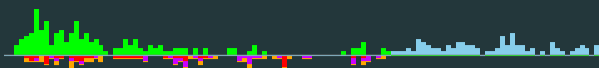## NWERC 2023 Test Session

Solutions presentation

November 25, 2023

A: Artistic Souvenir

Problem Author: Wendy Yi

Problem

Calculate the minimum area of a square tile that is needed for a round design with area a if we leave a margin of at least $1\,\text{cm}$ around the design.

Solution

- The area of a circle is $a_c = \pi r^2$, and the diameter is twice the radius, $d = 2r$.
- The length and the width of the square tile is $w = d + 2$, and the area is $a_s = w^2$.
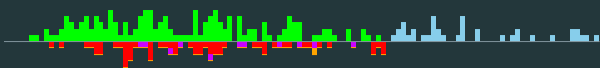- Rewriting this gives $a_s = \left(2\sqrt{\dfrac{a}{\pi}} + 2\right)^2$.

Pitfall

`floats` do not cover a precision of 10^{-9}, so you need to use `doubles`.

Statistics: 368 submissions, 147 accepted, 92 unknown

Problem

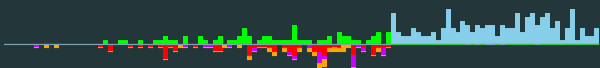Given n cheese wheels, make interactive queries comparing two weights and sort them.

Possible solutions

- Implement bubble sort.

- Implement your favourite $O(n \lg n)$ sort algorithm.

- Use the sort function in your standard library with a custom comparator that calls the interactor.

Statistics: 252 submissions, 136 accepted, 38 unknown

Problem

Given *n* pairs of numbers, put '+', '−', or '∗' between them such that no two results are the same.
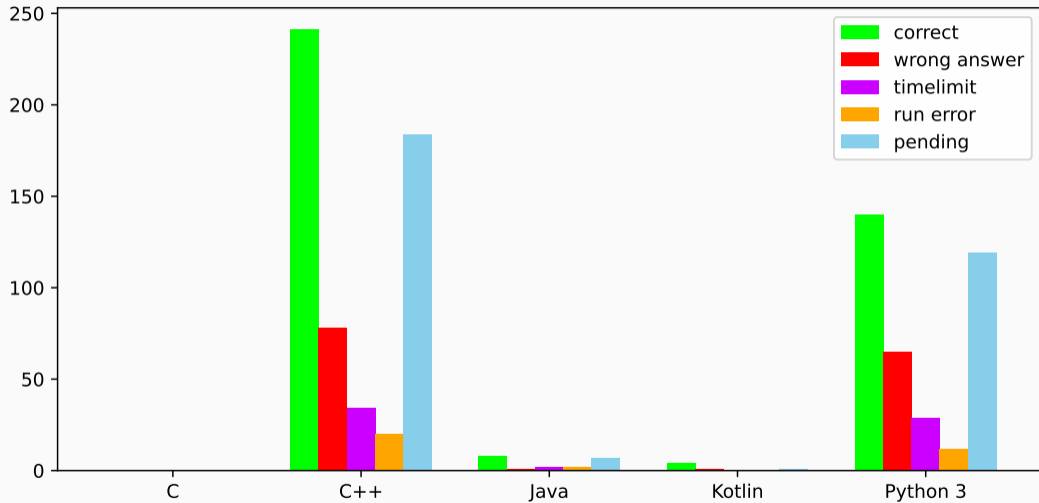
Solution

- Make a bipartite graph with *n* nodes on one side, and a node for every possible answer on the other side.
- Connect each pair of numbers to their 3 possible answers.
- Find a maximum matching, if this is of size *n*, we have a solution.

Pitfalls

- Result does not fit in an `int`.
- Greedy or brute force approach will not work.

Statistics: 348 submissions, 50 accepted, 181 unknown

Language stats

Clarifications

Clarifications

- Compiler flags can be found at 2023.nwerc.eu/systems and in /usr/local/bin/ (no longer in ~/.bashrc).
- The memory limit of your submission is 2 GiB (also see 2023.nwerc.eu/systems).
  - Note that exceeding the memory limit gives a RUN-ERROR.
- The judging is typically case- and whitespace-insensitive (no guarantees though).
- How to flush standard output: please check the documentation of your programming language before tomorrow.
- You *will not* get a time penalty if your submission has a compilation error.
- You *will* get a time penalty if your submission fails on a sample case.
- You can find the samples and contest PDF in your home folder.

- Other jury advice: 2023.nwerc.eu/jury-advice

For tomorrow

Tomorrow:

- you will get three copies of the problem set, scrap paper, and pens;
- you are *NOT* allowed to have your bags or any electronic equipment on you (except for medical reasons);
- you *MUST* wear your shirt and badge visibly;

- after the contest, you must take everything with you.

Systems update

Systems update

- You can remap keys as much as you like, but we will reset your laptop before tomorrow.
- In VSCode, the Python extension appears to be broken...
- In VSCode, the Vim extension was missing on purpose, but we will try to get it working before the contest.
- Printing from Code::Blocks does not work.
- The print command is `printfile <file>`
- We will do our best to fix the command-line `submit` client. If it does not work, we will send a general clarification.