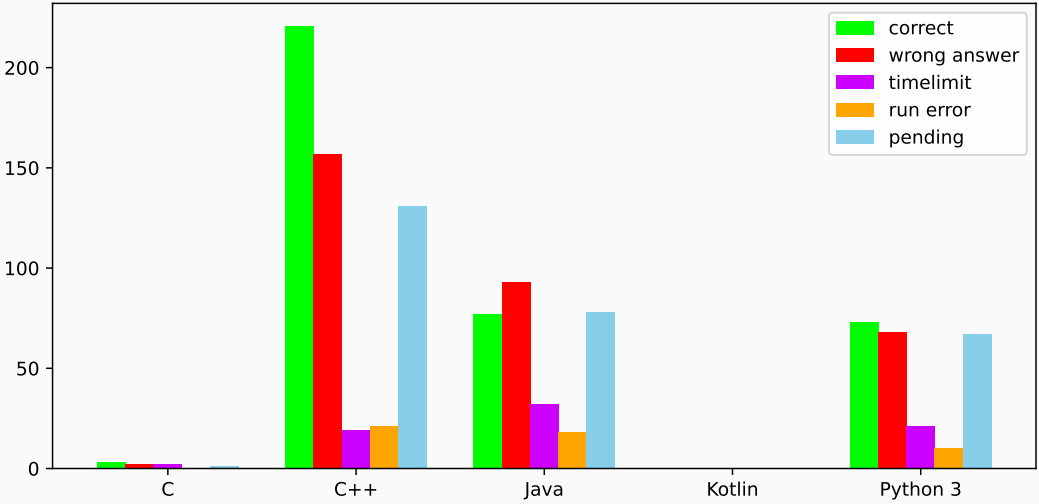
Statistics: 180 submissions, 57 accepted, 25 unknown

ETV also did their best!

Language stats



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- 839 secret test cases (last year: 802) (≈ 64.5 per problem!)
- 237 jury + proofreader solutions (last year: 221)
- The minimum[1] number of lines the jury needed to solve all problems is

$$8 + 2 + 15 + 14 + 1 + 1 + 20 + 12 + 18 + 1 + 11 + 9 + 1 = 113$$

  On average 8.7 lines per problem, up from 4 in last year's preliminaries

[1] With mostly™ PEP 8-compliant code golfing

Thanks to:

The proofreaders

Arnoud van der Leer
Bartjan Henkemans
Davina van Meer
Jaap Eldering
Kevin Verbeek
Pavel Kunyavskiy Kotlin Hero 🎈
Ragnar Groot Koerkamp
Thore Husfeldt
Thomas Verwoerd Kotlin Hero 🎈

The jury

Jeroen Op de Beek
Jippe Hoogeveen
Jonas van der Schaaf
Lammert Westerdijk
Leon van der Waal
Maarten Sijm
Marijn Adriaanse
Mike de Vries
Reinier Schmiermann
Tobias Röhr
Wietze Koops
Yanxu Chen

Want to join the jury? Submit to the Call for Problems of BAPC 2027 at:

`https://jury.bapc.eu/`