

Programming Competitions for ENS Lyon Training Camp: Introduction

Maxim Buzdalov, Vitaly Aksenov, Anna
Malova

October 25, 2015

Outline

General info

Technical information

- Programming environment

- Common things for problems

- Submission system: PCMS2 Client

What now?

Course website

`http://perso.ens-lyon.fr/eric.thierry/WCPS2015/`



World Champions Programming School in Lyon ENS Lyon, October 26 - 30 2015

Home Registration Schedule Contests Topics Accommodation Contact

A Programming Course by the ACM ICPC World Champions
From October 26 to October 30, the Ecole Normale Supérieure de Lyon will host a crash-course on competitive programming conducted by instructors Maxim Buzdalov, Anna Malova, Aksenov Vitaly and an experienced student team from [ITMO](#), the multiple award-winning university of St Petersburg ([ACM ICPC World Champions](#) in 2004, 2008, 2009, 2012, 2013, 2015).

Locally organized by ENS Lyon, IRIT Toulouse, University Paul Sabatier and sponsored by the [MILYON](#) labex, this one-week course is part of the [World Champions Programming School series](#) where ITMO instructors and competitors share their experience with students all over the world.

General organization
The course will be in english, it will alternate lab training sessions with problem analysis lectures (see the preliminary schedule). During lab sessions, the work on computers will be organised with teams of 1, 2 or 3 persons.

This course is intended for students and programmers who wish to improve their programming/algorithmic skills, and more specifically for the ones who wish to train for advanced programming competitions (such as ACM ICPC Contests). To take benefit from this crash-course, here is the **main prerequisite: each participant/team should be fluent with at least one of the following languages: C/C++/Java**. Knowledge about some classical algorithms is also recommended.

Localization
All the event will take place at ENS Lyon, site Jacques Monod, 46 allée d'Italie, Lyon 7e, main access under the arch (beware that it is different from the René Descartes site, check the [access map](#)).

Registration !
Registration only requires to apply for the school through a [form](#). It is free but does not cover lodging

Logos:
ITMO UNIVERSITY
MILYON UNIVERSITE DE LYON
ENS DE LYON
IRIT Institut de Recherche en Informatique de Toulouse
UNIVERSITÉ TOULOUSE III PAUL SABATIER

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Course website. Contests.

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

Contests - World Champ

perso.ens-lyon.fr/eric.thierry/WCPS2015/index.php?id=contests


World Champions Programming School in Lyon ENS Lyon, October 26 - 30 2015


Home Registration Schedule Contests Topics Accommodation Contact


Contests


Testing system: [PCMS 2 Client](#)


Day	Advanced group	Basic group
Practice session	Problems	
Day 01. 26.10.2015	here will be problems	

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General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Course website. Questionnaire.

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

Form - World Champions X

perso.ens-lyon.fr/eric.thierry/WCPS2015/index.php?id=form

World Champions Programming School in Lyon ENS Lyon, October 26 - 30 2015

Home Registration Schedule Contests Questionnaire Accommodation Contact

Form
Please fill the following form:
https://docs.google.com/forms/d/1uFTS6Asxkb_KKWrcKlaAGCrdxwKeSz69N5KbRqXLVg/viewform

ITMO UNIVERSITY

0111010
1010101
1101010
0101010
π MILYON
UNIVERSITE DE LYON

ENE
ENS DE LYON

IRT
Institut de Recherche en Informatique de Toulouse

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General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Programming competitions

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Programming competitions

What are they about?

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Programming competitions

What are they about?

- ▶ Several problems are given

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases
 - ▶ **Compilation error**

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases
 - ▶ **Compilation error**
 - ▶ **Wrong answer, test XX**

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases
 - ▶ Compilation error
 - ▶ Wrong answer, test XX
 - ▶ Time limit exceeded, test XX

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases
 - ▶ Compilation error
 - ▶ Wrong answer, test XX
 - ▶ Time limit exceeded, test XX
 - ▶ Security violation, test XX

Programming competitions

What are they about?

- ▶ Several problems are given
 - ▶ input data format
 - ▶ output data format
 - ▶ what to do with that
- ▶ Solve as many problems as you can
 - ▶ Write a program
 - ▶ **Efficiently**: fit time and memory limits
 - ▶ Program is tested on several test cases
 - ▶ Compilation error
 - ▶ Wrong answer, test XX
 - ▶ Time limit exceeded, test XX
 - ▶ Security violation, test XX
 - ▶ Accepted

This course

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The aim

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The aim

- ▶ Learn how to solve problems **efficiently**

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The aim

- ▶ Learn how to solve problems efficiently
 - ▶ invent an efficient algorithm

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The aim

- ▶ Learn how to solve problems efficiently
 - ▶ invent an efficient algorithm
 - ▶ write an efficient program

This course

The aim

- ▶ Learn how to solve problems efficiently
 - ▶ invent an efficient algorithm
 - ▶ write an efficient program
 - ▶ use human/computer resources efficiently

This course

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

- ▶ Contests

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)
 - ▶ thematic problems (data structures, DP)

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)
 - ▶ thematic problems (data structures, DP)
- ▶ Problem analyses

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)
 - ▶ thematic problems (data structures, DP)
- ▶ Problem analyses
- ▶ Lectures

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)
 - ▶ thematic problems (data structures, DP)
- ▶ Problem analyses
- ▶ Lectures
 - ▶ coding tips and tricks, team strategies, ...

This course

The structure

- ▶ Contests
 - ▶ real problem sets (quarterfinals, semifinals)
 - ▶ thematic problems (data structures, DP)
- ▶ Problem analyses
- ▶ Lectures
 - ▶ coding tips and tricks, team strategies, ...
 - ▶ lectures on data structures, dynamic programming and other funny stuff

Course website. Schedule.

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

Schedule information - W x

perso.ens-lyon.fr/eric.thierry/WCPS2015/index.php?id=schedule-information

World Champions Programming School in Lyon ENS Lyon, October 26 - 30 2015

Home Registration Schedule Contests Questionnaire Accommodation Contact

Schedule information

This is a preliminary version of the schedule, but the start on Monday 26 is fixed. arrive anytime between 10:00 and 11:00 at the ENS Lyon reception desk (site Monod) for the welcome session, preceding the course introduction at 11:00. Rooms are indicated in *italics* and if despite signposting you get lost, do not hesitate to ask the reception desk or any ENS member for directions.

First day, Monday October 26

- 10:00-11:00 Welcome session (*ENS Lyon reception desk, site Monod*)
- 11:00-11:15 Course introduction (*Lab room E001, ground floor*)
- 11:15-12:00 Practice session (*Lab room E001, ground floor*)
- 12:00-13:00 Lunch (*MMI, place de l'école*)
- 13:00-18:00 Training (*Lab room E001, ground floor*)
- 18:00-18:15 Intermission
- 18:15-19:00 Analysis
- 19:00- till the last: Data structures lecture

Schedule (other days, to be adjusted by instructors)

- 09:00-14:00 Training (*Lab rooms 125/171/E001, first floor/ground floor*)
- 14:00-15:00 Intermission/Lunch (*MMI, place de l'école*)
- 15:00-16:30 Problem analysis/Lecture (*Lab room E001, ground floor, or Amphi B, 3rd floor*)
- 16:30-16:45 Intermission
- 16:45-18:15 Lecture

Lectures by day:

Basic group:



General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Programming environment

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

**Programming
environment**
Common things
for problems
PCMS2 Client

What now?

Programming environment

Available languages

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

**Programming
environment**
Common things
for problems
PCMS2 Client

What now?

Programming environment

Available languages

- ▶ C, C++, Java (as at World Finals)

Programming environment

Available languages

- ▶ C, C++, Java (as at World Finals)

Available environments

Programming environment

Available languages

- ▶ C, C++, Java (as at World Finals)

Available environments

- ▶ Eclipse (C++, Java), IntelliJ IDEA (Java)

Programming environment

Available languages

- ▶ C, C++, Java (as at World Finals)

Available environments

- ▶ Eclipse (C++, Java), IntelliJ IDEA (Java)
- ▶ Code::Blocks

Common things for problems

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

**Programming
environment**
Common things
for problems
PCMS2 Client

What now?

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`
- ▶ Time limit: see problem statement

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`
- ▶ Time limit: see problem statement
- ▶ Memory limit: typically 256 megabytes

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`
- ▶ Time limit: see problem statement
- ▶ Memory limit: typically 256 megabytes
- ▶ We report test numbers

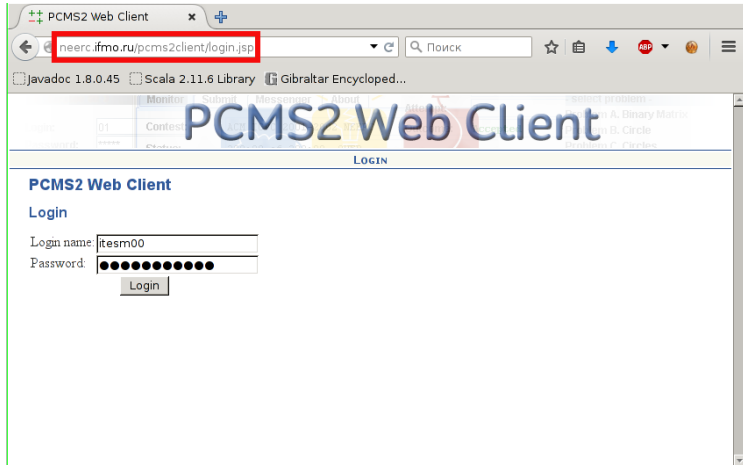
Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`
- ▶ Time limit: see problem statement
- ▶ Memory limit: typically 256 megabytes
- ▶ We report test numbers
 - ▶ “wrong answer, [test 22](#)”

Common things for problems

- ▶ Testing machines: AMD Phenom II X4 955, 3.2GHz, 8G RAM
- ▶ Operation system: Windows
- ▶ Use files for input/output
 - ▶ typically `something.in/something.out`
 - ▶ “security violation” if waiting for `stdin`
- ▶ Time limit: see problem statement
- ▶ Memory limit: typically 256 megabytes
- ▶ We report test numbers
 - ▶ “wrong answer, [test 22](#)”
- ▶ First k tests are example tests from the problem statement

PCMS2 Client: Login window



The screenshot shows a web browser window titled "PCMS2 Web Client". The address bar contains the URL "neerc.ifmo.ru/pcms2client/login.jsp", which is highlighted with a red rectangle. Below the address bar, there are tabs for "Javadoc 1.8.0.45", "Scala 2.11.6 Library", and "Gibraltar Encycloped...". The main content area displays the "PCMS2 Web Client" title and a "Login" section. The login form includes fields for "Login name" (containing "itesm00") and "Password" (masked with dots). A "Login" button is positioned below the password field. The browser's status bar at the bottom shows "LOGIN".

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
**Common things
for problems**
PCMS2 Client

What now?

PCMS2 Client: Monitor

PCMS2 Web Client

neerc.ifmo.ru/pcms2client/monitor.jsp

MONITOR SUBMIT RUNS MESSENGER LOGOUT

Programming Challenges for ITESM: Day 1

RUNNING, 159:01 of 300:00 ☒ Show time

Last success: * SPb IFMO 8, G (Given a string...), 158:06

You are: Jury

Rank	Party	A	B	C	D	E	F	G	H	I	J	K	=	Time
1	SPb SU 1	+	+	+	-1	.	.	+	+2	+	+	+	8	452
2	SPb IFMO 1	+2	+	+	.	+	.	+2	.	+	+	+	7	490
3	SPb IFMO 2	+	+	+	.	-2	.	+1	+2	+	+	+	7	551
4	SPb IFMO 3	+1	+	+3	.	.	.	+	-3	+	+4	+	6	401
5	Petrozavodsk SU 1	+1	+	+	.	+2	.	-6	.	+1	+	+	6	450
6	SPb SPU 1	+	+	+1	.	.	.	+1	.	+	+	+	6	489
7	SPb IFMO 4	+	+2	+	.	.	.	+4	+	+2	+	+	6	400

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
**Common things
for problems**
PCMS2 Client

What now?

PCMS2 Client: Submit a problem

The screenshot shows a web browser window titled "PCMS2 Web Client" with the address bar displaying "neerc.ifmo.ru/pcms2client/submit.jsp". The browser's status bar indicates installed software: "Javadoc 1.8.0.45", "Scala 2.11.6 Library", and "Gibraltar Encycloped...". The page content features a large, semi-transparent "PCMS2 Web Client" watermark. A navigation bar at the top contains links: "Monitor", "Submit", "Messenger", and "About". Below this, a horizontal menu has five items: "MONITOR", "SUBMIT" (highlighted with a red box), "RUNS", "MESSENGER", and "LOGOUT". The main content area is titled "Submit" and "Solution". It includes three form fields: "Select problem:" with a dropdown menu showing "--- Select problem ---", "Select language:" with a dropdown menu showing "--- Select language ---", and "Select file:" with a button labeled "Обзор..." and the text "Файл не выбран.". A "Submit" button is located at the bottom right of the form area.

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

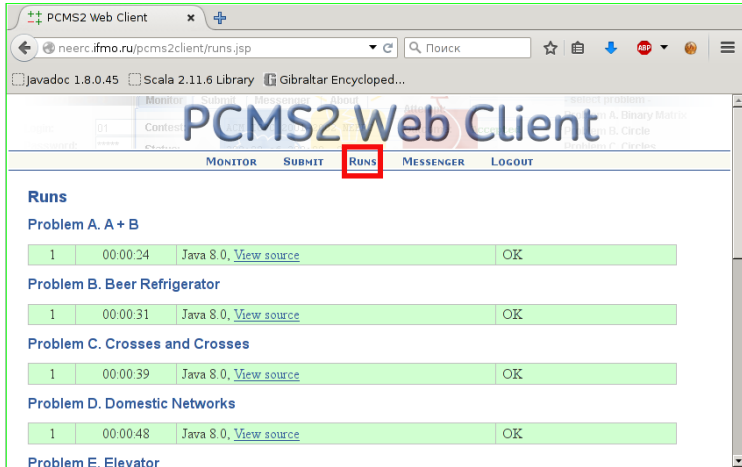
Technical
information

Programming
environment

**Common things
for problems**
PCMS2 Client

What now?

PCMS2 Client: View your runs



The screenshot shows a web browser window titled "PCMS2 Web Client" with the URL "neerc.ifmo.ru/pcms2client/runs.jsp". The browser's address bar and search bar are visible. Below the browser window, the PCMS2 Web Client interface is shown. It has a navigation bar with links: MONITOR, SUBMIT, RUNS (highlighted with a red box), MESSENGER, and LOGOUT. The main content area is titled "Runs" and lists four problems, each with a table of runs. The first problem is "Problem A. A + B", and the others are "Problem B. Beer Refrigerator", "Problem C. Crosses and Crosses", and "Problem D. Domestic Networks". Each problem has a table with columns for run number, time, language, source code link, and status. The status for all runs shown is "OK".

Runs				
Problem A. A + B				
1	00:00:24	Java 8.0.	View source	OK
Problem B. Beer Refrigerator				
1	00:00:31	Java 8.0.	View source	OK
Problem C. Crosses and Crosses				
1	00:00:39	Java 8.0.	View source	OK
Problem D. Domestic Networks				
1	00:00:48	Java 8.0.	View source	OK
Problem E. Elevator				

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

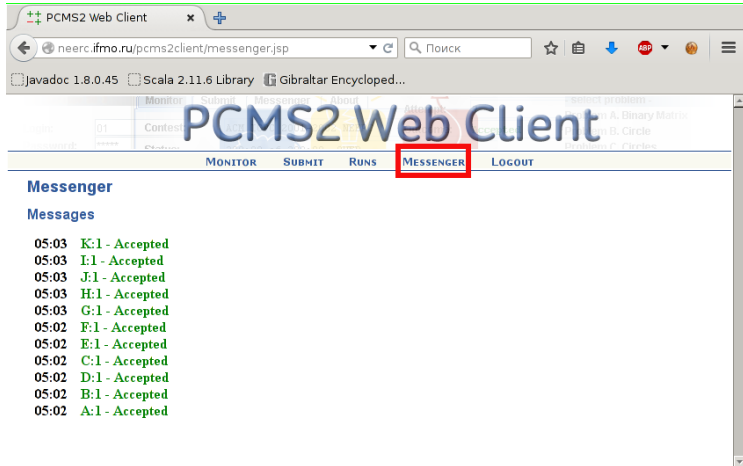
General info

Technical
information

Programming
environment
**Common things
for problems**
PCMS2 Client

What now?

PCMS2 Client: View messages



Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
**Common things
for problems**
PCMS2 Client

What now?

Practice session

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Practice session

- ▶ Get acquainted with the environment

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Practice session

- ▶ Get acquainted with the environment
- ▶ Solve two simple problems in 30 minutes

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Practice session

- ▶ Get acquainted with the environment
- ▶ Solve two simple problems in 30 minutes
 - ▶ in every language and every dialect you plan to use

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Practice session

- ▶ Get acquainted with the environment
- ▶ Solve two simple problems in 30 minutes
 - ▶ in every language and every dialect you plan to use
 - ▶ C/C++: check how `std::cin`, `std::cout`, `printf`, `scanf` work with various data types (`long long`, `long double`, etc)

Practice session

- ▶ Get acquainted with the environment
- ▶ Solve two simple problems in 30 minutes
 - ▶ in every language and every dialect you plan to use
 - ▶ C/C++: check how `std::cin`, `std::cout`, `printf`, `scanf` work with various data types (`long long`, `long double`, etc)
 - ▶ Don't forget to change `%lld` to `%I64d` before sending solution

Practice session

- ▶ Get acquainted with the environment
- ▶ Solve two simple problems in 30 minutes
 - ▶ in every language and every dialect you plan to use
 - ▶ C/C++: check how `std::cin`, `std::cout`, `printf`, `scanf` work with various data types (`long long`, `long double`, etc)
 - ▶ Don't forget to change `%lld` to `%I64d` before sending solution
- ▶ You may check system error messages, testing machine performance, etc

Main contest

Programming
Competitions
for ENS Lyon
Training Camp:
Introduction

Maxim Buzdalov,
Vitaly Aksenov,
Anna Malova

General info

Technical
information

Programming
environment
Common things
for problems
PCMS2 Client

What now?

Main contest

- ▶ Today's contest is the real quarterfinal of NEERC

Main contest

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- ▶ By results of this contest and your questionnaire we will split you in two groups:

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Main contest

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- ▶ By results of this contest and your questionnaire we will split you in two groups:
 - ▶ the first group will work in teams, preparing to real contests;
 - ▶ the other group will study theoretical basis and implement algorithms;
- ▶ Everybody from the first group, who wants to learn some basic stuff or don't know something, could join lectures of other groups too.