Competitive Programming (CSC_41M02, INF471S)
ICPC SWERC Training

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First class

This course is about algorithmic problem solving

- You don't know an algorithm unless you've implemented it (without any bugs).
- Combining simple techniques to solve bigger problems

ICPC SWERC, 29 November–1 December 2024, Lyon, Lisbon, Pisa

- 13 problems
- 5 hours
- 3 people
- 1 keyboard

`swerc.eu`

icpc International Collegiate Programming Contest

icpc.foundation

advancing the art and sport of competitive programming

Probably 3 teams per university/school (last year: 2).

Judges

Input

```
9 10
##########
.....#...#
####.###.#
#..#.#...#
#..#.#.###
###..#.#.#
#.#.####.#
#........#
########.#
```

Output

```
##########
XXXXX#...#
####X###.#
#..#X#...#
#..#X#.###
###XX#.#X#
#X#X####X#
#XXXXXXXX#
#########X#
```

```
python laby.py < laby.in > laby.out   # Python

make laby
./laby < laby.in > laby.out   # C++
```

Schedule

- Lessons are 10:30-18:00 on Fridays
- November: Team selection and SWERC registration deadline
- End of November: SWERC

Outline

1. Pathfinding
2. DP: Dynamic Programming
3. Meta (strategies)
4. Advanced graphs
5. Matching & flows
6. Advanced and dynamic data structures (segment trees)
7. Maths: Arithmetics, Combinatorics and Linear algebra
8. Geometry & sweep line
9. Strings (suffix arrays)
10. Team selection

Team selection

Will be probably in November
(but depends on SWERC registration deadline that we do not know yet)

6 problems

3 or 4 hours

By teams (last year: individual)

Please solve at least one problem

Advice

- It is a team competition
  - You should learn to debug each other's code
- Identify asap the easy problems
- Avoid presentation errors (missing spaces, etc.)
- Think about extreme cases (empty graph)
- Think about out-of-bounds (sometimes it is better to allocate more memory)
  - E.g. integer bounds: you may need an `unsigned long long int (%lld)`
- Evaluate the complexity before implementing it
  - Sometimes it is good to code the naive solution just to debug a better one
- If there are several instances, make sure everything is cleared, notably global variables

More advice

- Highlight the important points of the statement (bounds).
  Is it a DP? A graph problem?
- Think about corner cases / edge cases for the rest of your team
- Learn to solve problems on paper
- It is a team competition
  - If a submission fails, print your code and debug it by hand in order to free the keyboard for someone else

By tomorrow

- Please fill form: https://forms.gle/XLPi6VyWz93pKKVL7
- Set up an account on https://open.kattis.com and tell me your username
- Configure VSCode/VSCodium