St. Petersburg University of IT, Mechanics & Optics and ACM International Collegiate Programming Contest

Fedor Tsarev

tsarev@rain.ifmo.ru

St. Petersburg University of IT, Mechanics & Optics

Computer Technologies Department

- Organized by ACM, sponsored by IBM
- The most prestigious competition for young programmers
- Held since 1979
- World championship – from early 90-s
- More then 7000 teams from 2000 universities of 88 countries
- Medals are given to top 12 teams – 4 gold medals, 4 silver medals and 4 bronze medals

International Collegiate Programming Contest (2)

- Multitiered competition
  - Quarterfinals – near 260 over the world
  - Semifinals – near 30 over the world
  - World Finals (100 teams)
- World Finals 2013 will be hosted by SPbSU ITMO

- Contest lasts 5 hours
- Team consists of 3 students
- Problem set contains 10-12 problems
- Different types of problems
- Only one computer is available
- To solve problems one has to:
  - Know different algorithms and data structures
  - Quickly implement them without mistakes on programming language

2009 World Finals hosted by KTH
acm International Collegiate Programming Contest · IBM · event sponsor · ICPC 2009 Stockholm

Problem A
A Careful Approach
Input: approach.in

If you think participating in a programming contest is stressful, imagine being an air traffic controller. With human lives at stake, an air traffic controller has to focus on tasks while working under constantly changing conditions as well as dealing with unforeseen events.

Consider the task of scheduling the airplanes that are landing at an airport. Incoming airplanes report their positions, directions, and speeds, and then the controller has to devise a landing schedule that brings all airplanes safely to the ground. Generally, the more time there is between successive landings, the "safer" a landing schedule is. This extra time gives pilots the opportunity to react to changing weather and other surprises.

Luckily, part of this scheduling task can be automated – this is where you come in. You will be given scenarios of airplane landings. Each airplane has a time window during which it can safely land. You must compute an order for landing all airplanes that respects these time windows. Furthermore, the airplane landings should be stretched out as much as possible so that the minimum time gap between successive landings is as large as possible. For example, if three airplanes land at 10:00am, 10:05am, and 10:15am, then the smallest gap is five minutes, which occurs between the first two airplanes. Not all gaps have to be the same, but the smallest gap should be as large as possible.

Input
The input file contains several test cases consisting of descriptions of landing scenarios. Each test case starts with a line containing a single integer n ($2 \leq n \leq 8$), which is the number of airplanes in the scenario. This is followed by n lines, each containing two integers a_i, b_i, which give the beginning and end of the closed interval $[a_i, b_i]$ during which the ith plane can land safely. The numbers a_i and b_i are specified in minutes and satisfy $0 \leq a_i \leq b_i \leq 1440$.

The input is terminated with a line containing the single integer zero.

Output
For each test case in the input, print its case number (starting with 1) followed by the minimum achievable time gap between successive landings. Print the time split into minutes and seconds, rounded to the closest second. Follow the format of the sample output.

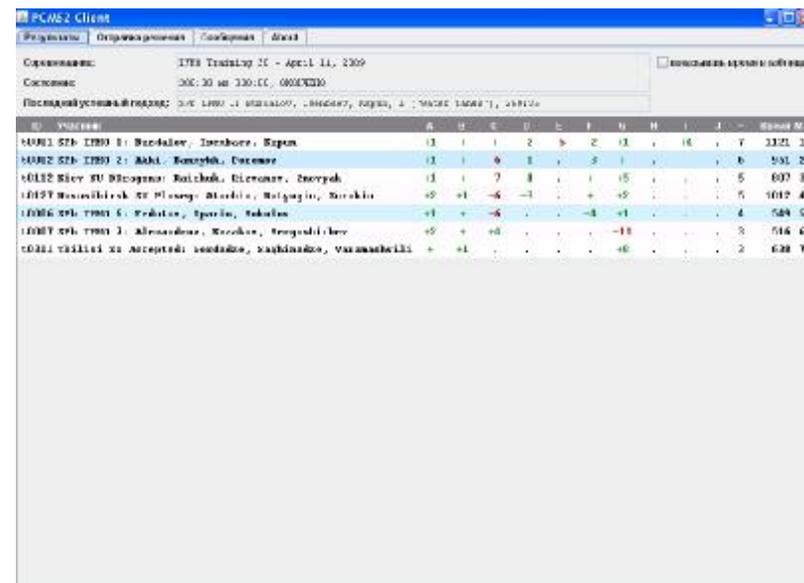| Sample Input	Output for the Sample Input
3	Case 1: 7:30
0 10	Case 2: 20:00
5 15	
10 15	
2	
0 10	
10 20	
0	

North Eastern European Regional Contest (NEERC)

- North Eastern European Regional Contest – "Russian" semifinal
- Teams from former USSR
- Held since 1996
- Hosted by SPbSU ITMO
- 14 quarterfinals, 11 countries, 700 teams, 260 universities
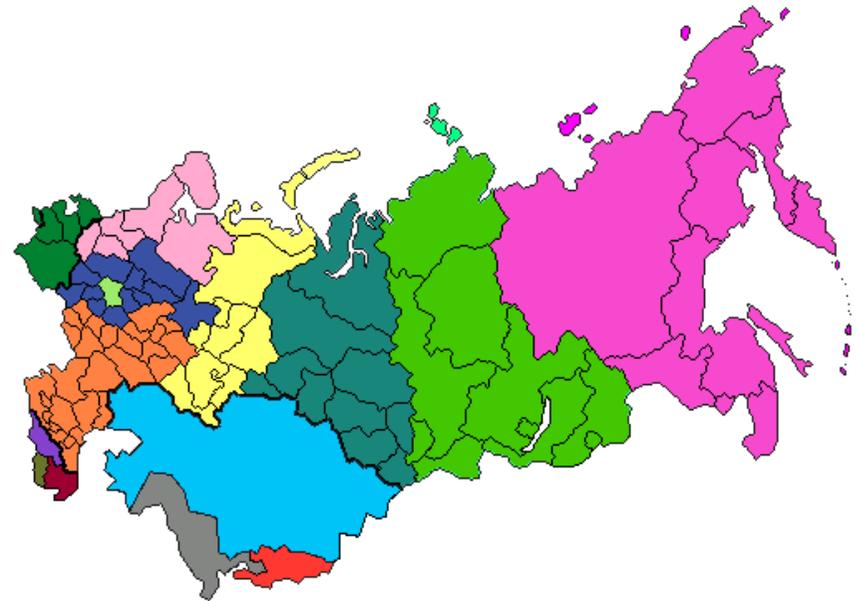
PCMS 2 – System for Automated Testing of Solutions

- Developed at SPbSU ITMO
- Used on quarterfinals in Russia, on NEERC, on trainings
- Usage in educational process:
  - Algorithms and data structures
  - Algorithms of algebra and number theory
  - Theory of formal languages and grammars
  - Java technology
- Competition-based approach

Russian teams on World Finals

- World champions:
    - 2000 – St Petersburg SU
    - 2001 – St Petersburg SU
    - 2004 – SPbSU ITMO
    - 2006 – Saratov SU
    - 2008 – SPbSU ITMO
    - 2009 – SPbSU ITMO
- 10 more gold medals – four of them were taken by SPbSU ITMO

2004, Czech Republic, Prague

- SPbSU ITMO – 1-st place
- Perm SU – 4-th place
- Izhevsk STU – 8-th place

2004 World Champions

World champions 2004 and President of Russia Vladimir Putin

World champions 2004 and President of Russia Vladimir Putin

World champions 2004 and President of Russia Vladimir Putin

2007, Tokyo, Japan

- SPbSU ITMO – 3-rd place
- Novosibirsk SU – 5-th place
- Saratov SU – 6-th place
- Moscow SU – 10-th place
- Petrozavodsk SU – 13-th place

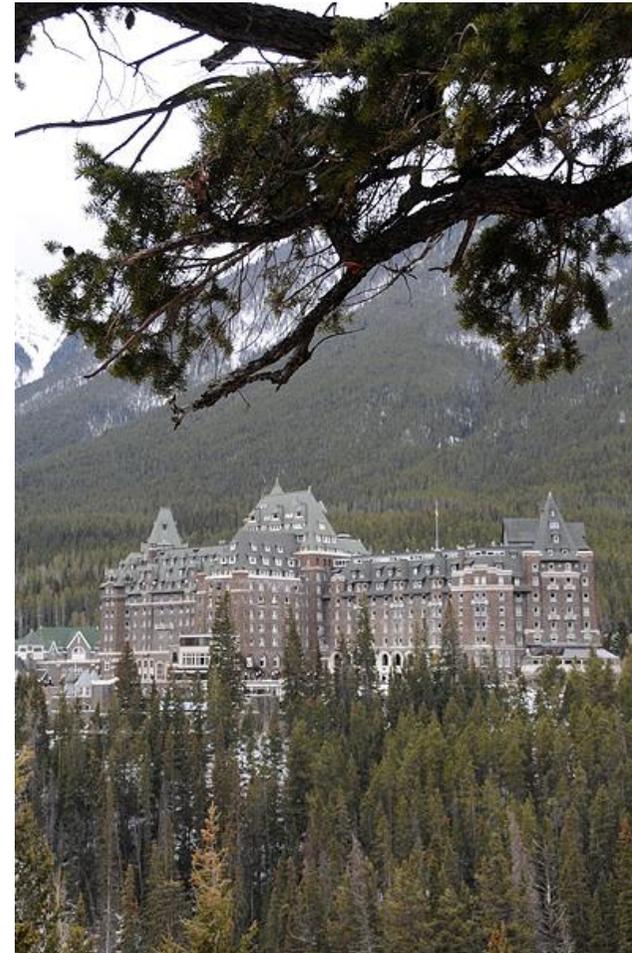# Medalists 2007 and Vice-prime minister Dmitry Medvedev

- SPbSU ITMO – 1-st place
- MIT – 2-nd place
- Izhevsk STU – 3-rd place
- Moscow SU – 5-th place
- Beijing U – 6-th place
- Stanford U – 7-th place
- Petrozavodsk SU – 10-th place
- SPbSU – 11-th place
- All 11 Russian teams are among top 30 teams of the world

World Finals 2008

ACM Awards 2008 (1)

ACM Awards 2008 (2)

2009, Stockholm, Sweden

- SPbSU ITMO – 1-st place
- Tsinghua U – 2-nd place
- SPbSU – 3-rd place
- Saratov SU – 4-th place
- Oxford U – 5-th place
- MIT – 7-th place
- Altai STU – 8-th place

DeBlasi Award (2009)

World Champions 2009

Video – World Finals 2009

- http://www.youtube.com/watch?v=65J8L3W15oQ

Gold medalist 2003 Alexander Shtuchkin and President of Russia Dmitry Medvedev

Training for ACM ICPC in SPbSU ITMO

- http://neerc.ifmo.ru/trains
- Coach – Andrey Stankevich, winner of President of Russia Award in the area of education (2003), Award for Great Contribution to Spreading ACM ICPC in Europe (2004), Best Coach Award (2009)
- Five hour trainings two times a week
- About 70% of first and second year students of Computer Technologies Department take part in trainings
- Special training camps in winter and summer in Petrozavodsk

Russian Government Award in the area of education (2008)

Thank you!