

Giochi di Fibonacci Year II: Competitive Blocks Programming for Young Students

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Overview

- Introduction
 - Motivation and context
 - Contest overview
 - Relation with Bebras
- The competition
- Conclusions

Motivation and context

- need to introduce computational thinking to **younger students**
 - primary and lower secondary schools
 - early acquired competences allow for greater performance in later years
- school **curricula** lag behind; other initiatives lead the way
 - **Bebras**: international challenge
 - **Programma il Futuro**: online-assisted courses
 - ... many more on **local level**
- no other initiatives in Italy currently take the form of a **contest**
 - leverage **competitiveness** and **gamification** to drive motivation
 - **modular** experience based on the students' abilities
 - ... gifted students can receive targeted **higher-level** education
 - synergistic with later contests such as the **IOI**



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Contest overview

First Phase (\approx same as last year)

- no background required, open to everyone
- *logical, algorithmic* and *program reading* quizzes
- similar to Bebras but more focus on block programming

Second Phase (updated!)

- best students in each school
- *program reading* questions for continuity
- block programming integrated in the contest site

Third Phase (updated!)

- best students in the country
- fully online event: contest and awards
- traditional or block programming

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Relation with Bebras

Synergies

- all phases scheduled **after** the Bebras challenge
- participating to Bebras first is **encouraged**
- first phase is strongly **inspired** by Bebras

Differences

- competitive **contest** vs non-competitive challenge
- multiple phases for a **modular** experience
- progressive focus shift towards **programming**



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 - First phase
 - Second phase
 - Third phase
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First phase

Structure

- 1 school hour, online quiz platform
- quizzes specific by school level, with overlapping questions:
 - logical thinking: closed questions (4 for primary, 3 for secondary)
 - algorithmic thinking: open questions (2 for primary, 4 for secondary)
 - program reading: closed questions (3 for both primary and secondary)

Results

- lower participation than last year: 6,616 instead of 11,581
- more difficult problems: median score 15 (for both school levels)
- ...easier tasks for next year are needed
- still high reported satisfaction through feedback forms

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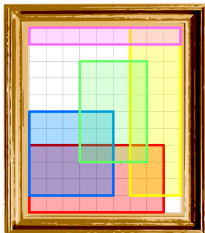
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First phase: logical & algorithmic thinking tasks

Domanda 3

Tip-Tap ha ricevuto 5 cartoline rettangolari, di dimensioni (in cm) 8×4 , 5×5 , 3×10 , 9×1 e 4×6 .

Ora vuole acquistare una bacheca rettangolare in cui mettere le cartoline, possibilmente sovrapposte ma **non ruotate**. Per esempio, questa è una possibile bacheca di area $9 \times 11 = 99$ che contiene le cartoline.



Per risparmiare, Tip-Tap vorrebbe acquistare la bacheca più piccola possibile: quanto vale la più piccola area (in cm^2) di una bacheca che può contenere le cartoline?

- ☐ 10
- ☐ 85
- ☐ 80
- ☐ 0
- ☐ 90

Domanda 5.1

Gli amici di Tip-Tap si sono messi tutti in fila per la conta! Ognuno di loro ha una diversa altezza, scritta sulla propria maglietta:



Tip-Tap in una mossa può scegliere due amici consecutivi e far uscire dalla fila il più basso dei due. Qual è la minima altezza di un amico che può rimanere in fila dopo 5 mosse?

Domanda 5.2

Qual è la minima altezza di un amico che può rimanere in fila dopo 4 mosse?

First phase: program reading tasks

Domanda 8

Tip-Tap vorrebbe tanto mangiare la sua carota, prima però deve raggiungerla! A separarlo dal suo obiettivo ci sono due porte chiuse. Tip-Tap sa compiere le seguenti azioni: + **avanza**: salta alla roccia più vicina a destra, solo se non c'è una porta chiusa in mezzo. + **apri porta**: apri la porta a destra, ma solo se è di fianco a te. + **mangia carota**: mangia la carota a destra, ma solo se è di fianco a te.

Quali delle seguenti successioni di azioni consentono a Tip-Tap di raggiungere la carota?



- ☐ solo 2
- ☐ sono tutti corretti
- ☐ 2 e 1
- ☐ 1 e 3
- ☐ solo 1

Opzione 1:

avanza

apri porta

ripeti 2 volte:

avanza

apri porta

avanza

mangia carota

Opzione 2:

avanza

ripeti 2 volte:

apri porta

avanza

mangia carota

Opzione 3:

ripeti 2 volte:

avanza

apri porta

avanza

mangia carota

Second phase

Structure

- 2 school hours, online quiz platform
- quizzes specific by school level, with overlapping questions:
 - program reading: closed questions (3 for both primary and secondary)
 - block programming questions in blockly (3 for both primary and secondary)

Results

- higher participation than last year: 2,102 instead of 1,320
- schools decided to let more people to participate than we suggested
- median score only 10/60, need to reduce participation
- a critical bug let to some data being lost
- for fairness, a per-school selection criteria was adopted
- still high reported satisfaction through feedback forms

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Second phase: block programming task

Livello 1 ?

Livello 2 ?

Livello 3 ?



A rabbit is standing on a shelf. To its left are two tall grey blocks and a wooden ladder. To its right are six colored blocks numbered 1 to 6: 1 (light blue), 2 (purple), 3 (green), 4 (blue), 5 (yellow), and 6 (dark blue).

sinistra 0/9

destra 0/12

blocchetti 6/6

inizia qui

Third phase

Structure

- 3 hours, online programming judge or quiz platform
- four tasks, with 3 in common with high school regionals

Results

- 79 participating students, only from lower secondary school
- only 8 students (3 medalists) using the programming judge
- 75 non-zero scores: few zero points and mostly for technical issues
- 39 medals awarded: 20 bronzes / 11 silvers / 8 golds
- mostly positive feedback from participants
- silvers and golds invited to join the Italian IOI trainings

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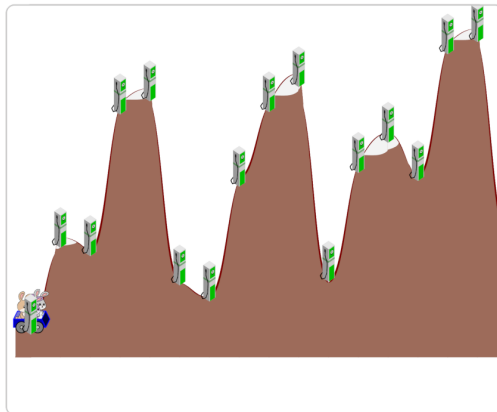
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Third phase: sample task

Livello 1 ? Livello 2 ? Livello 3 ? **Livello 4 ?** Livello 5 ?

Livello 6 ? Livello 7 ? Livello 8 ? Livello 9 ?

Livello 10 ?



- Esecuzione
- Variabili
- Matematica
- Logica
- Cicli
- Liste

Inizia qui

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 - Feedback analysis
 - Lessons learned
 - Future plans
 - Wrap up

Feedback analysis

Research Questions

- Impact of preparatory activities: couldn't find, more research needed
- Correlation between students and teachers impressions is very low
- Negligible impact of the bug on student satisfaction
- No preference between program comprehension and coding questions
- Main factors for students' satisfaction are students' interest for the topic, and secondarily questions' presentation
- Main factors for recommending participation are personal interest and satisfaction

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Lessons learned

- overall, the initiative worked well and was **positively received**
- first phase was successful but **too hard**, need more easy tasks
- **too many** people in the second phase, due to school autonomy
- ...and more **testing** is needed to avoid new bugs
- **third phase** was successful without caveats
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- simpler problems in **first phase**
- stress with teacher that only **few students** should pass to the **second phase**
- offer a parallel guided activity based on the second phase for **all students** for teachers that want to include everyone
- demand official participants to the second phase to **subscribe** to our website (currently required only for the third phase)
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- **Fibonacci Games** are a contest-like initiative leveraging **competitiveness**
- three phases for progressive **selection** and focus on **coding**
- good success, despite a major bug and some points of improvement

Thanks!

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