Introduction to ACM-ICPC and CCPC

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Outline

• Introduction to ACM-ICPC and CCPC
• Practice and training
Introduction to ACM-ICPC and CCPC
What are they?

- ACM International Collegiate Programming Contest.
- Official site: [https://icpc.baylor.edu/](https://icpc.baylor.edu/)

- The Association for Computing Machinery (ACM) is an international learned society for computing. It is the world's largest scientific and educational computing society.
What are they?

- China Collegiate Programming Contest.
- Official site: [https://ccpc.io/](https://ccpc.io/)

- The 1\textsuperscript{st} CCPC was held in 2015.

- HKU Team \textit{GMT+7} ranked 5 in CCPC Final 2018
Basic rules

• Solve 10 to 14 programming tasks in 5 hours.
• 3 members per team.
• 1 computer.
• C++ or Java.
Question style

- Mathematically well-defined (No Ambiguities)
- Time/Memory limit.
- Data constraints.
- Input/Output specifications.
- No GUI, network knowledge etc. are needed.

http://poj.org/problem?id=1001
How is it judged?

• Only **source code** is submitted and judged.
• Data-based judging. Your source code is **compiled** and **run** by the judge.
• The judge uses a preset dataset as input, and compare your output against the referenced answer.
How is it judged?

Your solution is judged as correct (AC - Accepted) only if

- it compiles successfully; CE - Compile Error
- it does not crash; RE - Runtime Error
- the memory it requires is within the memory limit; MLE - Memory Limit Exceeded
- it terminates within the time limit; TLE - Time Limit Exceeded
- it outputs all the correct answers. WA - Wrong Answer
Example

Submissions (team deFAUI) show all teams

<table>
<thead>
<tr>
<th>time</th>
<th>team</th>
<th>problem</th>
<th>lang</th>
<th>status</th>
<th>verified</th>
<th>PROBLEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-10-27 21:35:14</td>
<td>default</td>
<td>C - Doors and Penguins</td>
<td>cpp</td>
<td>CORRECT</td>
<td>NULL</td>
<td>A - Permutation Recovery</td>
<td>1 (19 + 0)</td>
</tr>
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<td>C - Doors and Penguins</td>
<td>cpp</td>
<td>CORRECT</td>
<td>NULL</td>
<td>B - Crosswords Insider</td>
<td>0</td>
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<tr>
<td>2006-10-27 21:20:25</td>
<td>default</td>
<td>C - Doors and Penguins</td>
<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>C - Doors and Penguins</td>
<td>3 (314 + 40)</td>
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<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>D - Gypsy Moths</td>
<td>2 (136 + 50)</td>
</tr>
<tr>
<td>2006-10-27 20:57:29</td>
<td>default</td>
<td>F - Ganeric Units Convertor</td>
<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>E - Marbles in Three Baskets</td>
<td>5 (186 + 40)</td>
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<td>2006-10-27 20:56:54</td>
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<td>F - Ganeric Units Convertor</td>
<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>F - Ganeric Units Convertor</td>
<td>0</td>
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<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>G - Zoned Out</td>
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<tr>
<td>2006-10-27 20:41:35</td>
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<td>F - Ganeric Units Convertor</td>
<td>cpp</td>
<td>WRONG-ANSWER</td>
<td>NULL</td>
<td>H - Shrew-ology</td>
<td>1 (34 + 0)</td>
</tr>
</tbody>
</table>

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http://2009.nwerc.eu/documentation/
How are teams ranked?

• Teams are firstly ranked according to the number of problems solved, then the total time used.

• The **total time** is the sum of the time consumed for each problem solved.

• The time consumed for a solved problem is the **time elapsed** from the beginning of the contest to the submittal of the first accepted run plus **20 penalty minutes** for every previously rejected run (Compile Error excluded) for that problem.
Example

• Suppose you have the following submissions:
  • The 12th minute, problem A, correct;
  • The 34th minute, problem B, incorrect;
  • The 56th minute, problem C, incorrect;
  • The 78th minute, problem B, correct;
  • The 90th minute, problem A, incorrect.

• Then your time consumed is 12 for problem A, $78 + 20 \times 1 = 98$ for problem B and 0 for problem C. Your total time is thus 110.

• Contestants can check ranks in real time.

• Example: https://icpc.baylor.edu/scoreboard/
So far, all accepted solutions for problem E use the easier but slower implementation that runs in $n \log n$ time, said Michal Forisek.
Contest structure of ICPC

• University selection

• Asia regional contests (East Continent sub-region)
  • Our main battlefield.
  • Last year we went to Shenyang, Shanghai, Shenzhen (HK Regional)
  • Regional Contests were held in weekends

• World finals
  • Top teams in regional contests advance to world finals. About 120 teams in total around the world.
Selection Contest

• Last year (2019):
  • Time: early September
  • Form: onsite individual contest
  • Top 9 participants formed 3 teams

• This year:
  • TO BE DETERMINED
  • How can you know the latest update?
    • Our website: https://i.cs.hku.hk/~provinci/
    • Subscribe our mail: https://forms.gle/g2ucKVE3BKnEKhTt5
Skills required

• Coding. Implement whatever algorithms you have in mind.
• Algorithm design.
  • Classic algorithms
    • Data Structures, e.g. Stack/Queue, (persistent) Segment Tree, Link-Cut Tree
    • Graph Algorithms, e.g. Shortest Path, Network Flow, Steiner Tree
    • String Algorithms, Number Theory Algorithms, Geometry Algorithms, etc.
  • Algorithm design techniques like divide-and-conquer, square root decomposition, dynamic programming, efficient search
• Programming and debugging onsite under pressure.
Practice and training
Being self-motivated

• You can start whenever you want
• You can quit whenever you want
• We assist you to participate in the contests, including organizing online training sessions.
• However, we do not and cannot force you to do anything.
• You have to be self-motivated.
Your benefits

• Opportunity to participate in ACM-ICPC and CCPC.
  • You can win good medals and take your proud photos!
• The department appoints a TA (Hao XIE) for you to consult, regarding the competition and solving programming problems.
• Experience helps in finding a good job in industry.
• Meet new friends that have the same interest with you.
Practice makes perfect

• Online judge
  • Codeforces: https://codeforces.com/
  • Atcoder: https://atcoder.jp/
  • TopCoder: https://www.topcoder.com/
  • Peking University Online Judge (many classic problems, some are a little bit outdated): http://poj.org/

• ACM-ICPC Live Archive (past contest problems): https://icpcarchive.ecs.baylor.edu/

• Etc.

• Virtual judge (DIY contests): https://vjudge.net/
Training plan – this semester

• We will collect some online problems about different topics
• > Mainly for beginners <
• Some advanced problems for non-beginners
• Distribute weekly via team email
• You are also encouraged to participate in the contest held by Codeforces, Atcoder, Topcoder

• If you are new, you can also find some resources in http://i.cs.hku.hk/~provinci/training.html
Consultation

• Send me an email if you have any questions about the contest, both technical and non-technical.

• Hao XIE, hxie@connect.hku.hk

• Appoint with me if you need face to face consultation.

• Our website: https://i.cs.hku.hk/~provinci/
Any questions?