



# Bebras International Contest on Informatics and Computer Fluency

[www.bebas.org](http://www.bebas.org)

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Due to development of society and technology it is essential to develop a curriculum for teaching Computing (including Digital Literacy and in particular Computer Science) that will allow children in K12 education to have an access to knowledge that will make them **creators of technology – not just its consumers.**

*IFIP TC3, Torun, 2013*



# International Contest on Informatics **BEBRAS** (Lithuanian word for beaver)

Task oriented contest for school pupils aged 8 to 19

## Goals

- to **develop** Computational Thinking
- to **stimulate** pupils' interest in informatics and information technology
- to **encourage** pupils to *think* deeper while using computers and information technologies
- to **inseminate** concepts of informatics



# Bebras Countries

**24  
countries**

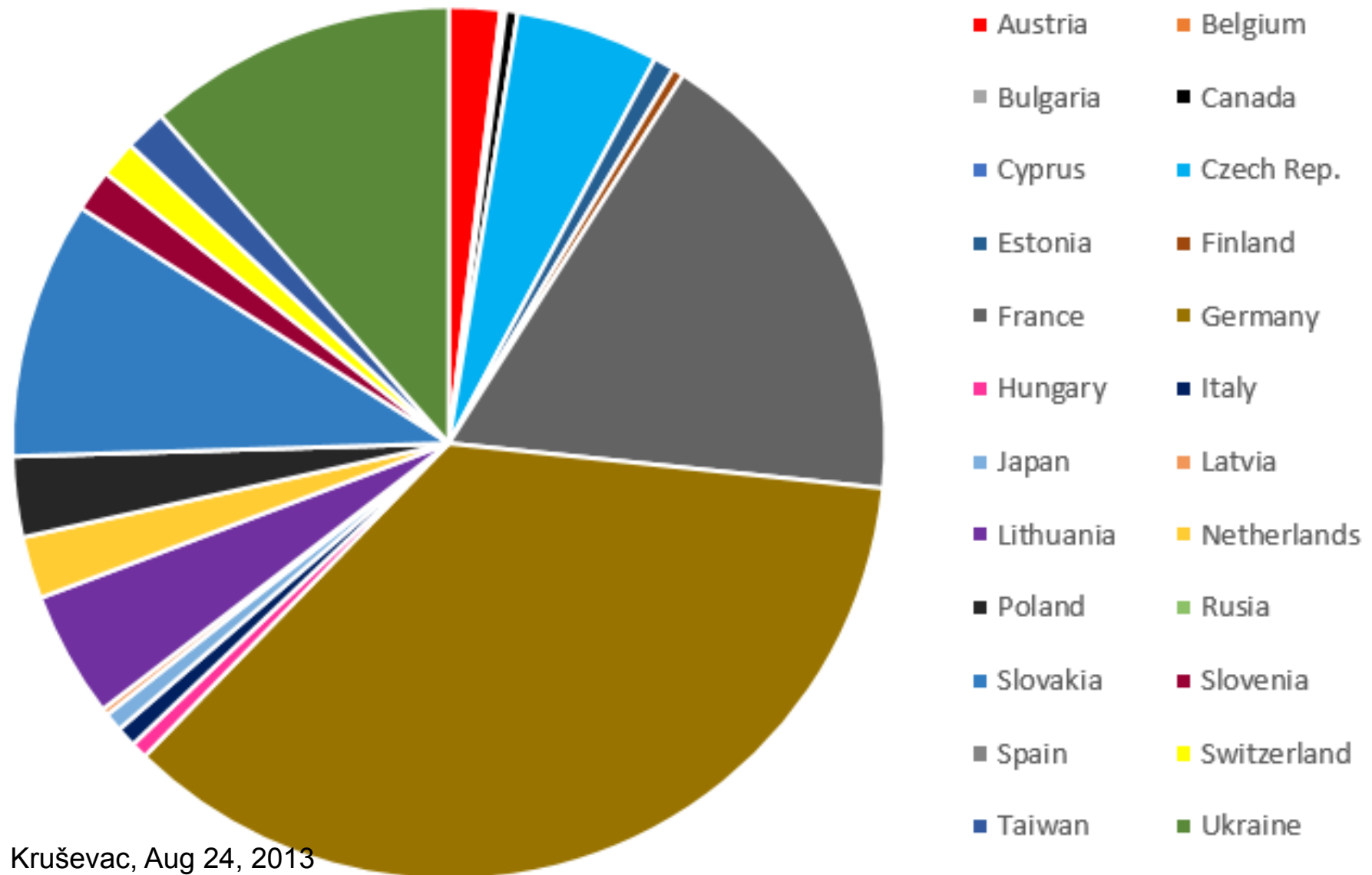
**Trial**  
Israel  
Sweden

**New  
countries**  
Ireland  
Mexico  
UK  
USA  
S. Korea  
Thailand

Kruševac, Aug 24, 2013

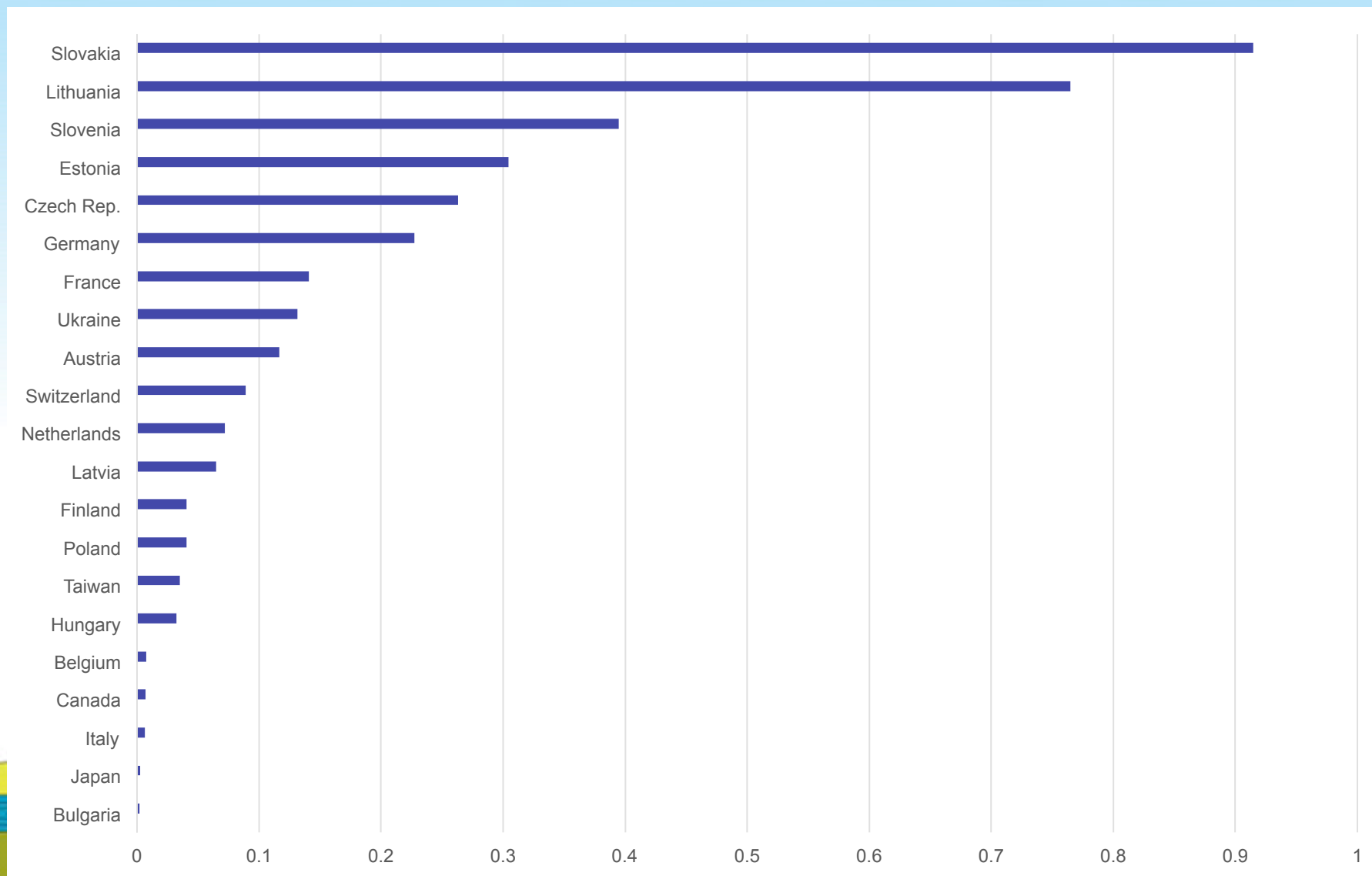
Country	Particip. 2010	Particip. 2011	Particip. 2012	First Contest
Austria	8 425	9 171	9877	2007
Belgium	-	-	848	2012
Bulgaria	-	-	137	2012
Canada	-	200	2400	2011
Cyprus	-	-	?	2012
Czech Rep.	14 867	19 280	27650	2008
Estonia	3 956	4 807	4012	2005
Finland	1 472	2 045	2197	2010
France	-	46 346	92000	2011
Germany	117 950	155 419	186048	2006
Hungary	-	1 911	3200	2011
Italy	1 325	1 597	3885	2009
Japan	-	1 600	3600	2011
Latvia	1 072	893	1336	2005
Lithuania	13 889	19 277	24390	2004
Netherlands	10 231	11 252	12000	2005
Poland	9 962	11 945	15587	2005
Russia	-	-	?	2012
Slovakia	22 139	36 382	49798	2008
Slovenia	-	3 454	8120	2011
Spain	-	-	?	2011
Switzerland	3 470	4 475	7086	2010
Taiwan	-	-	8100	2012
Ukraine	25 971	42 176	59918	2008

# Absolute Participation 2012



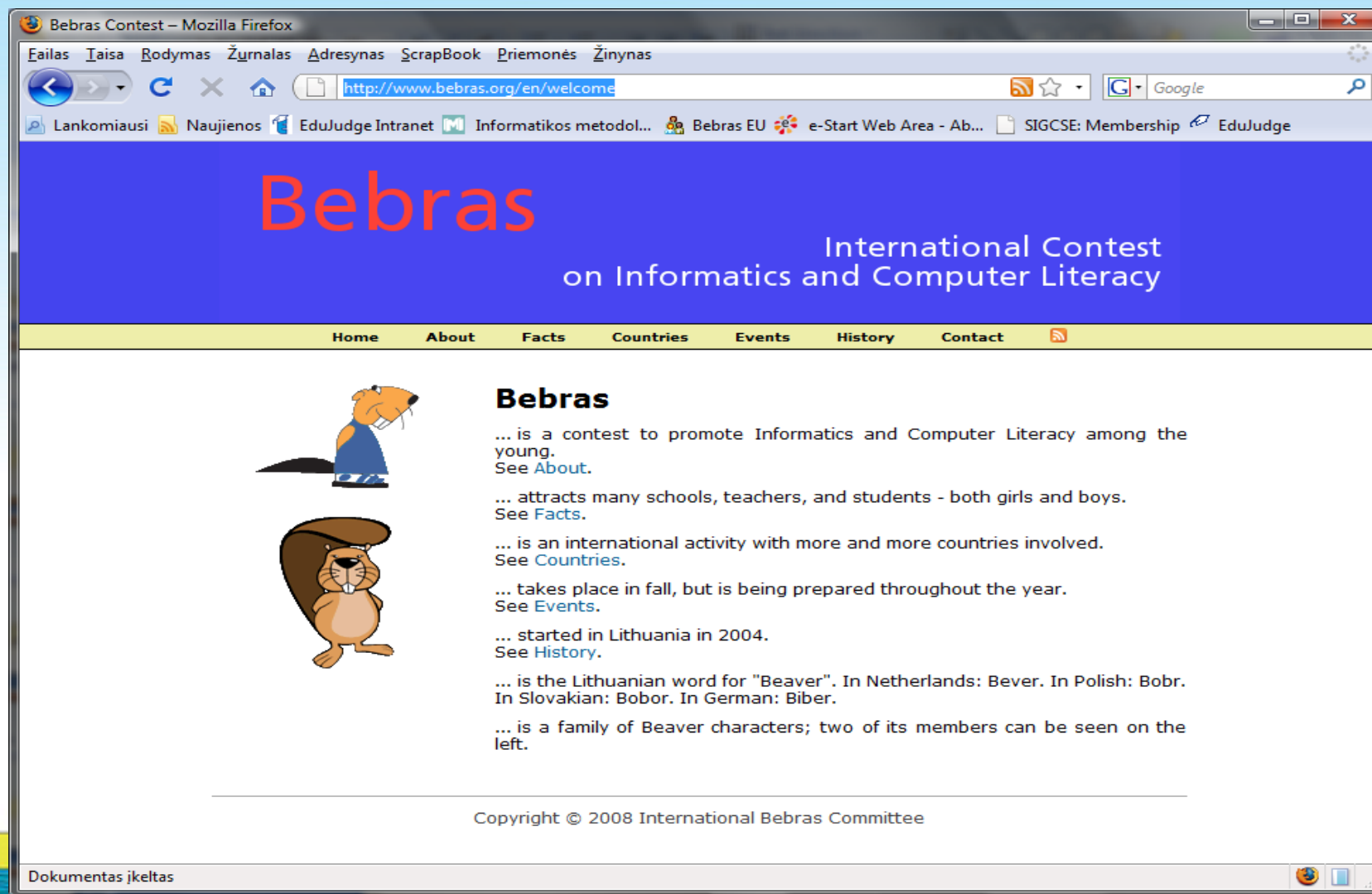
Kruševac, Aug 24, 2013

# Relative Participation 2012



Kruševac, Aug 24, 2013

# http://www.bebras.org



Krušėvac, Aug 24, 2013



# ACM Slovenija – *competitions*

What  
?

Why  
?

Integrated  
ACM  
competitions  
website

Three ACM competitions

- Bober
- RTK
- UPM

Online judge systems

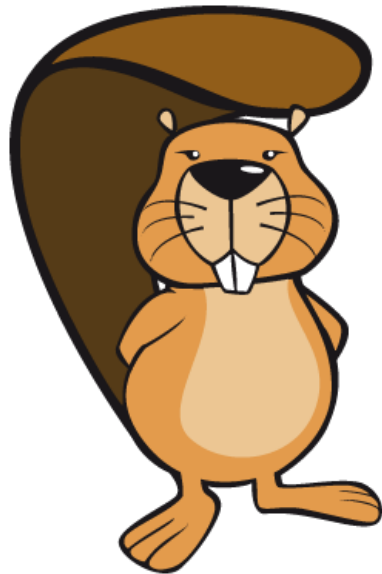
How  
?





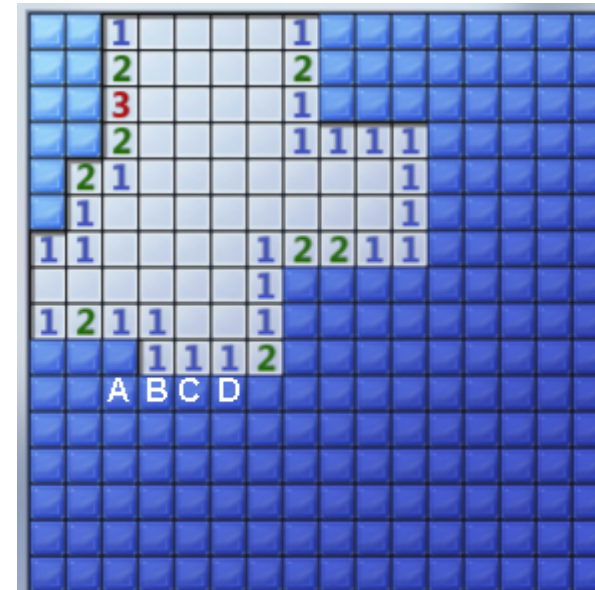
# Bober

- Primary and secondary school
- Bebras



## Minesweeper:

Which of the following fields should not be clicked?





# RTK

- Secondary school
- IOI, CEOI



**Write a function:**

PbREPeseLEdTIEloNO →  
PREPLETENObesedilo

**Write a program that decrypt any string with FFT encryption:**

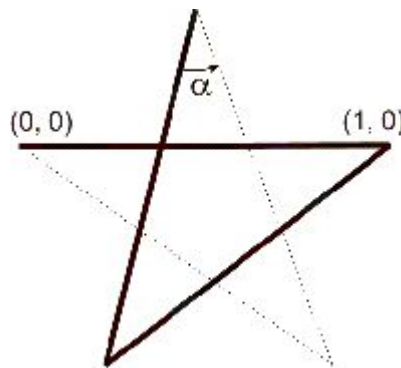
$$\text{FFT}(s_1 s_2 s_3 s_4 \dots) = \text{FFT}(s_1 s_3 s_5 \dots) + \text{FFT}(s_2 s_4 s_6 \dots)$$
$$\text{FFT}(\text{sadje}) = \text{sedaj}$$



# UPM

**</upm**  
UNIVERZITETNI  
PROGRAMERSKI MARATON

- University Programming Marathon
- ICPC, CERC



**Input:**

2

9

5

**Output:**


3

2



# http://tekmovanja.acm.si/

## ACM Tekmovanja




[Domov](#) [Bober](#) [RTK](#) [UPM](#) [Forum](#)

**12 Sep**

### Registracija mentorjev bo mogoča konec septembra

Registracija mentorjev za Tekmovanje Bober bo mogoča od konca septembra do 23. oktobra 2012.




[Všeč mi je](#) [+1](#) 0 [Tweet](#) 0

[Preberi več](#)

**22 Aug**

### Tekmovanje RTK v šolskem letu 2012/2013

RTK šolsko tekmovanje bo v petek, 25. januarja 2013, RTK državno tekmovanje pa v soboto, 23. marca 2013.




[Všeč mi je](#) [+1](#) 0 [Tweet](#) 0

[Preberi več](#)

[Išči](#)


**Prihajajoči dogodki**

- UPM – 3. kolo  
četrtek, 11. Oktober 2012 (Cel dan)
- UPM – Finale  
sobota, 20. Oktober 2012 (Cel dan)
- Šolsko tekmovanje  
torek, 13. November 2012 - 8:00



**Organizatorji**

Univerza v Ljubljani  
Fakulteta za računalništvo in informatiko



Kruševac, Aug 24, 2013



# Bebras Contest: The Challenge of Thinking

- To solve the tasks one has to **think**
- Already learned knowledge is not asked
- Pupils have to find solving strategies
- They have to find and understand structures
- They have to think about different cases
- They have to find arguments for or against given alternatives



# Developing Problem Solving Skills

- Solving Bebras tasks educates in “*Computational Thinking*”
- Computer science (CS) like thinking is done while solving a task
- Tasks are mostly on CS-related problem solving skills
- Each task involves a CS concept that needs specific thinking qualities



# Concepts of Informatics

are related to “Fundamental Ideas of Computer Science” that  
are applicable in different areas of computer science  
may be taught on every intellectual level  
will be relevant in the long run  
have meaning in everyday life

Concepts are independent from specific informatics systems  
Concepts can be applied in new situations in the future  
Concepts are valuable in the long run

Concepts consist of several aspects

Example: Algorithmic Thinking:

- Symbolic representation
- Rules
- Conditional choice
- Parallelism, Synchronization
- Iteration, Recursion

etc.

## IL-06 Data Transmission (Benjamin easy)

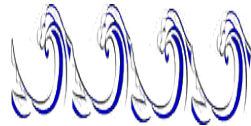
We are in 18th century. Popeye The Sailor Man found a treasure chest on a Caribbean island and wants to send a message to his friends on land. When Popeye eats spinach, he is capable of making different kinds of water waves.

His friends know the meaning of the following signs.

**I found the treasure**



**I'm waiting on the island**



**hurry**



Popeye sends his friends the following message by creating water waves:



**What does this message mean?**

- A. I found the treasure. I'm waiting on the island. Hurry.
- B. Hurry. Hurry. I found the treasure. I'm waiting on the island.
- C. Hurry. I found the treasure. Hurry. I'm waiting on the island.
- D. I'm waiting on the island. Hurry

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### **This is informatics**

To transport information we need a representation (code), a transport medium, a sender and a receiver. Digital communication is an important part of all informatics systems.





# Bebras Contest

## Participants

all pupils age 8 to 19

different tasks for 5 age groups:

- PRIMARY      *cicibober*      6-9 years (grade 1-3)
- BENJAMIN      *bobrček*      10-12 years (grade 4-6)
- CADETS      *mladi bober*      13-15 years (grade 7-9)
- JUNIOR      *bober*      15-16 years (grade 1-2)
- SENIOR      *stari bober*      16-19 years (grade 3-4)

## Tasks

pupils have to solve 18-24 tasks within 40 to 60 minutes

interactive tasks and multiple-choice tasks

2 - 3 minutes per task

easy, medium and hard tasks

performed on PCs, usually during school lectures



# Task Categories

## **INF Information comprehension**

Representation (symbolic, numerical, visual)

Coding, encryption

## **ALG Algorithmic thinking**

Including programming aspects

## **USE Using computer systems**

e.g. search engines, email, spread sheets, etc.

General principles, but no specific systems

## **STRUC Structures, patterns and arrangements**

Combinatorics

Discrete structures (graphs, etc.)

## **PUZ Puzzles**

Logical puzzles

Games (mastermind, minesweeper, etc.)

## **SOC ICT and Society**

Social, ethical, cultural, international, legal issues



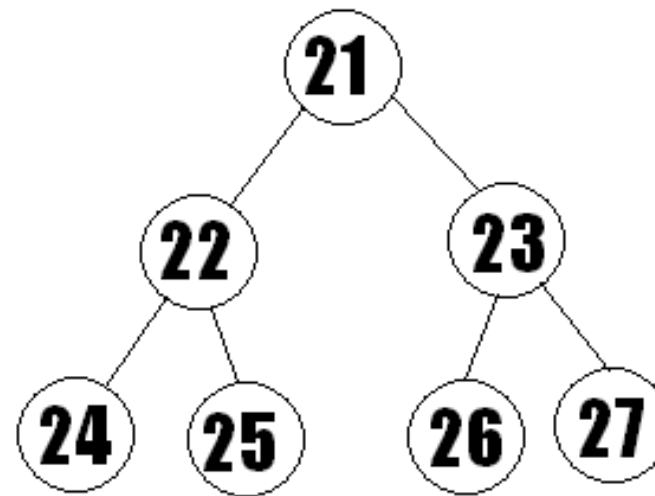
# Attractive Tasks

- are interesting, powerful, surprising, inspiring, ...
- stimulate to think and to learn about some aspects of CS concepts
- offer equal chance for all pupils coming from different countries and different school types



# Example of a Task Development

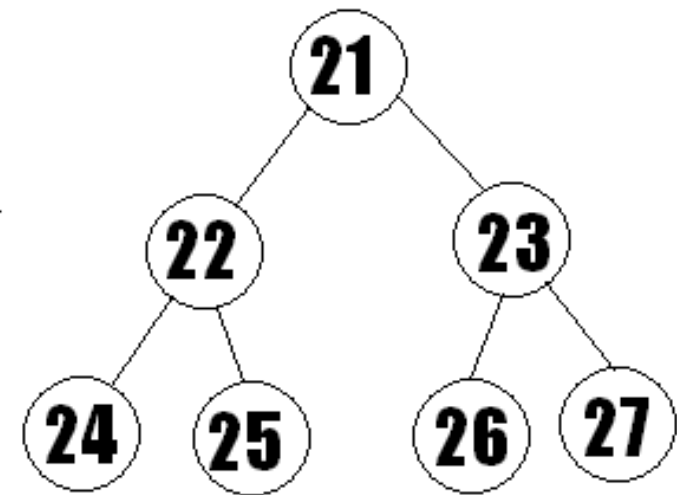
- **Idea:** Given is a binary tree with values. How many exchanges of two arbitrary values is necessary to achieve a *heap data structure*?





# First formulation of the task

*The picture shows a binary tree with values in the nodes. A binary tree is called a “Heap” if each parent node has a value greater than or equal to both child nodes. The given binary tree is not a “Heap”. Give the minimum number of value exchanges (of any two nodes) that produces a “Heap”.*



*Answers:    A) 2    B) 3    C) 4    D) 5*

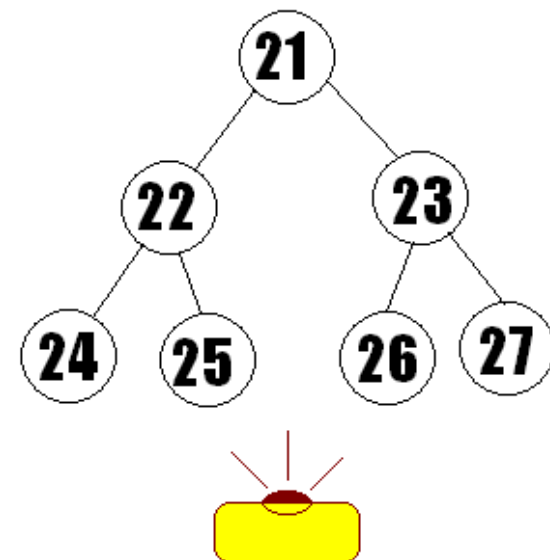


# Final formulation of the **Group Photo** task

*To make a group photo of 7 beavers it is necessary that the smaller beavers stand in front and the larger beavers in back. Unfortunately the beavers stand in a wrong order. In the graphics below those beavers are connected by a line where the back beaver should be larger than the front beaver. The only operation to rearrange beavers you can do is exchanging any two beavers of the group.*

*What is the minimum number of exchange-operations, that after all, the beavers are ready for taking picture?  
Please perform a minimum number of exchange-operations by clicking on pairs of beavers.*

Kruševac, Aug 24, 2013



# Influence of *Bebras* Contest

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- On teaching informatics (computing)
  - Introduces concepts to pupils
  - Encourages exploring
  - Gives examples of good tasks
  - Stimulates learning some topics of Informatics
- On curriculum
  - Sets an international standardization
- On teacher training
  - Challenges teachers to deal with new concepts
  - Improves deeper understanding of informatics



# *Bebras* workshops for creating tasks

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## Workshops are held in spring:

- **2005** in Balsiai, Pasvalys, Lithuania
- **2006** in Balsiai, Pasvalys, Lithuania
- **2007** in Balsiai, Pasvalys, Lithuania
- **2008** in Torun, Poland
- **2009** in Balsiai, Pasvalys, Lithuania
- **2010** in Dagstuhl, Germany, May 19-22
- **2011** in Druskininkai, Lithuania, May 10-15
- **2012** in Druskininkai, Lithuania, May 29 - June 3
- **2013** in Torun, Poland, June 29 - July 1 <http://wcce2013.umk.pl/>
- **2014** in Vilnius, May 28 – June 1(2)      Join us! WELCOME!

Krušėvac, Aug 24, 2013





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**Thank you / Hvala!**

**tekmovanja.acm.si/bober**

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