HKOI 2019/20 Final Event Briefing Session

Susanna Chan
7/12/2019
Practice Competition starts at 10am
Content

1. Contest Environment
2. Useful Skills & Knowledge + Contest Strategies
3. Common Mistakes
4. Tasks + Scoring
5. Demonstration on using the HKOI Judge
6. Practice Competition (and solutions)
7. Final reminders
HKOI Briefing Session

HKOI Timeline

Nomination
October
16 students/school

Heat Event
November
1.5 hr written test

Final Event
December
3 hr coding test
February

Training Team
January - May
6 hrs x 12 days

Team Formation
April / May
5 hr coding test

IOI / NOI & more
July - September

We are here!
Benefits of winning HKOI

1. Get a medal
   - ~180 contestants in total, ~90 contestants in each group
   - ~Top 50% of contestants in each group will get a medal
   - Gold : Silver : Bronze ≈ 1 : 2 : 3
Benefits of winning HKOI

2. Enter the HKOI Training Team

- Trainings on every Saturday from February to May
- Lectures, coding practices, mini-competitions, social events...
- Meet friends!
Benefits of winning HKOI

3. Be eligible to join the Team Formation Test (TFT)

TFT selects potential students to participate in:

- International Olympiad in Informatics (IOI)

- National Olympiad in Informatics (NOI)

- ACM-ICPC Hong Kong Chapter
HKOI 2019/20 Final Event

Contest Environment
Final Event

The HKOI 2019/20 Final Event has been **postponed to 1st February, 2020** (Saturday)

Please check our website regularly, and again on the competition day for any last minute announcement.

<table>
<thead>
<tr>
<th>Date:</th>
<th>1st February, 2020 (Saturday)</th>
</tr>
</thead>
</table>
| Reporting Time: | Senior Group: 9:00 a.m.  
Junior Group: 1:30 p.m. |
| Event Time: | Senior Group: 9:30 a.m. – 12:30 p.m.  
Junior Group: 2:00 p.m. – 5:00 p.m. |
| Venue: | Rm 924, Ho Sin Hang Engineering Building,  
The Chinese University of Hong Kong, Shatin |

Please report on time to test your machine before the contest!

Contestants who are late for more than 15 minutes will be disqualified.

Remember to bring your HKID card or student ID card for registration.

Contest Environment

Programming languages

- Contestants shall answer in **C++**
- We cannot guarantee that the problems are solvable using **Pascal, C, Java** and **Python**
- We cannot guarantee the proper functioning of the software provided for **Pascal, C, Java** and **Python**
- Contestants may use such languages at their own risk

<table>
<thead>
<tr>
<th>1st-class Language</th>
<th>2nd-class Language</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C++</strong></td>
<td><strong>Pascal</strong></td>
</tr>
<tr>
<td></td>
<td><strong>C</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Java</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Python</strong></td>
</tr>
</tbody>
</table>

Contest Environment

Software

- Desktop Computer (Windows 7)
- You can use any software provided (paint, calc, IDE, compiler, code editor, web browser etc)
- C++ and Pascal documentations will be provided in the web browser
- NO Internet except HKOI Online Judge

<table>
<thead>
<tr>
<th>Programming Language</th>
<th>Development Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>C++ (C++11)</td>
<td>Dev-C++ 5.11 (TDM-GCC 4.9.2)</td>
</tr>
<tr>
<td>Pascal</td>
<td>Free Pascal 3.0.0</td>
</tr>
<tr>
<td>C (C99)</td>
<td>Dev-C++ 5.11 (TDM-GCC 4.9.2)</td>
</tr>
<tr>
<td>Java 8</td>
<td>JDK 1.8.0</td>
</tr>
<tr>
<td>Python 3.5</td>
<td>Python 3.5.2</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>Visual Studio Code (with Pascal, C/C++, Java and Python plugins)</td>
</tr>
</tbody>
</table>
Contest Environment

Software
- You can view the compiler flags on the HKOI Online Judge, even during contest.
- You will develop your solutions on Windows 7.
- Submitted programs will be compiled under the Linux operating system.
- There might be differences in compiler behaviour between Windows and Linux in rare occasions.
- **We will not help resolve errors related to this during contest.**
- Please test it using your HKOI Online Judge account this two months to avoid using strange syntax.

https://judge.hkoi.org/help
Contest Environment

Hardware
- Roughwork sheet, keyboard, mouse and mousepad will be provided
- You can bring one personal keyboard for use in the competition
  - Wireless keyboards, keyboards that require installation of drivers, and mechanical keyboards fitted with “blue” switches (or equivalent) are not allowed
  - We reserve the right to examine and disallow any keyboard.
- Your own stationery (pen, pencil, rubber, ruler etc)
- NO calculators or other electronic devices
- NO personal roughwork sheet
HKOI 2019/20 Final Event

Useful Skills & Knowledge
Contest Strategies
## Useful Skills & Knowledge

Topics covered in the competition syllabus

### Junior Group
- Computer literacy / General STEM knowledge
- Mathematics
  - Euclidean distance (Pythagoras’ theorem)
  - Discrete mathematics (primes, permutation and combination, modular arithmetic)
- Boolean algebra
- Variables, statements, expressions, and functions
- Basic data types (integer, floating points, boolean, character, string)
- Control structures
  - Conditional (if-then-else, switch-case)
  - Iteration (for-loop, while-loop, do-while loop)
- String processing
- Array and array processing (up to 2 dimensions)
  - Linear search
  - Binary search
  - Comparison-based sorting (bubble, selection, insertion)
  - Counting sort
- Errors and debugging
- Concepts of data structures (stack, queue and linked list)

### Senior Group
Contents of Junior Group, plus:
- Advanced array processing
- Implementation of data structures (stack, queue and linked list)
- Recursion
- Exhaustion and optimization
- Divide and conquer
- Graph theory (vertices, edges, tree)
- Depth-first search
- Algorithm analysis (time and memory complexity)

Contest Strategies

Before the contest begins...

- Relax :D
- Check
  - The equipment provided (mouse, keyboard...)
  - Programming environment (compilation, execution)
- Try to write some simple programs
  - Output “Hello World!” :o)
  - Tasks in HKOI Testing
Contest Strategies

During the contest...

- Read all problems before you start coding
- Start with the problem you are most confident in
- Score subtasks
  - Do not ignore easy subtasks and directly head for full solution
  - Easy subtasks may be very easy to code
  - Subtasks and constraints may be hints that help you to think about the full solution
    - Distinct integer, max. value of integer <= 1000
Contest Strategies

During the contest...

- Try to observe patterns and special properties
  - Write programs based on your observations to test if your guess is correct
  - May lead you to the full solution... Don’t hesitate to try!
- Keep calm when your solution is incorrect
  - Read the problem statement + your code again
  - Print debug messages to check your code (e.g. value of variables)
  - Check if you have committed some common mistakes (will be discussed later)
  - Test your program with sample and your own test cases
  - Write programs (may be slow but accurate) to debug [more advanced]
  - Think more thoroughly
Contest Strategies

During the contest...

- Analyse the bottleneck of your solution
  - Optimization needed? (e.g. binary search instead of linear search)
  - Other approaches?

- Give up the current task and move on to other tasks
  - When you think you are not able to score more points
  - When you have spent too much time on it
  - * most candidates cannot solve all problems
  - * most candidates cannot fully solve a problem
HKOI 2019/20 Final Event

Common Mistakes
Common Mistakes

- **Wrong Spelling**
  - “Yes” vs “YES” vs “yes”
  - “Impossibie”
  - “TURE”

- **Inappropriate data types**
  - Using integer variables to store decimal numbers
  - 16-bit vs 32-bit vs 64-bit integers
    - integer (Pascal) vs int (C / C++)
    - longint (Pascal) vs long long (C / C++)
    - int64 (Pascal)
  - Overflow :(
  - **Use "%lld" if the variable you use is longint**

```c
for (int j=0; i+j<N; j++) {
    if (A[N-1-j] > B[i+j]) {
        ans.push_back(A[N-1-j]-B[i+j]);
    } else if (A[N-1-j] == B[i+j]) continue;
    else if (A[N-1-j] < B[i+j]) {
        cout << "Impossibie\n";
        return 0;
    }
}
```
Common Mistakes

- Incorrect array size
  - **Avoid negative indexes in C / C++**

- No initialization
  - e.g. missing “cnt = 0;”

- Divide by 0
  - e.g. when \( Y = 1 \), an error will occur when calculating \( X / (Y - 1) \)

- Infinite loop

- Did not consider corner cases (a.k.a. boundary cases)
Common Mistakes

- Useless attempts
  - Naive hard coding
  - Small constant optimization
  - Randomize
  - Over-complicated algorithm

- Poor time management
  - Spending most of the time on coding / debugging one single question
  - Spending too much time aiming at a full solution
  - Ignoring simple subtasks
HKOI 2019/20 Final Event

Tasks + Scoring
Final Event

Question paper (by past experience)

- There are four tasks in total
- The tasks are not sorted by difficulty
- Each task worths 100 points
- Each task is divided into subtasks with different constraints and points

SUBTASKS

<table>
<thead>
<tr>
<th>Points</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time zone $A$ is PST. Time zone $B$ is not IST, NPT nor ACDT.</td>
</tr>
<tr>
<td>2</td>
<td>Time zone $A$ is PST.</td>
</tr>
<tr>
<td>3</td>
<td>Neither time zones is IST, NPT nor ACDT.</td>
</tr>
<tr>
<td>4</td>
<td>Neither time zones is NPT.</td>
</tr>
<tr>
<td>5</td>
<td>No additional constraints</td>
</tr>
</tbody>
</table>

HKOI 2015/16 Final Event Junior Task 2 "Time Zones"  
https://judge.hkoi.org/task/J162

http://hkoi.org/en/past-problems
Final Event

Writing a solution

- Use standard input and standard output, not file I/O
- i.e. scanf, printf, cin, cout, read, readln, write, writeln
- avoid fopen, system("pause") etc
- For C/C++, main function should return 0
- Please make use of your HKOI Online Judge account to practice and test
Final Event

Submitting solution

- Same procedure as in HKOI Online Judge
- You will receive feedback about your submission: the type of error first encountered (if any) for each subtask
- You may submit at most once per task per 60 seconds, and at most 50 times per task
Final Event

Scoring

- If your solution passes ALL test cases in a subtask, you get all points of that subtask (a.k.a. Batch Scoring)

- For example, a solution solving all cases with $N \leq 2000$ would get $10 + 17 + 24 = 51$ points

<table>
<thead>
<tr>
<th>SUBTASKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

HKOI 2017/18 Final Event
Junior Task 4 "Mysterious Area"
https://judge.hkoi.org/task/J184
Final Event

Scoring

- Scores of each subtasks are accumulated
- So, if you submit a solution that passes only subtask 1 to 3, you get 51 points; if you then submit another solution that passes only subtask 4, your final score will be $51 + 19 = 70$ points.
Final Event

Scoring

- Some tasks could employ partial scoring
- One possible score:
  \[ 60\% \times 8 + 100\% \times 18 = 22.8 \text{ points} \]

### SCORING

For each test case:
- you score zero if the arrangement is illegal, or \( M > R + C + N \); otherwise
- you score 60% if the arrangement is nice, i.e. \( N + 1 < M \leq R + C + N \); otherwise
- you score 100% if the arrangement is excellent, i.e. \( M \leq N + 1 \).

You score for each subtask is the lowest score among all test cases within that subtask.

<table>
<thead>
<tr>
<th>Points</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>( R = C = 2 )</td>
</tr>
<tr>
<td>18</td>
<td>( R = 1 )</td>
</tr>
<tr>
<td>21</td>
<td>( N = 0 )</td>
</tr>
<tr>
<td>53</td>
<td>No additional constraints</td>
</tr>
</tbody>
</table>

SUBTASKS

For all cases:
- \( 1 \leq R, C \leq 300 \)
- \( 0 \leq N < R \times C \)
HKOI 2019/20 Final Event

Demonstration on using the HKOI Online Judge

Judge.hkoi.org

HKOI Briefing Session
Demonstration - Practice (Tasks)

Good evening, barney!

HKOI 2019/20 Final Event Postponed 決賽延期舉行

The HKOI 2019/20 Final Event has been postponed to 1st February, 2020 (Saturday). For details please visit this page. As a reminder, there will be NO on-site briefing / practice session this year. Teachers and contestants should check our website regularly and again on the competition day for any last minute announcements.

HKOI 2019/20 決賽將延至 2020年2月1日(星期六) 舉行，詳情請瀏覽此頁，再次提醒：今年不會設有實地簡介會 / 練習賽，教師及參賽者應定期及在比賽當日前往本會網站查看最新公告。

Posted on 2019-12-06 09:00:00

(1) Click ‘Task’ to view all practice tasks.
## Demonstration - Practice (Tasks)

### Recommended Tasks

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>★</td>
<td>M1744 Binary Search Tree</td>
</tr>
<tr>
<td>★</td>
<td>M1122 Apple Garden</td>
</tr>
<tr>
<td>★</td>
<td>01056 Counting Rectangles</td>
</tr>
<tr>
<td>★</td>
<td>J194 Graffiti</td>
</tr>
</tbody>
</table>

(2) You can view tasks recommended by the Judge, or filter tasks by Groups (where you can find HKOI Final past problems) and Tags.
Demonstration - Practice (Tasks)

(3) Click ‘Submit’ after you have finished coding solution for a task.

(4) You can either upload / paste your code to submit
Demonstration - Practice (Tasks)

Submission 431288

2019-12-06 23:33:43  trainee - HKOI Trainee  D101 - Phone number  Wrong Answer  Score: 0.000

Judge Results

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Test</th>
<th>Result</th>
<th>Run Time</th>
<th>Memory</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.352 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.348 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.348 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.344 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.348 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.352 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.348 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.344 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.352 MB</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>Wrong Answer</td>
<td>0.001 s</td>
<td>1.344 MB</td>
<td></td>
</tr>
</tbody>
</table>

(5) You can view the judge results in afterwards (verdict, run-time and memory usage of each test)
# Demonstration - Practice (Tasks)

**Verdicts explained**

Currently, these are the only verdicts given by the judge.

<table>
<thead>
<tr>
<th>Verdict</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted</td>
<td>Output is correct and the score is 100.</td>
</tr>
<tr>
<td>Partial Score</td>
<td>Output is correct but the score is between 0 - 100 (exclusive).</td>
</tr>
<tr>
<td>No Output File</td>
<td>(Output-only tasks only)</td>
</tr>
<tr>
<td></td>
<td>You did not submit a output file for that case.</td>
</tr>
<tr>
<td>Wrong Answer</td>
<td>1. Output is incorrect.</td>
</tr>
<tr>
<td></td>
<td>2. Output is &quot;correct&quot; but the score is 0.</td>
</tr>
<tr>
<td></td>
<td>3. Incorrect output format, such as extra lines, multiple spaces for separating numbers, incorrect case for strings.</td>
</tr>
<tr>
<td>Time Limit Exceeded</td>
<td>Program did not end before the time limit.</td>
</tr>
<tr>
<td>Runtime Error</td>
<td>1. Program ended with a non-zero exit status</td>
</tr>
<tr>
<td></td>
<td>2. Memory access violation. (Segmentation Fault)</td>
</tr>
<tr>
<td></td>
<td>3. Memory limit exceeded</td>
</tr>
<tr>
<td>Compilation Error</td>
<td>1. Program contains syntax error.</td>
</tr>
<tr>
<td></td>
<td>2. Program uses features that is not supported by the online judge.</td>
</tr>
</tbody>
</table>

Explanations on the verdicts: [https://judge.hkoi.org/help](https://judge.hkoi.org/help)
Demonstration - Practice (Contests)

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Posted on 2019-12-06 09:00:00

(1) You can experience the contest environment in the ‘Contest’ page
(2) In the ‘Recent Contests’ section of the contest page, you can view tasks by contest.
## Demonstration - Practice (Contests)

### Virtual Contests

<table>
<thead>
<tr>
<th>Name</th>
<th>Duration</th>
<th># Contestants</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Virtual] 2018/19 HKOI Junior</td>
<td>3 h</td>
<td>7</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018/19 HKOI Senior</td>
<td>3 h</td>
<td>5</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018 NOIP Junior</td>
<td>3 h 30 m</td>
<td>0</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018 NOIP Senior Day 1</td>
<td>3 h 30 m</td>
<td>0</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018 NOIP Senior Day 2</td>
<td>3 h 30 m</td>
<td>0</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018 Team Formation Test</td>
<td>5 h</td>
<td>3</td>
<td>Submissions</td>
</tr>
<tr>
<td>[Virtual] 2018 Mini Competition 0</td>
<td>3 h</td>
<td>1</td>
<td>Submissions</td>
</tr>
</tbody>
</table>

(3) The ‘Virtual Contests’ section is below ‘Recent Contests’.

*Strongly recommended* Get familiar with the contest interface and test your ability with past contests using the **virtual contest** feature.
The interface used in the final event would be very similar to that of the virtual contests.
Scores (per subtask, per task) will be shown here.

Note that scores and judge results of other contestants will not be shown during the contest.
Demonstration - Contest

Submission would be same as usual (demo [here](#))

In the judge results of each subtask, there will be three kinds of verdicts:

- **Accepted**
- the type of error **first encountered** for each subtask
- Skipped (due to error in subtasks included in this subtask)
A summary of the **cumulated score** you obtained is also shown.

### Demonstration - Contest

#### Judge Results

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Test</th>
<th>Result</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>Accepted</td>
<td>100.000</td>
</tr>
<tr>
<td>2</td>
<td>Including tests in Subtask 1</td>
<td>Accepted</td>
<td>100.000</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>Accepted</td>
<td>100.000</td>
</tr>
<tr>
<td>3</td>
<td>Including tests in Subtask 1</td>
<td>100.000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Wrong Answer</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td>Including tests in Subtask 3</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Skipped</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Including tests in Subtask 2</td>
<td>100.000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Including tests in Subtask 4</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Skipped</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Summary

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Prev</th>
<th>This</th>
<th>Score</th>
<th>Max Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
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<td>13</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
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<td>0</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28</strong></td>
<td><strong>28</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
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</tbody>
</table>
More information about the Judge on
https://assets.hkoi.org/hkoi201617/online_judge_2016.pdf
Solutions for Practice Contest
Solutions for Practice Contest

J162
J151
J181
S181

Solution for other past final problems:
Two months to go, what should I do now?
Revise

- Knowledge covered in HKOI
- Functions of your programming language
  - lower_bound, strcpy... (C / C++)
  - pos, copy, length... (Pascal)
Practice!

HKOI Online Judge [http://judge.hkoi.org/](http://judge.hkoi.org/)

- Many tasks and virtual contests for practice
- Each finalist has been given a practice account
- Please make good use of it
- You may practice until 2020-2-1 00:00am (you are advised to sleep earlier!)
Final reminder

- Before leaving home, check your bag:
  - HKID or student ID
  - Pen, pencil, rubber, ruler
- Report on time
Contact us

Email: info@hkoi.org
Facebook inbox: https://www.facebook.com/hkoi.org/