

THE ART OF

# “TEACHING WITHOUT TEACHING”



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WHO ARE WE?

# ABOUT US

-  For two years we have had an Apl class with 25 students from our liceum G.B. Grassi Saronno located in the north of Italy.
-  They also write functions during their boring lessons.
-  Our try in the apl contest.
-  The birth of the idea.

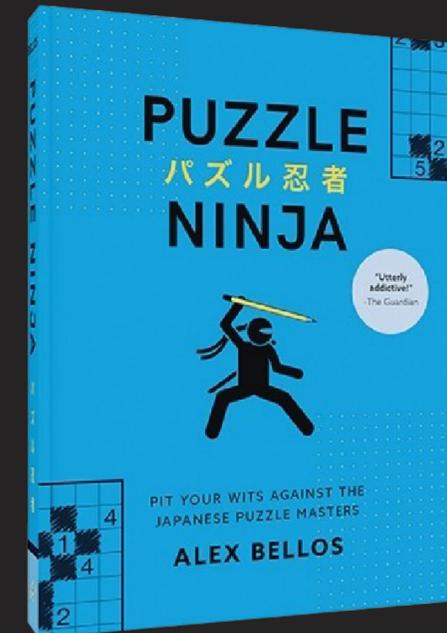


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A BOOK:

# OUR INSPIRATION

-  **Alex Bellos travels to Japan and meets the world's brightest puzzle inventors, awesome puzzle masters, and startling origami experts. The Puzzle Ninja is a delightfully brain-bending mix of history, reportage, and over 200 mind-boggling puzzles.**
-  **Alex Bellos is brilliant on all things mathematical. He has a degree in Mathematics and Philosophy from Oxford University. He writes a popular maths blog and a puzzle blog for the Guardian.**



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CONTRADICTIONS

# IDENTITY PROBLEM

**“ I am a teacher, but I do not like teaching.  
In fact, I do not teach.  
The art of teaching without teaching is my way. ”**

 **Tetsuya Miyamoto**  
Inventor of the KenKen puzzle.

FIGHTING AGAINST STRANGE CREATURES

# TEACHERS' ILLUSION

**“Do you think that students become smarter after a careful explanation?**

**No, not at all**

**After a careful explanation students have an illusion they can understand**

**They cannot solve the problems by themselves”**

 **Tetsuya Miyamoto**  
Inventor of the KenKen puzzle.



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HOW TO:

# SMARTER STUDENTS

-  I give them interesting puzzles.
-  They enjoy to solve them, learning by themselves, each at his or her own speed.
-  No child should be forced to do anything, you need to accept that they are who they are.

 **Tetsuya Miyamoto**  
Inventor of the KenKen puzzle.



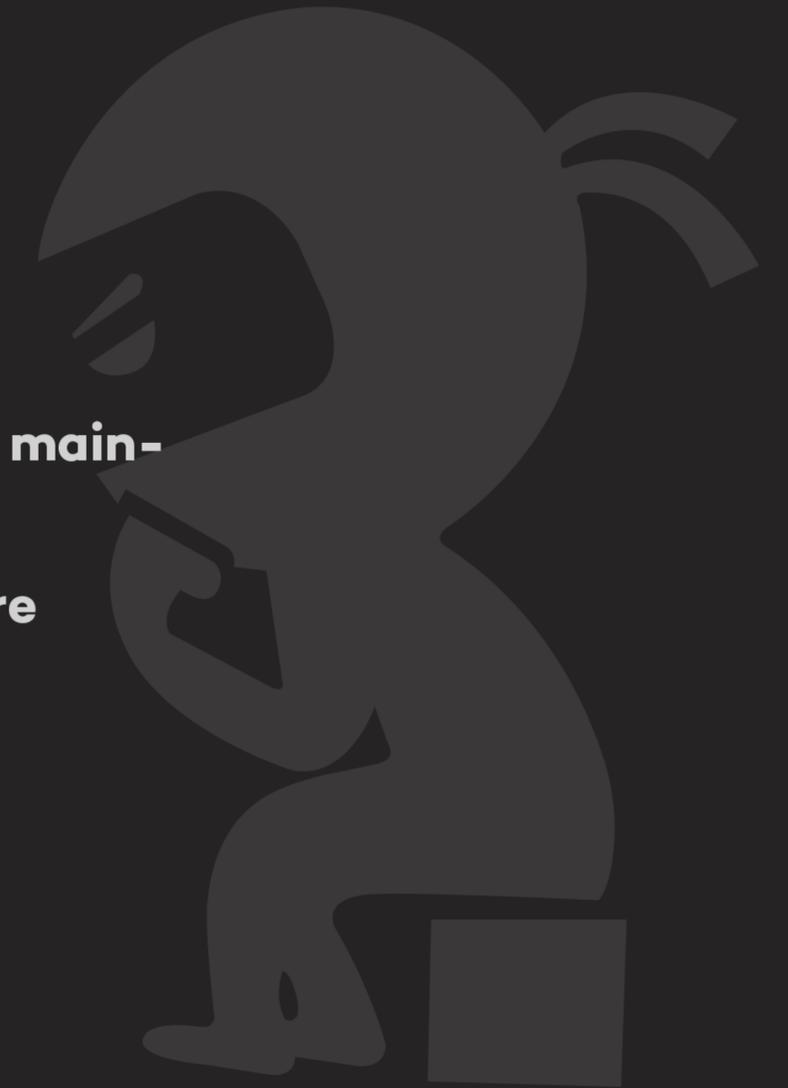
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FIGHTING AGAINST STRANGE CREATURES

# TRANSPARENT TEACHER

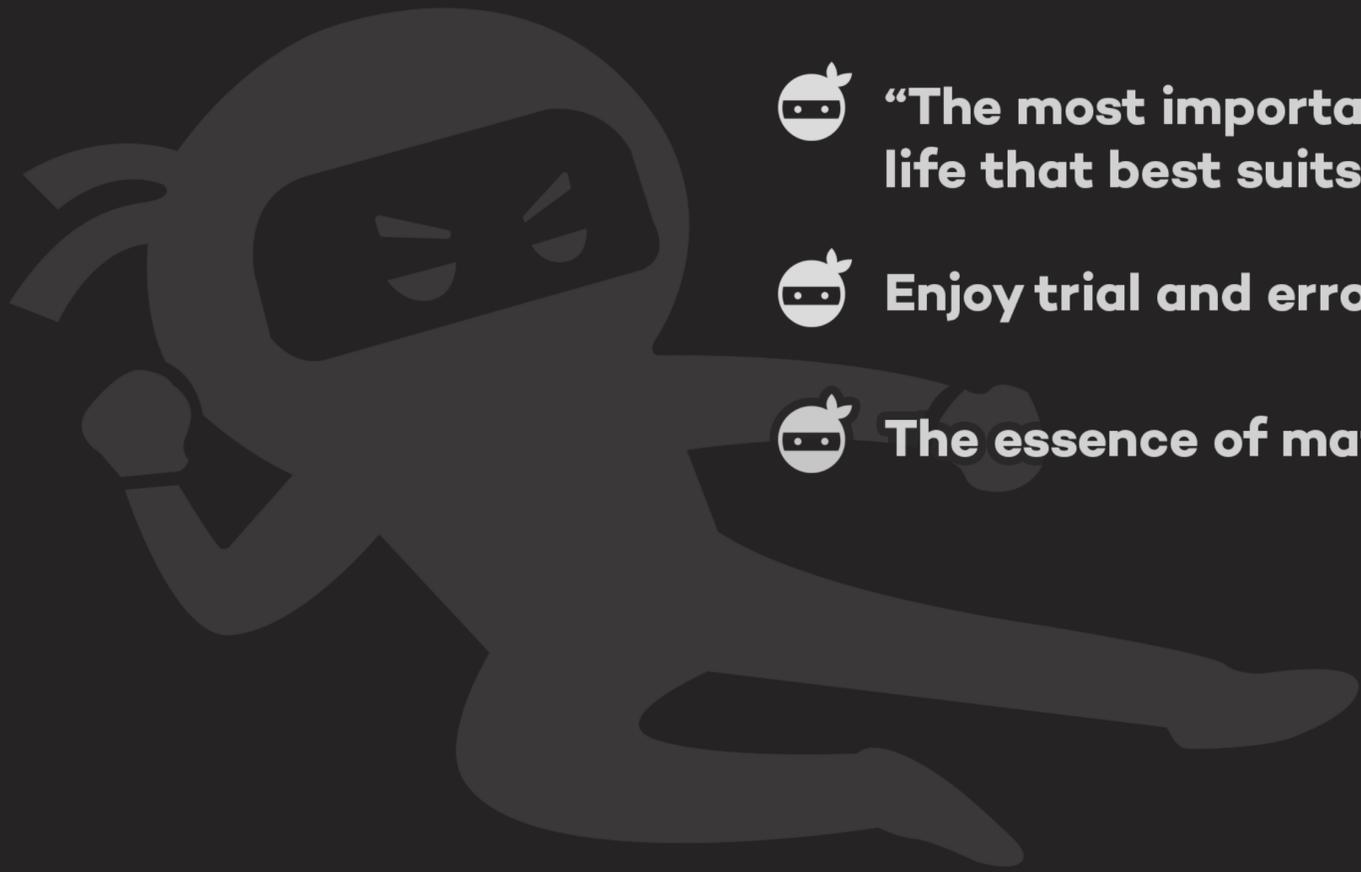
- 🍎 **“Children only care about whether something is fun or not”**
- 🍎 **“If we allow children to play freely with a variety of things, then children would never hate studying”**
- 🍎 **“If you see that they truly love or are truly immersed in something, try to maintain that environment”**
- 🍎 **“It is not whether they are good or bad at something but whether they are interested or not in something”**



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ENJOY CHALLENGES IN LIFE AS ENJOY TRIAL AND ERROR

# OVERCOME FRUSTRATIONS



- 🤖 **“The most important thing for a child is to find solutions but to find a way of life that best suits their personality”**
- 🤖 **Enjoy trial and error, and the answer will come to you.**
- 🤖 **The essence of mathematics is to keep on thinking.**



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# APL'S ILLUSION



- 🤖 **Mathematical notation is a tool of thought, said K. Iverson**
- 🤖 **Using APL to think of a solution to a problem could be an effective way to progress yourself in mathematical and coding learning.**
- 🤖 **Apl is not enough.**



THIS IS THE REAL CHALLENGE

# BY HAND OR BY PC?

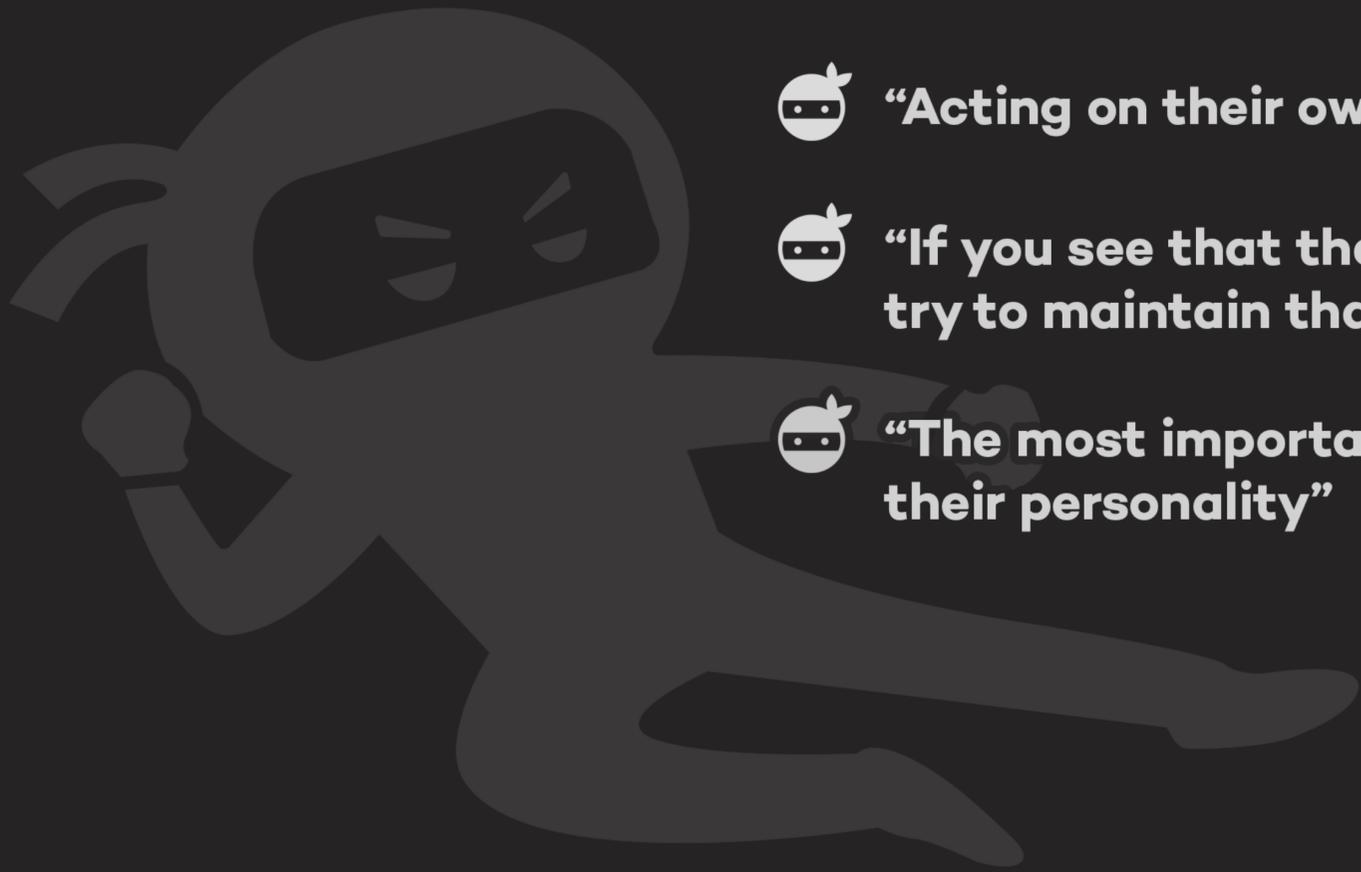
-  **By hand or By computer? Which is the best?**
-  **A mixed strategy is required in some situations.**
-  **Coding leads to do not think deeply to analyze the real issue of a problem.**
-  **We need a kind of problem solving contest where it must not be clear from the start if apl is the best approach.**
-  **Increase individual critical thinking**



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THE REASONS FOR AN APL PROBLEM SOLVING CONTEST

# A PUZZLE LEAGUE



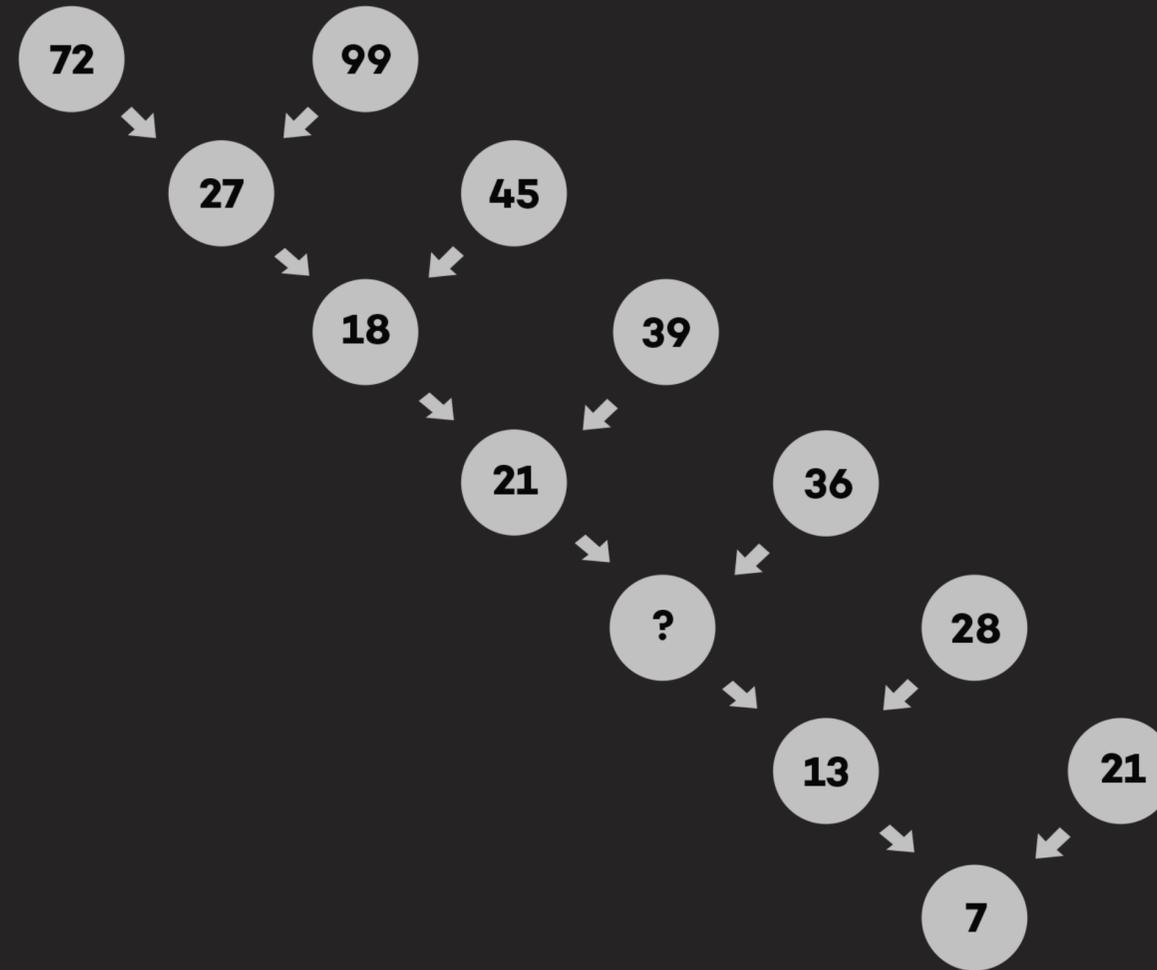
- 🤖 **“Acting on their own judgements and taking full responsibility for the result”**
- 🤖 **“If you see that they truly love or are truly immersed in something, try to maintain that environment”**
- 🤖 **“The most important thing for a child is to find a way of life that best suits their personality”**



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THINGS DON'T HAVE TO BE AS THEY SEEM

# NOT AS IT SEEMS



**Yoshigahara Nob**

Inventor of puzzles, mechanical puzzles.

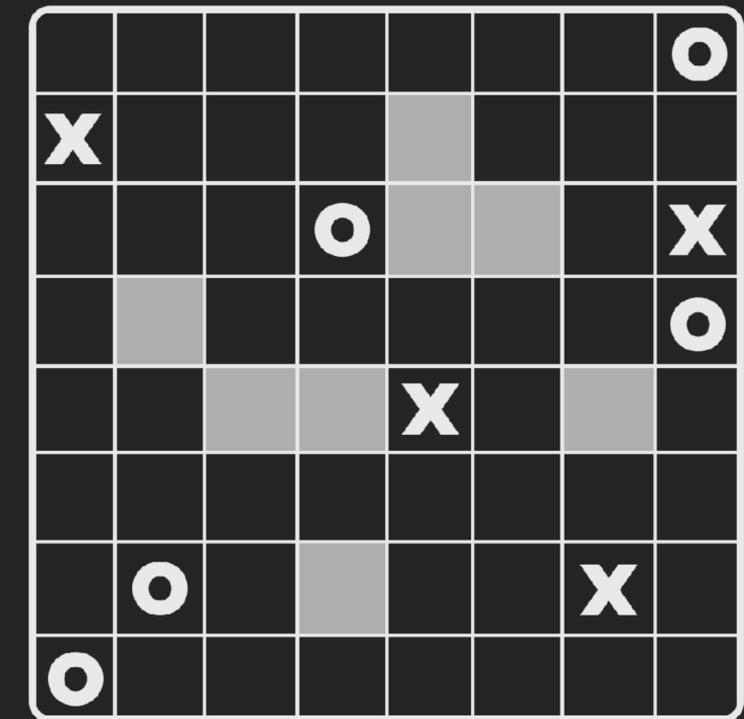


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WHY WE CHOSE A LOT OF

# GRID PUZZLES

-  **The grid logic puzzles are a sort of middle ground.**
-  **You can create and solve puzzles by hand or by computer and a programming language is an hybrid way to do this.**
-  **Puzzles represent the most interesting problems in which you should alternate hand and coding strategy.**



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THE PERFECT PUZZLE:

# SIMPLE RULES



«If I can't make a puzzle with simple rules, I quit that puzzle»



«The puzzle is like a simple equation and in a simple equation two things lead to a third.»



**Naoki Inaba**

Inventor of 'Area Maze' and Marupeke

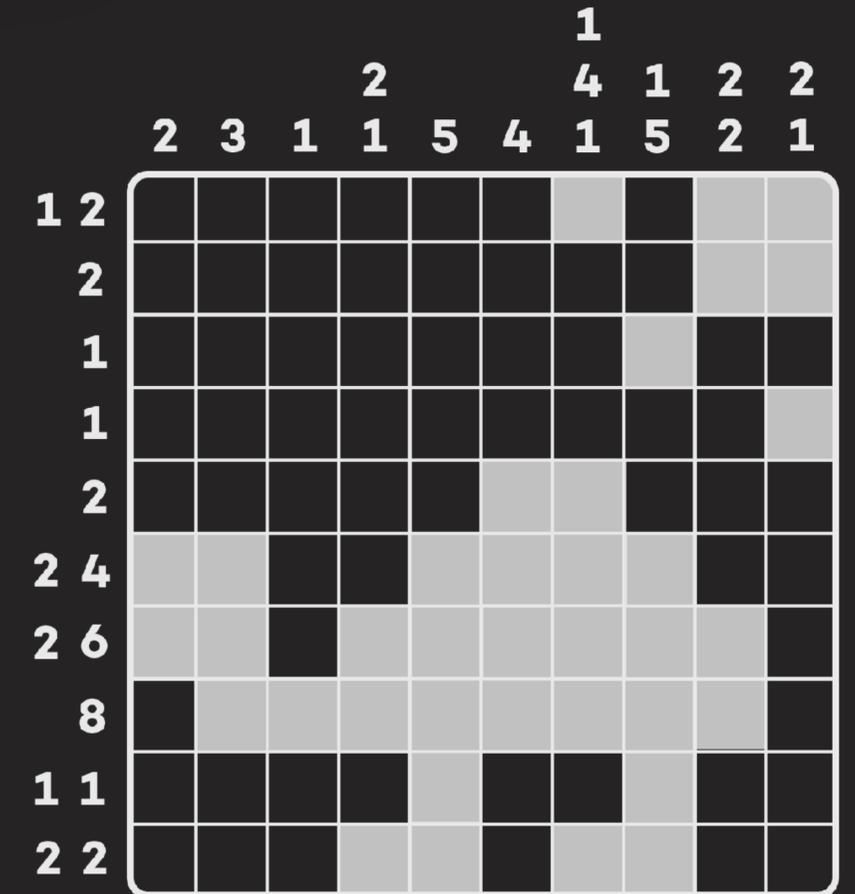


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THE PERFECT PUZZLE:

# HERE IS IT

-  The solver should not have to do the same thing again and again.
-  It should be cultural-neutral.
-  The puzzle should be well balanced between the 'part' and the 'whole': the solver should alternate his attention between the individual step and the complete picture.
-  Pay attention to details but keep an overall sense of balance like the art of cultivating bonsai miniature trees.

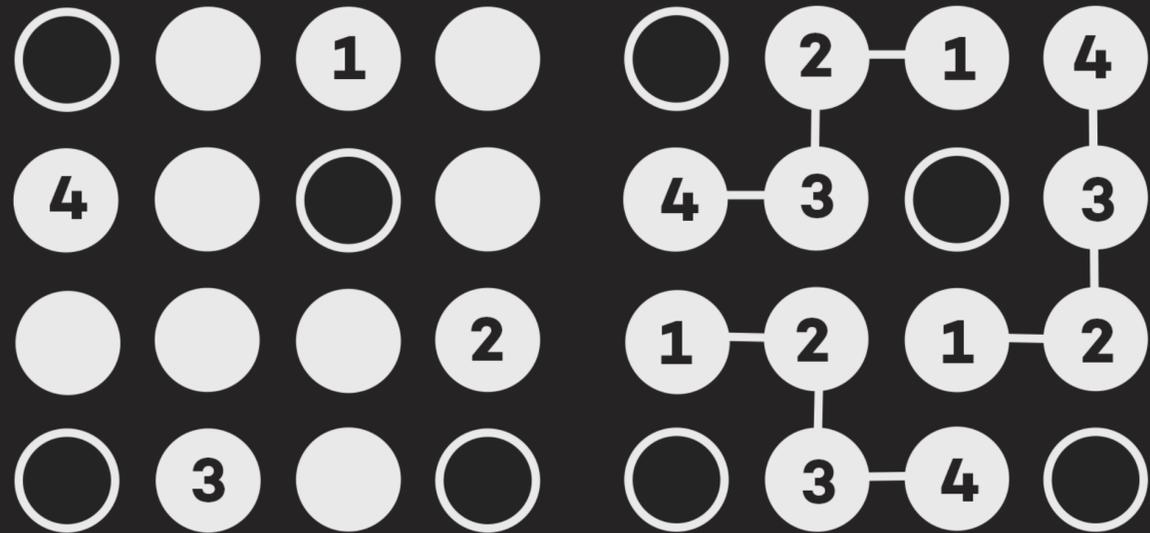


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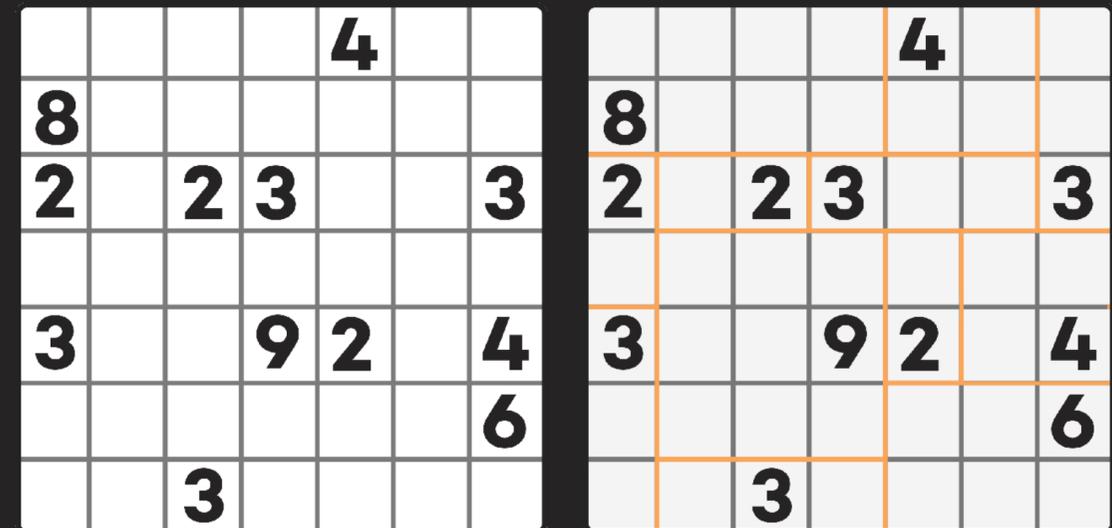
SOLUTIONS:

# APL OR NAH?

 Apl is not suitable



 Apl is suitable



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HOW TO:

# SOLVE PUZZLES

-  Freebies represent the first step , which lead you to a second step and so on.
-  Freebies are free moves that require almost no thinking so they are can be implemented in Apl.
-  After a freebie you have in front of you simplified puzzle from that point on you continue using your mind and the of the next step.
-  Go on by alternating computer and mind shots.



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HOW IT WORKS?

# ALGORITHMS

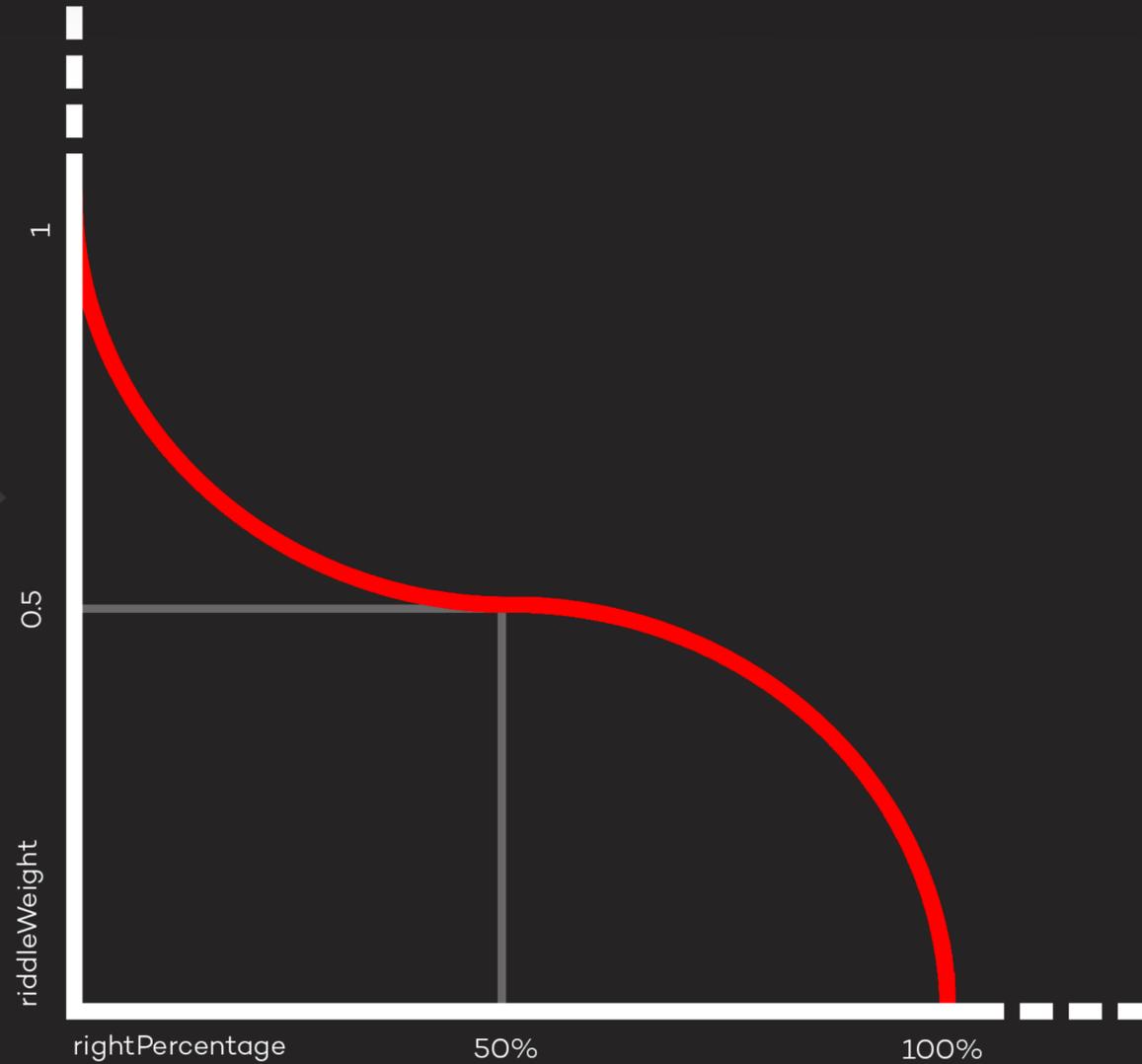

$$\text{GAINED} = \frac{100 \times \text{RIDDLEWEIGHT}}{\text{ATTEMPTS}} + \text{TIMEBONUS}$$



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HOW IT WORKS?

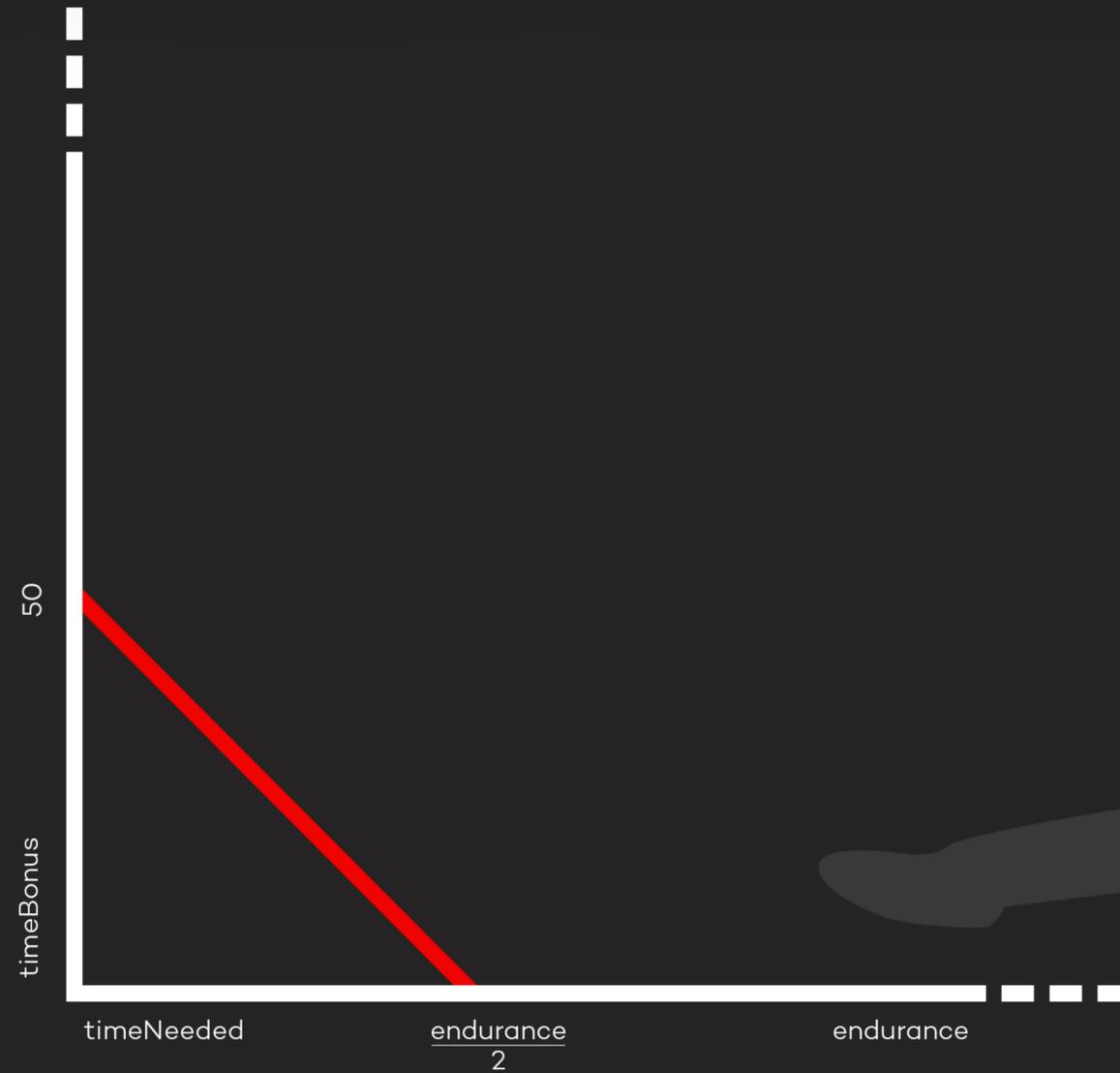
# RIDDLEWEIGHT



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HOW IT WORKS?

# TIMEBONUS



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YOU CAN SEE MY TEACHER OVER THERE!

# I'M NOT A DEV



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OUR PROJECT

# MATHMAZE



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PYTHON - APL INTERFACE

# DJANGO



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PYTHON - APL INTERFACE

# PY'N'APL

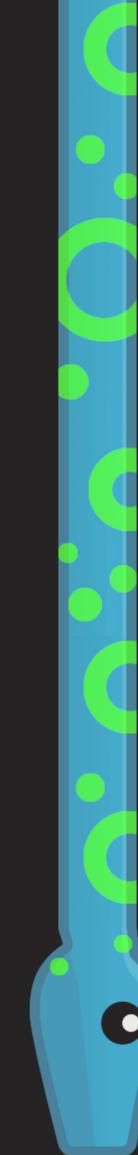


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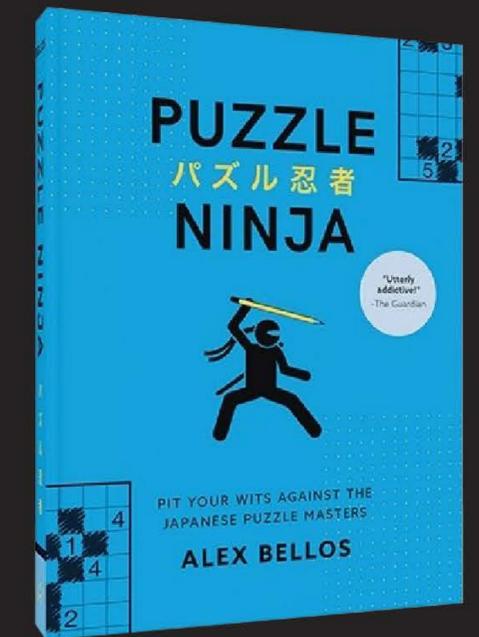
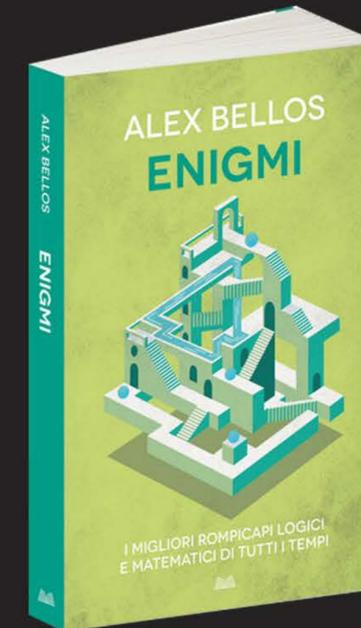
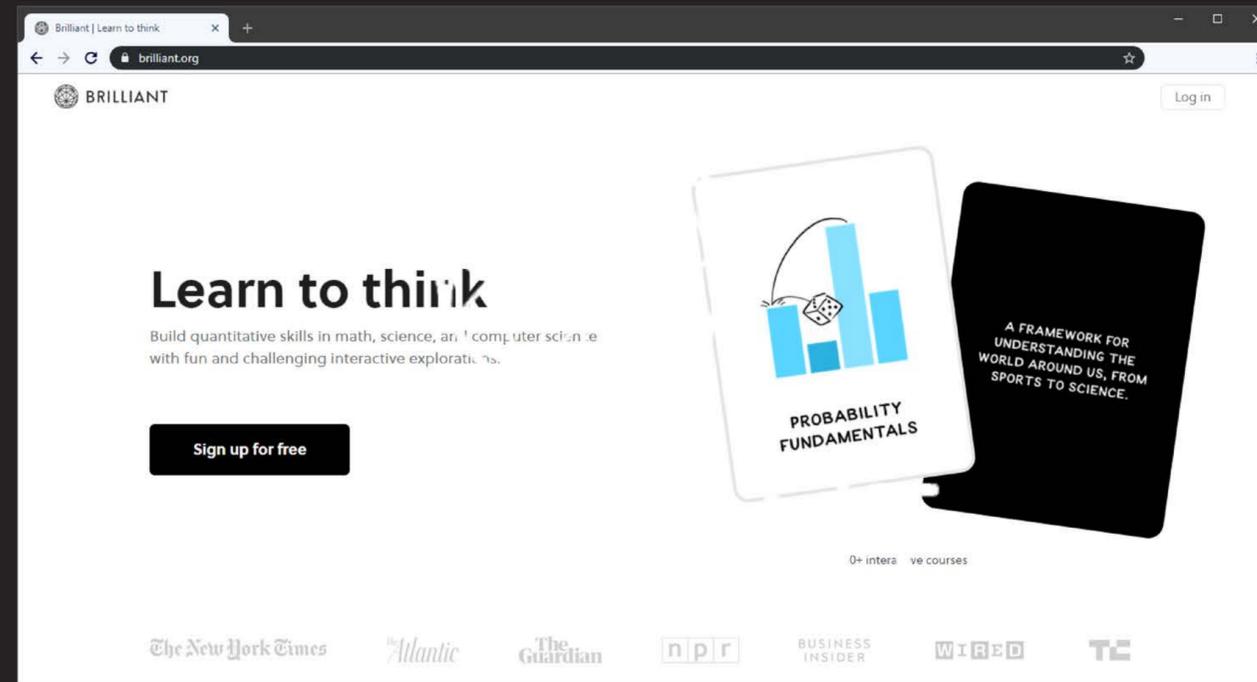
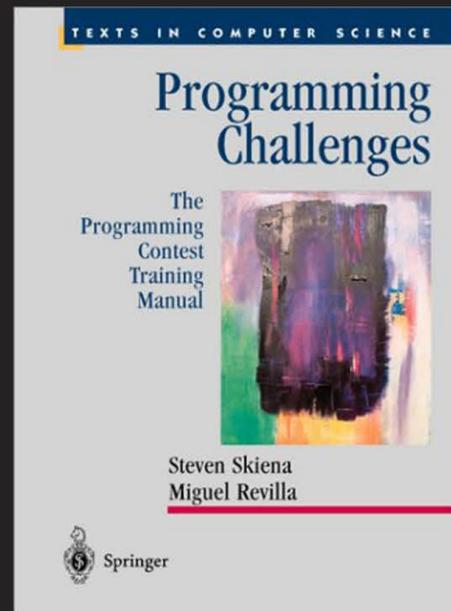


IT LOOKS TO BE COOL TOO!

# DESIGN



# OUR REFERENCES



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**“Once i get on a puzzle, i can’t get off!”**

 **Richard Feynman**  
American theoretical physicist



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