GB21802 - Programming Challenges

Week 0 - Introduction

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Before Anything else: Important Notices

Manaba Page

All lecture notes and announcements for this course will be done through MANABA. Access the url below:

`https://manaba.tsukuba.ac.jp/ct/course_781339`
Registration Code: 8467527

Language

- Lectures: Japanese
- Slides and materials: English
- Exercises: English
- Questions, Mails and Homework: Any language

About the Lecturer

- Name: Claus Aranha;
- Country: Brazil;
- Research: Artificial Intelligence, Genetic Algorithms, Deep Learning;
- Language: Python, R;
- Hobbies: Game Programming, Geocaching, Twitter Bots;
- twitter: @caranha
- webpage: `http://conclave.cs.tsukuba.ac.jp`

What is this course about?

You have learned many programming techniques...

...but can you use them?

Course Philosophy: Learning by Practice

- Every week, you will be asked to solve some programming problems;
- You have to decide the best data structure, and algorithm to solve each problem;
- Each problem has a max time, and max memory;
- We will discuss algorithms, techniques and tricks;

Course Goal:

Improve programming abilities, techniques and familiarity.

Why you should do this class?

- You like to program, you think programming is fun
- You learned a lot of programming theory, but you need more programming practice;
- You have not written many programs yet;
- You want to think about program efficiency;
- You want a class where skill is more important than memorization;
- You want to practice your technical English;
- You want to participate in Programming Contests;

Warnings about this class

1- Heavy Workload

- Challenges start easy, but end very hard;
- Expect to use a few hours per week on homework;
- Lots of debugging;

- Hint: Do your homework early!

2- Course Language

- All the course materials are in English;
- Importantly: All the homework is in English;
- You can submit your programs/questions in Japanese;

- Practice some English in this course too! :-)

What is a “Programming Challenge”?

A programming challenge is a puzzle that can be solving by making a computer program.

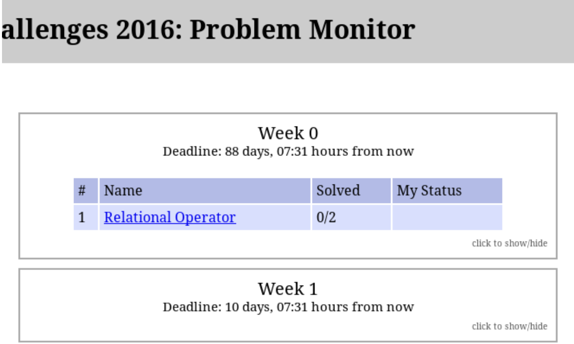
The challenge describes the inputs and the rules of the problem, and you must write a program that finds out the correct output.

Let’s see an example.

Example Challenge: “Relational Operator” (1)

The challenges for this course are listed at the page:

`http://conclave.cs.tsukuba.ac.jp/lecture/monitor.html`



allenges 2016: Problem Monitor

Week 0
Deadline: 88 days, 07:31 hours from now

#	Name	Solved	My Status
1	Relational Operator	0/2	

click to show/hide

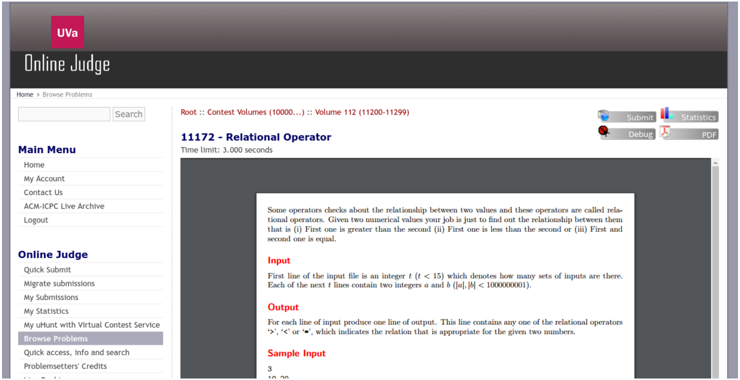
Week 1
Deadline: 10 days, 07:31 hours from now

click to show/hide

Click on the title to go to the problem page.

Example Challenge: “Relational Operator” (2)

Clicking on the title will take you to the problem page.



11172 - Relational Operator

Time limit: 3.000 seconds

Some operators checks about the relationship between two values and these operators are called relational operators. Given two numerical values your job is just to find out the relationship between them that is (i) First one is greater than the second (ii) First one is less than the second or (iii) First and second one is equal.

Input

First line of the input file is an integer t ($t < 15$) which denotes how many sets of inputs are there. Each of the next t lines contain two integers a and b ($|a|, |b| < 1000000001$).

Output

For each line of input produce one line of output. This line contains any one of the relational operators ‘>’, ‘<’ or ‘=’, which indicates the relation that is appropriate for the given two numbers.

Sample Input

```
3
10 20
```

Here you can read the problem and submit a solution.
(You will need an UVA account!)

Example Challenge: “Relational Operator” (3)

Problem Description

Some operator checks about the relationship between two values, these operators are called relational operators. Given two numerical values, your job is just to find out the relationship between them. That is (i) First one is greater than the second, (ii) First one is less than the second or (iii) First and second one is equal.

Input

First line is the number *t* of tests ($t < 15$). Following t lines are two integers *a* and *b*.

Output

For each line of input, print one line of output with ’>’,’<’ or ’=’, according to the relationship of *a* and *b*.

Solving “Relational Operator”

```
// UVA 11172 - Relational Operator
// Test if a is bigger, smaller or equal to b

#include <iostream>
using namespace std;

int main()
{
    int n; long a, b;

    cin >> n;
    for (; n > 0; n--)
    {
        cin >> a >> b;
        if (a > b) cout << ">\n";
        if (a < b) cout << "<\n";
        if (a == b) cout << "=\n";
    }
}
```

How to submit a problem

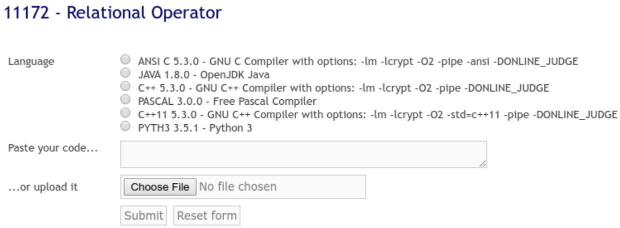
After you finish your programs, and make sure they are correct, you can submit it.

Your weekly routine should have four steps:

1. Think about how to solve each problem;
2. Submit each problem to the UVA website, and check it is correct;
3. Prepare your MANABA package (code + comment file);
4. Submit your MANABA package to MANABA;

Submitting the problem to UVA (1)

UVA is an Automated Robotic Judge. It will test your program on a set of inputs, and check if the outputs are correct.
From the problem page, click on the submit button.



11172 - Relational Operator

Language
○ ANSI C 5.3.0 - GNU C Compiler with options: -lm -lcrypt -O2 -pipe -ansi -DONLINE_JUDGE
○ JAVA 1.8.0 - OpenJDK Java
○ C++ 5.3.0 - GNU C++ Compiler with options: -lm -lcrypt -O2 -pipe -DONLINE_JUDGE
○ PASCAL 3.0.0 - Free Pascal Compiler
○ C++11 5.3.0 - GNU C++ Compiler with options: -lm -lcrypt -O2 -std=c++11 -pipe -DONLINE_JUDGE
○ PYTH3 3.5.1 - Python 3

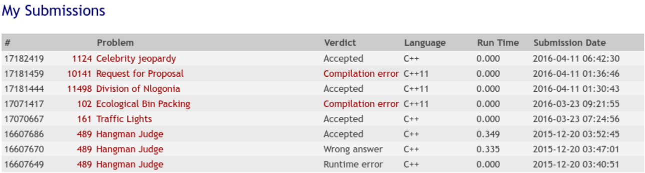
Paste your code...

...or upload it

Select your language, choose the file, and press submit.
(You can use C, C++, Java, Python and Pascal)

Submitting the problem to UVA (2)

After you submit the program, the judge will output one of the following results: Accepted, Wrong Answer, Time Limit Exceeded, Memory Limit Exceeded, Runtime Error, etc.



My Submissions

#		Problem	Verdict	Language	Run Time	Submission Date
17182419	1124	Celebrity jeopardy	Accepted	C++	0.000	2016-04-11 06:42:30
17181459	10141	Request for Proposal	Compilation error	C++11	0.000	2016-04-11 01:36:46
17181444	11498	Division of Nlogonia	Accepted	C++11	0.000	2016-04-11 01:30:43
17071417	102	Ecological Bin Packing	Compilation error	C++11	0.000	2016-03-23 09:21:55
17070667	161	Traffic Lights	Accepted	C++	0.000	2016-03-23 07:24:56
16607686	489	Hangman Judge	Accepted	C++	0.349	2015-12-20 03:52:45
16607670	489	Hangman Judge	Wrong answer	C++	0.335	2015-12-20 03:47:01
16607649	489	Hangman Judge	Runtime error	C++	0.000	2015-12-20 03:40:51

You can see this information on the “my submissions” page.

Submission Statues:

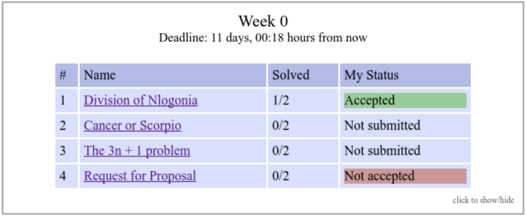
- Accepted: Your program is correct! Congratulations!
- Wrong Answer: Your program is incorrect. Debugging time.
- Time/Memory limit exceeded: Your program is inefficient. Think more.
- Runtime Error: Your program is crashing. To the debugger!

We will see how to deal with some of these problems in the next class.

Back to the problem Monitor

In the problem monitor page, you can check how many people solved each problem, which problems you still have to solve, and the deadlines.

g Challenges 2016: Problem Monitor



Week 0

Deadline: 11 days, 00:18 hours from now

#	Name	Solved	My Status
1	Division of Nlogonia	1/2	Accepted
2	Cancer or Scorpio	0/2	Not submitted
3	The 3n + 1 problem	0/2	Not submitted
4	Request for Proposal	0/2	Not accepted

click to show/hide

Submitting the problem to MANABA

After you finish the problems listed in the monitor, you need to submit your source code and a comment file as a zip package to MANABA.

s2015XXXXXX-weekYY.zip

- problem1.cpp
- problem2.cpp
- problem5.cpp
- kaisetsu.txt

Attention

Submission to the UVA judge without a submission to MANABA will not be accepted!

Some warnings about Java:

- All code must be in the same source file (can define many classes in this file)
- All programs must begin in a static main method in a Main class.
- Do not use public classes. Even Main must be non public.
- Use Buffered I/O to avoid time limit exceeded.

Outline

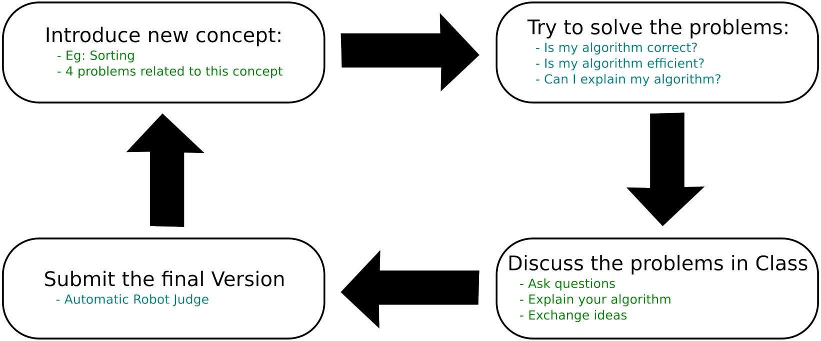
Two classes per week

- Each week has a theme
- Friday Class: Introduction
- Monday Class: Problem Solving and Q&A

Solving Problems

- Every week there are 6-10 programming assignments;
- Assignments follow the weekly theme;
- Automatic Submission and Evaluation System;
- Program Deadline is Thursday 23:59

Outline


Introduce new concept:
- Eg: Sorting
- 4 problems related to this concept

Try to solve the problems:
- Is my algorithm correct?
- Is my algorithm efficient?
- Can I explain my algorithm?

Discuss the problems in Class
- Ask questions
- Explain your algorithm
- Exchange ideas

Submit the final Version
- Automatic Robot Judge

Evaluation and Grading (1)

Evaluation Criteria: Problems solved, Code and Participation

Evaluation Process: Base Grade +Bonus -Penalty

Evaluation and Grading (2) – Base Grade

The Base Grade is based on homework submissions to UVA.

- C: One problem per lecture, or X_c problems total
- B: Two problems per lecture, or X_b problems total
- A: Three problems per lecture, or X_a problems total

Parameters $X_{a,b,c}$ will be decided at a later date. Do not rely on this

Evaluation and Grading (3) – Bonus and Penalty

A Bonus or Penalty will be added to the base grade.

- Bonus: grade one step up (C->B, B->A, A->A+)
- Penalty: grade one step down (A+->A, B->C, C->C)

Bonus: Grade Up

- Participation in class and MANABA
- Submit corrections/suggestions to lecture notes
- Consistently good Comment/Kaisetsu file
- Best *N* students in number of submissions

Penalty: Grade Down

- More than 25% problems submitted after the deadline

Parameter *N* will be decided at a later date.

Evaluation and Grading (4) – comment/kaisetsu file

When you submit your package every week, include a text file (no Word!) with comments on each problem you tried to solve.

Example

```
Name: Claus, ID: 98884735
# Problem 1:
To solve this problem, I sorted the input data, and
printed the input with the highest number of repeated
letters.

# Problem 2:
I tried to solve this problem with brute force, but
the time limit was exceeded. I had to use DP on the
number of people instead.
```

Comments may be in Japanese. (FILENAMES must be in romaji)

Evaluation and Grading (5) – about plagiarism

The assignments are individual. Use your own strength to solve the programs.

GOOD

- Ask for ideas to your friends;
- Ask for ideas in the MANABA forum;
- Ask for help with a bug;

BAD

- Copy a solution from the internet;
- Copy a solution from your friends;
- Give your code to a friend;

Plagiarism will result in course failure, and possibly worse.

Useful Links

- Manaba Page: All the class material will be here. Access Code is: 8467527
- UVA Online Judge: Use this page to submit your problems. Make an account and list the username on MANABA
- Problem Monitor: Use this page to check deadlines and weekly problems.
- Github Repository: Working directory for lecture notes. Send me PR, issues!
- uDebug: Web service that generates test inputs and test outputs for UVA problems. Useful tool for this course.

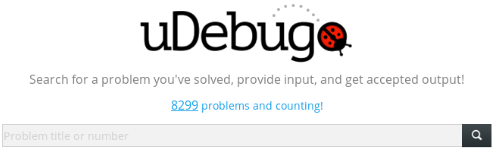
Books

- Main Book: Competitive Programming, 3rd Edition Link
- Old Course Book: Programming Challenges Link
- For suggestions of books in Japanese, please check the Manaba materials!

uDebug Tool

If you are having problems, the uDebug site offers, for many problems in UVA, the correct set of outputs for any input you give.

`https://www.udebug.com/`

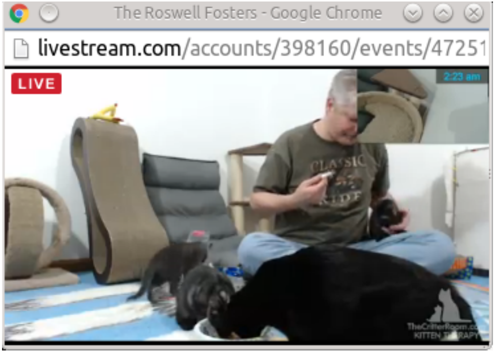


Search for a problem you've solved, provide input, and get accepted output!

8299 problems and counting!

If you are still having problems...

Watch a cat stream to relax!


The Roswell Fosters - Google Chrome
livestream.com/accounts/398160/events/47251
LIVE
2:23 am
TheCritterRoom.com
KITTEN THERAPY

`http://livestream.com/FosterKittenCam/`

Contact the professor

- e-mail: caranha@cs.tsukuba.ac.jp
- website: `http://conclave.cs.tsukuba.ac.jp`
- twitter: @caranha

- Room: SB1012
  Best times to find me:
  - Morning (9:00 – 11:00): Monday, Wednesday, Friday
  - Evening (17:00 – 19:00): Monday, Tuesday, Wednesday

Both English and Japanese are okay!

Do we still have some time?

- Create an account on UVA (if you already have an account, you can use that)
- Submit your account name to the MANABA
- Ask any other questions you want to know!

Thank you for today!