@MathigonOrg

SHALL WE PLAY A GAME?

Philipp Legner — Mathigon

MathsConf24, 3 Oct 2020

Mathigon.org

The Textbook of the Future

Interactive. Personalised. Free.

Nine Principles
For Great Mathematics Content

1. Learning Should Inspire

Mathematics should inspire and empower students, not scare or confuse them. We should show the surprising beauty and great power of mathematics – and that *everyone* can "do maths".

2. Tell a Story

Storytelling can motivate students, make the content more memorable, and justify why what you're learning is important – including real-life applications, curious puzzles, or historical background. More…

3. Exploration and Creativity

Allow students to explore, be creative, make mistakes, practise critical thinking, and discover new ideas – rather than just telling them the final results and procedures to memorise. More…

4. Mathematics is Everywhere

We are always surrounded by mathematical patterns and relationships. Students should be able to recognise these, and harness the power of maths to solve problems in everyday life.

5. Not *Useful*, but *Meaningful*

Not all topics in the curriculum have to be *useful* in everyday life (neither are Mozart or Shakespeare), but every topic should be *meaningful* – because of its applications or mathematical significance. More…

6. Mathematics is Visual

Equations are useful, but there are often much better representations of mathematical concepts and relationships. The content should be as visual and colourful as possible.

7. Intuition over Rigor or Fluency

Rigor is an important part of mathematics, and there is also a place for practising fluency – but the main goal should be to develop intuition, deep understanding, and general numeracy. More…

8. Discussion and Teamwork

Mathematics is rarely a solitary pursuit, and many real problems don't just have a single, correct answer. Discussions, collaboration and teamwork should be a key part of every curriculum.

9. Mathematics is Alive

To make mathematics more relevant, it is important to portray its history, recent discoveries, and current research – as well as the diverse groups of mathematicians and scientists doing this work.

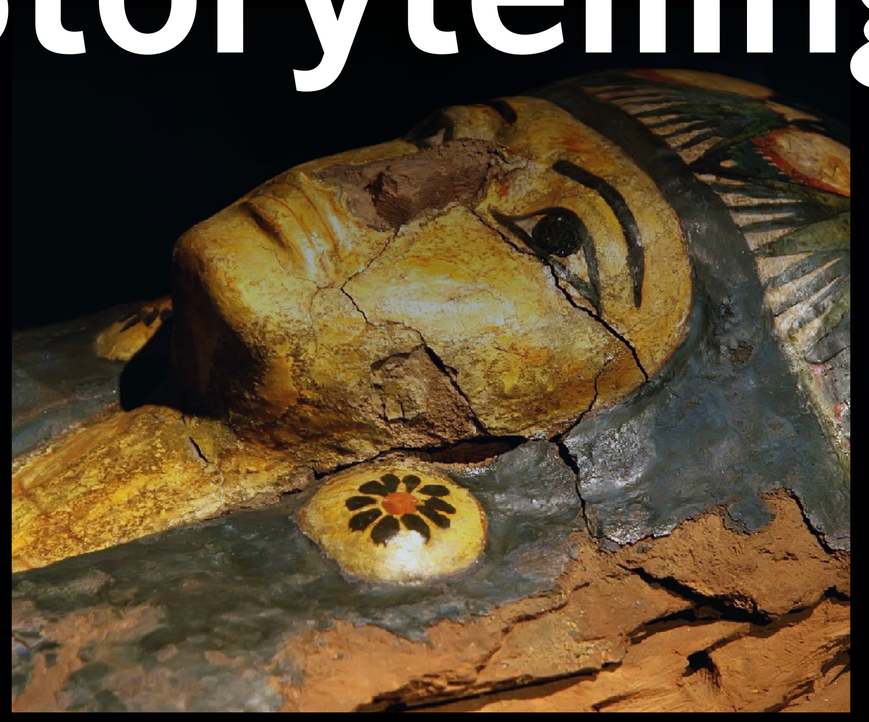
mathigon.org/principles

Creativity


Cube
Octahedron
Dodecahedron
Icosahedron
Cuboctahedron
Truncated Hexahedron
Truncated Octahedron
Intersecting Tetrahedra
Snub Cube
Icosidodecahedron
Truncated Icosidodecahedron
Snub Dodecahedron


THE TONNETZ

Storytelling



La Salle MathsConf 23

JUNE 2020 – VIRTUAL

In the school curriculum, mathematics is usually presented as "finished": students just see the final version of thousands of years filled with exploration, discovery, surprises, mistakes and misconceptions. In this workshop, we will discuss what it feels like to "discover" mathematics, and how you can give students this experience in the classroom.

Slides (7MB) | Live Activities

FETC Conference

JANUARY 2020 – MIAMI BEACH, FLORIDA

Join us at the *Future of Education Technology* conference, and hear about how Mathigon can make STEM learning more fun and interactive than ever before.

Slides (12 MB) | Conference Website

LaSalle MathsConf 21

OCTOBER 2019 – PETERBOROUGH, UK

Creativity is an essential part of mathematics: the ability to see patterns and relationships, or to come up with new models and representations. Here we discuss how you can bring creativity into the classrooms – from art, tessellations, origami and symmetry to music and problem solving.

Slides (16 MB)

MoMath Workshop

MAY 2020 – VIRTUAL

We are surrounded by networks: from roads and rail tracks to supply chains, the internet, and even social relationships. Discover how mathematics can help us understand these connections (called "graphs"), and draw some fascinating conclusions.

Live Activities

Talking Maths in Public

SEPTEMBER 2019 – CAMBRIDGE, UK

TMiP is a conference for people who work in mathematics communicating. It includes workshops by expert guests, discussions, networking sessions and projects showcases.

Slides (3 MB) | Event Website

ISTE 2019

JUNE 2019 – PHILADELPHIA

Join us at the annual Conference of the *International Society for Technology in Education* to hear about the latest advances in interactive and personalised learning resources.

Event Website

NCTM 100 Days of Learning

MAY 2020 – VIRTUAL

For many students, learning mathematics is simply about memorizing abstract rules and procedures. In this talk, we want to explore how storytelling and real-life applications can make the content more accessible and engaging, and how creativity and problem-solving can show students the great power and surprising beauty of mathematics.

Slides (22MB)

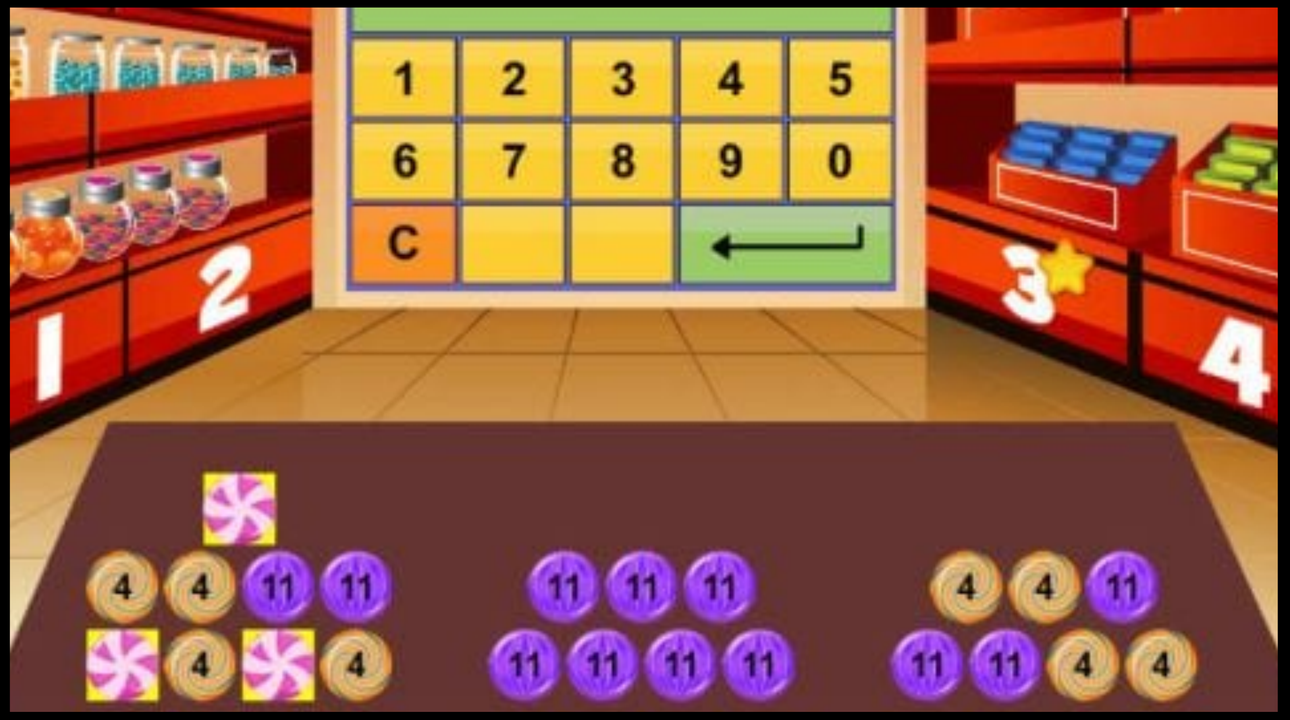
Xoogler Pitch Day

JUNE 2019 – LONDON

Mathigon founder Philipp Legner joins other Ex-Google employees to pitch startup ideas to leading investors and VC funds.

mathigon.org/about#talks

Mathematical Games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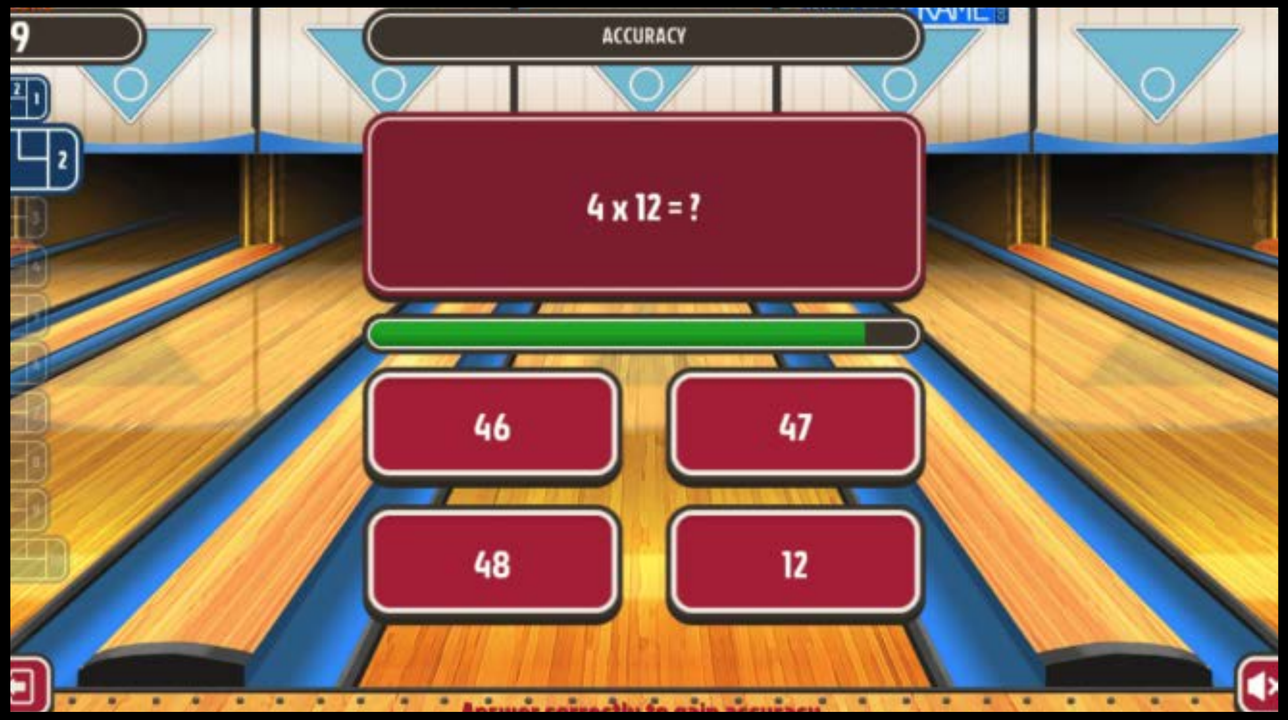
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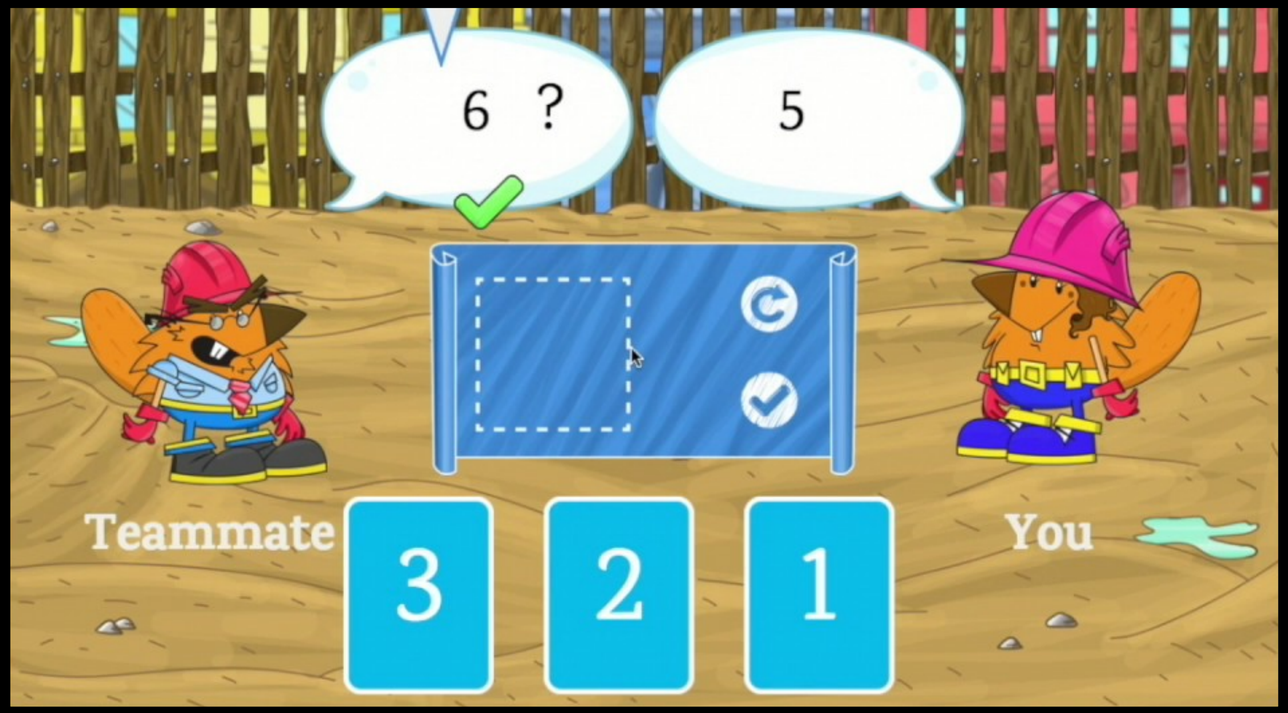
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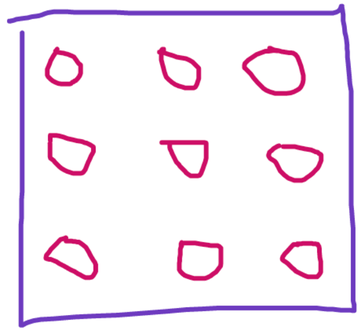
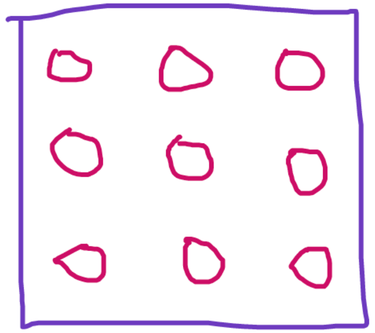
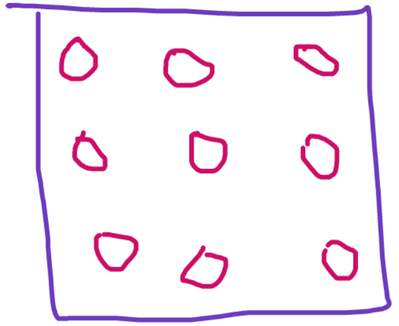
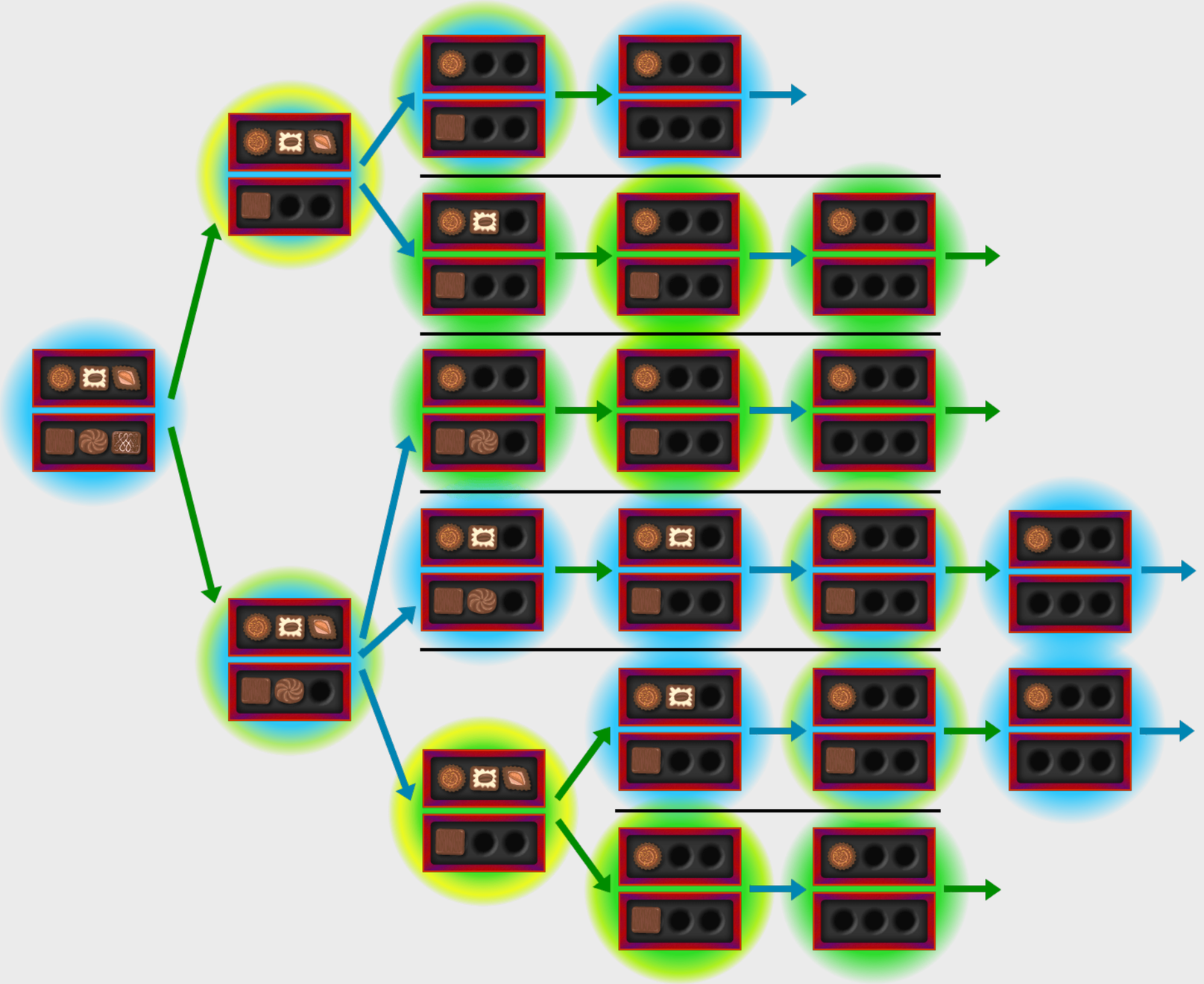
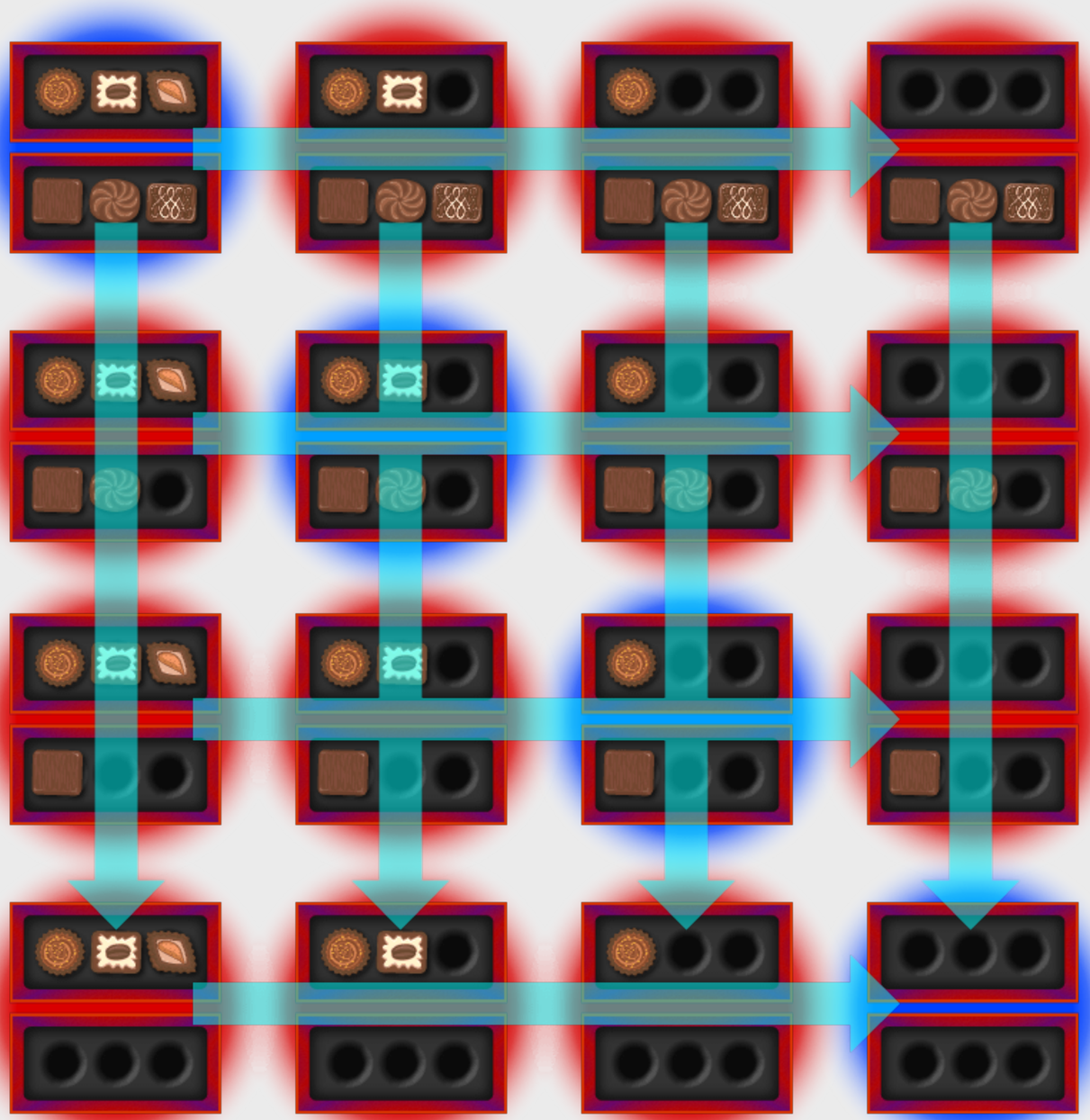






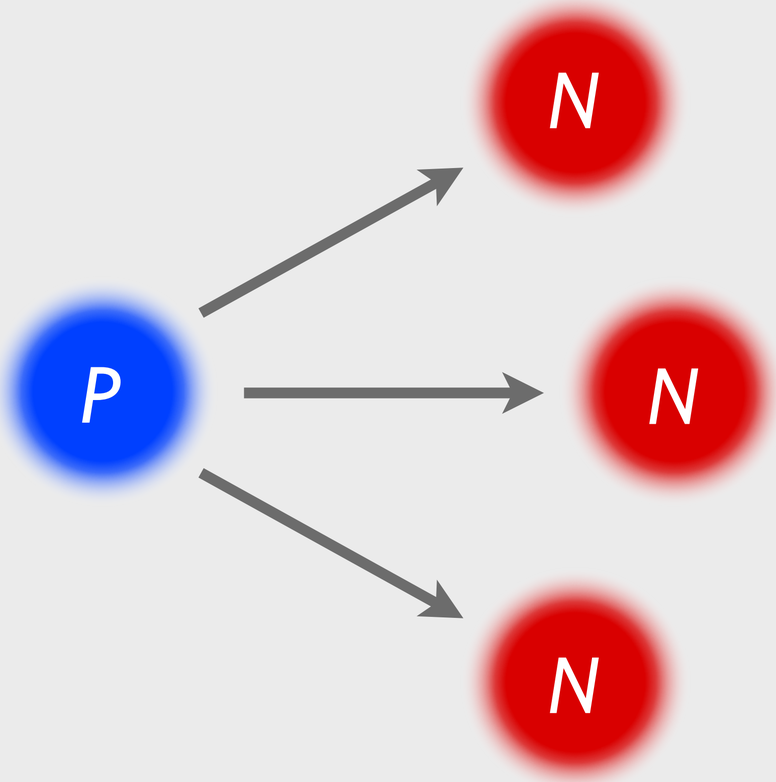



MILLENNIUM



Previous player wins

Next player wins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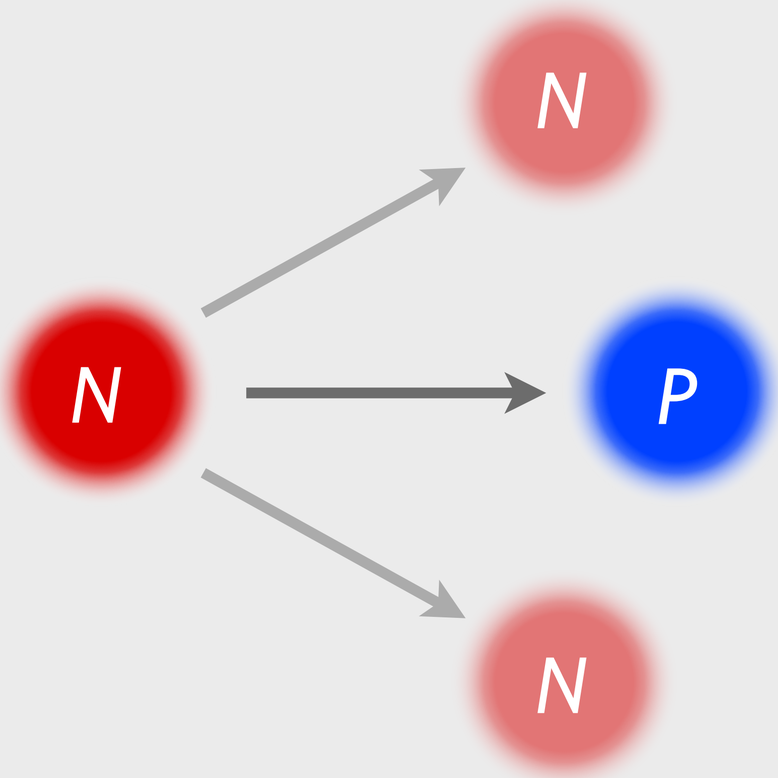
N
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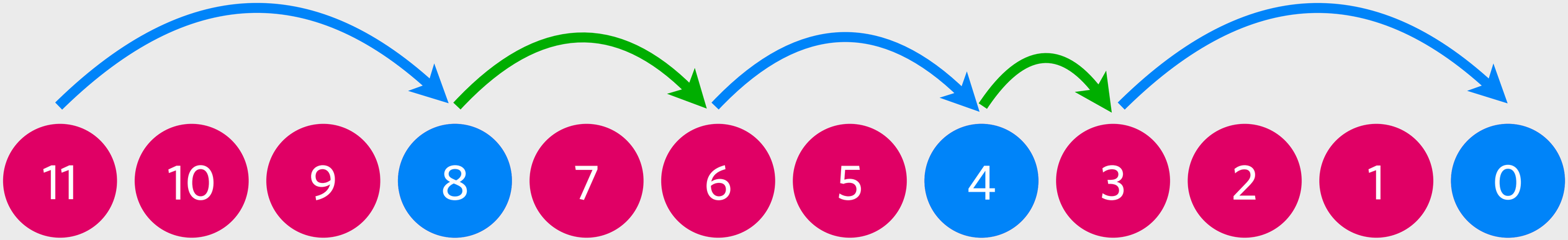
11
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6 1 1 0

7 + 1 1 1

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2 0 1 0

Different Types of Games

Deterministic
No chance or luck involved

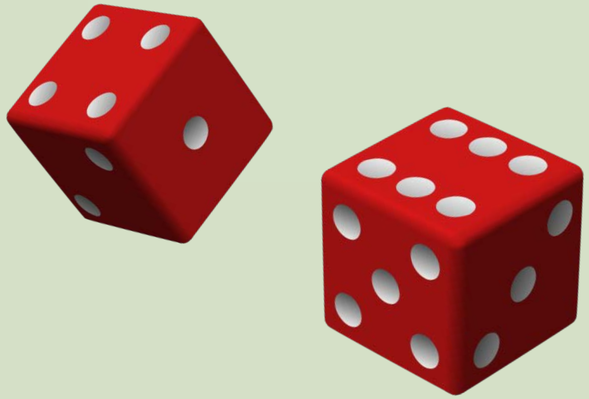
Perfect Information
No "secrets"

Zero-Sum
The gain of one player is the loss of another

Combinatorial
Sequential, deterministic, perfect information games

Impartial
Combinatorial game where both players have the same moves

2	3	4	5	6	7	8	9	10	11	12
1+1	2+1	3+1	4+1	5+1	6+1	6+2	6+3	6+4	6+5	6+6
	2+2	3+2	4+2	5+2	6+2	6+3	6+4	6+5	6+6	
		3+3	4+3	5+3	6+3	6+4	6+5	6+6		
			4+4	5+4	6+4	6+5	6+6			
				5+5	6+5	6+6				
					6+6					



math.fit/dice

MONOPOLY
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COMMUNITY CHEST
GO
JAIL
FREE PARKING
GO TO JAIL
COLLECT ₩200 SALARY AS YOU PASS
PICCADILLY
REGENT STREET
OXFORD STREET
BOND STREET
LIVERPOOL ST. STATION
PARK LANE
SUPER TAX
MAYFAIR
OLD KENT ROAD
WHITECHAPEL ROAD
KINGS CROSS STATION
THE ANGEL, ISLINGTON
EUSTON ROAD
PENTONVILLE ROAD
VINE STREET
MARLBOROUGH STREET
BOW STREET
MARYLEBONE STATION
NORTHUMBERLD AVENUE
WHITEHALL
ELECTRIC COMPANY
PALL MALL
JUST VISITING
IN JAIL
STRAND
FLEET STREET
TRAFALGAR SQUARE
FENCHURCH ST. STATION
LEICESTER SQUARE
COVENTRY STREET
WATER WORKS
INCOME TAX
PARKER

KLAUS TEUBER'S

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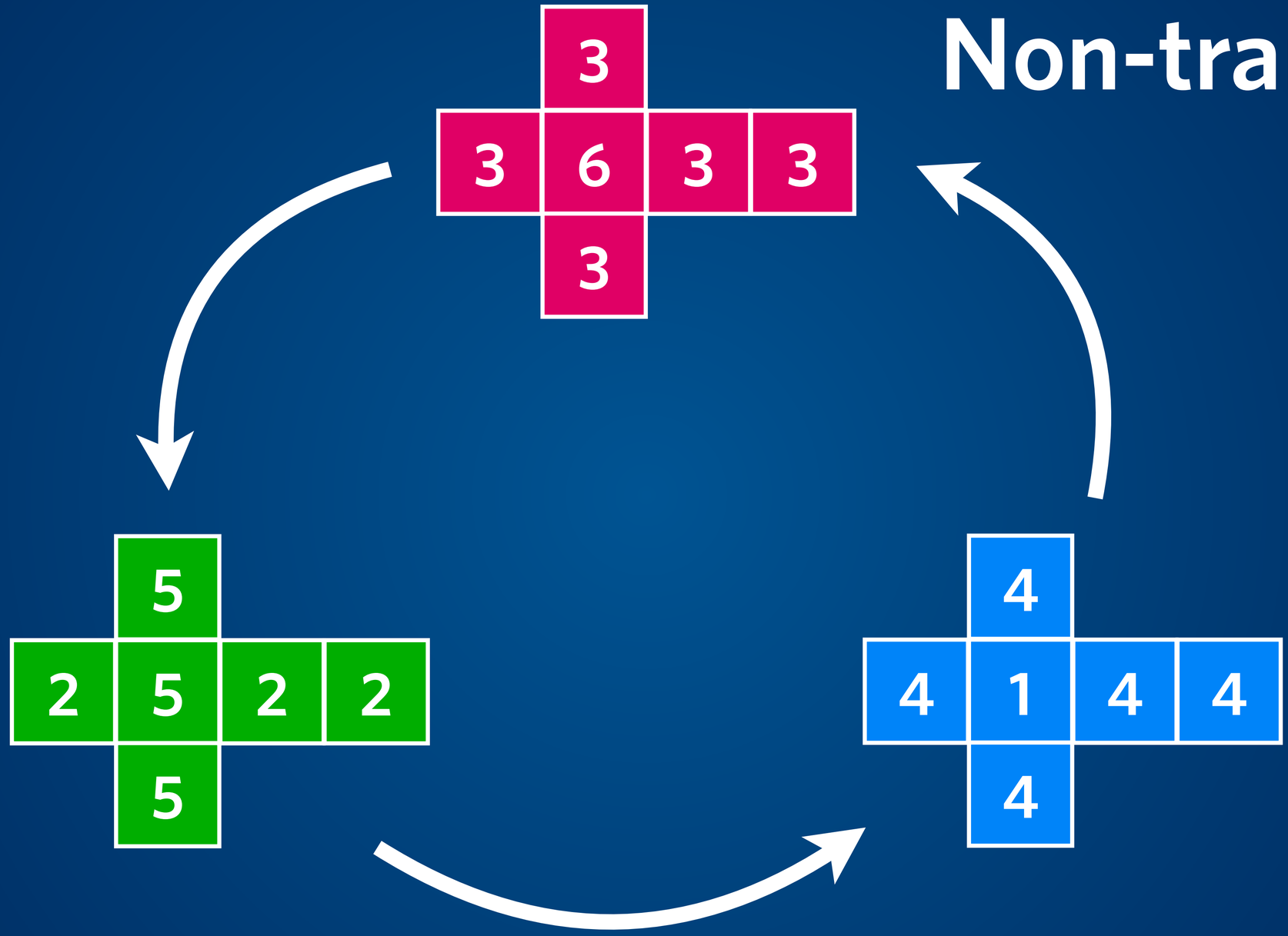
TRADE BUILD SETTLE

Platonic Solids

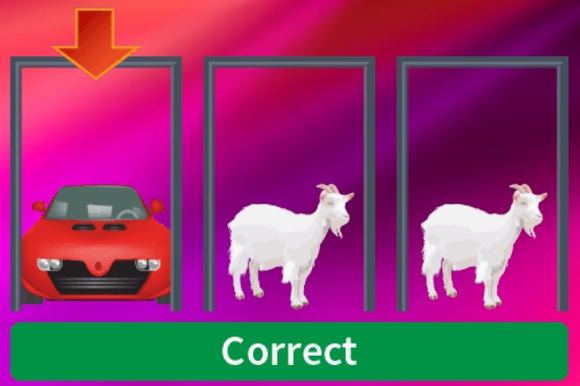
Skewed Dice

d120

Non-transitive dice



math.fit/monty-hall



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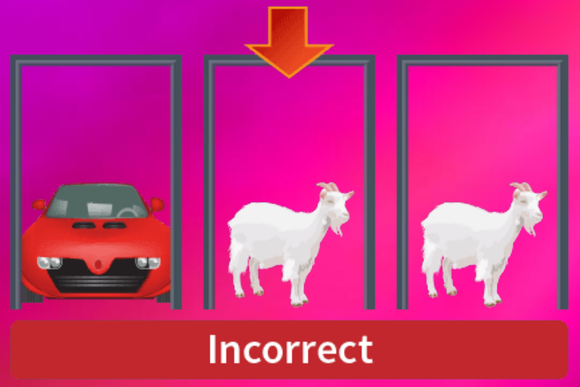

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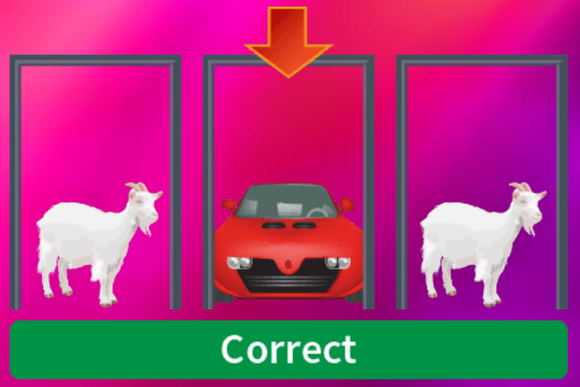

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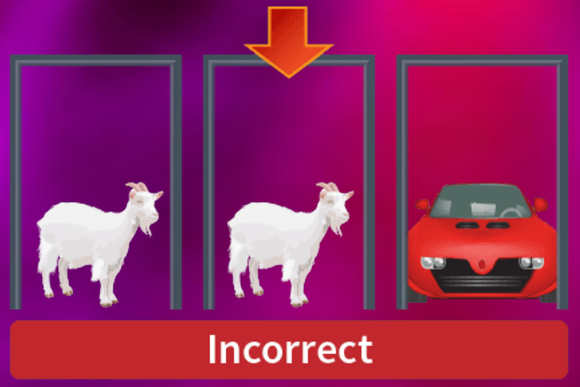

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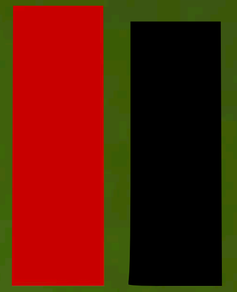

Red Black

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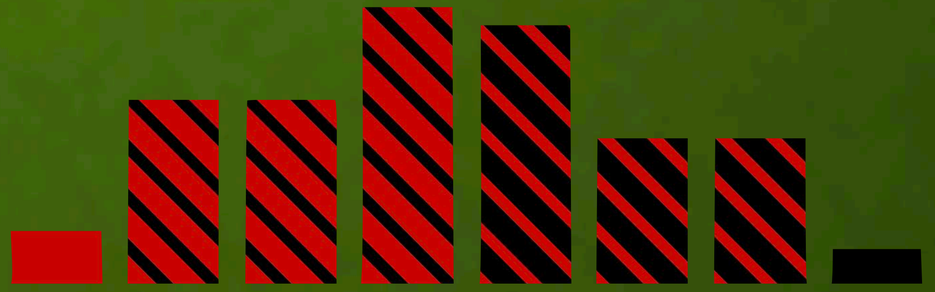

RRR RRB BRR RBR BRB BBR RBB BBB


31
29
17
33


Prisoners' Dilemma

	Stay silent	Betray
Stays silent	1 years	no jail!
Betrays	5 years	3 years

Mr Nice

Always cooperates

Mr Grudger

Cooperates until betrayed, and then betrays always

Ms Tit-for-tat

Repeat what you did last time

Dr Average

Repeat the average of your previous decisions

Mrs Mean

Always betrays

Miss Random

Betrays randomly, with a specific probability

POPULATION | PAYOFFS | RULES

Start off with this distribution of players:

COPYCAT	3	CHEATER	3
COOPERATOR	3	GRUDGER	3
DETECTIVE	3	COPYKITTEN	3
SIMPLETON	3	RANDOM	4

NOTE: Sandbox Mode is totally optional. Feel free to skip it, or play around! Once you're done, let's recap...

what we learnt today! →


D3D11 35 FPS
GPU 72 °C 100 %
CPU 45 °C 21 %
RAM 6713 MB
Ping: 39
10.29 KB/s
2.41 KB/s
35 Packets/s
0% Packet Loss
217
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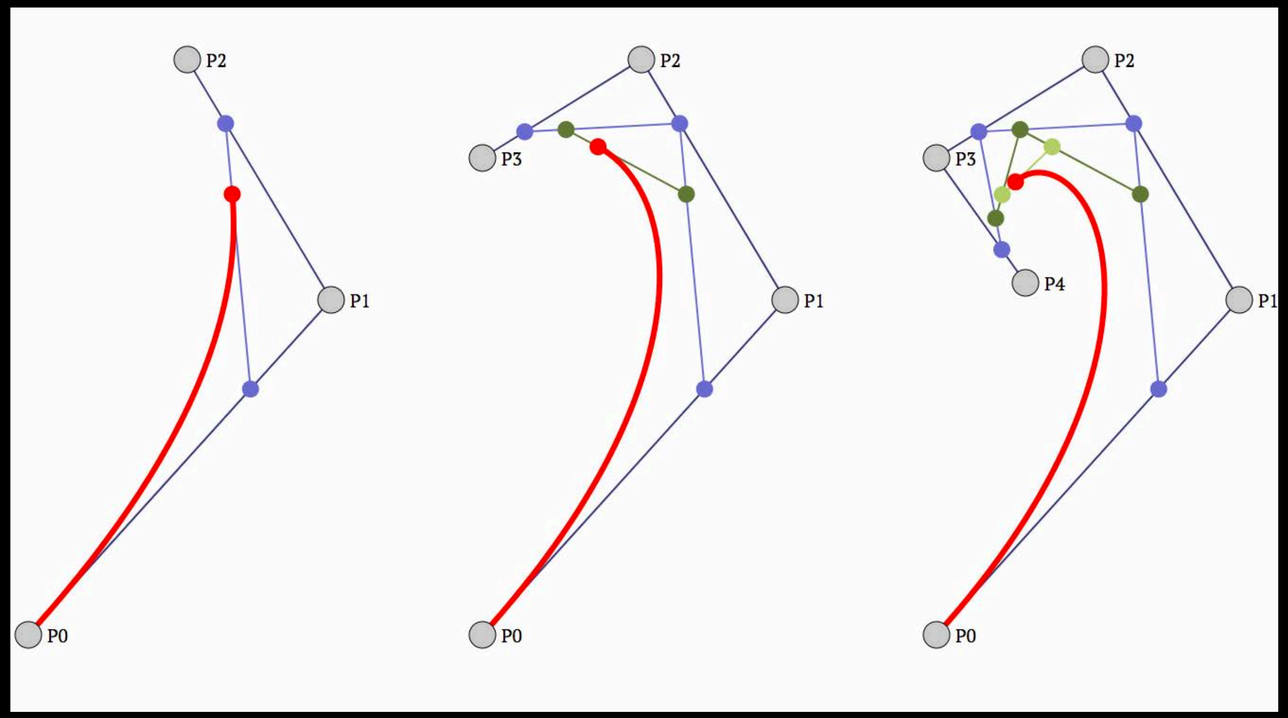
FORTNITE


ANGRY BIRDS


MINECRAFT


kalipa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P0


#3
OBJECTIVE 6


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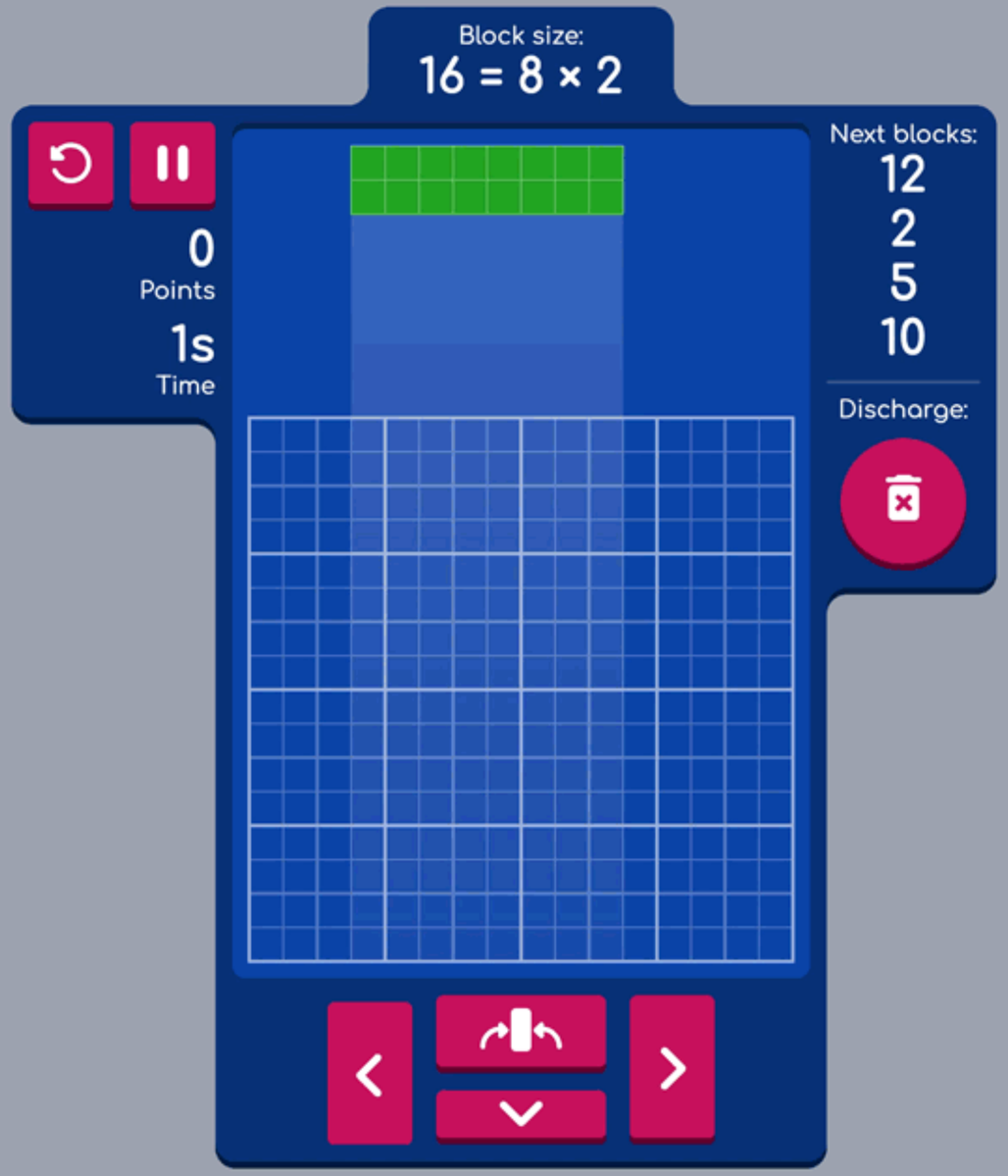

mathigon.org/factris

Thanks for listening!

philipp@mathigon.org

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