

# MateMorfóziS tudományos ismeretterjesztő előadássorozat

Gergő Pintér  
MTA Rényi Institute

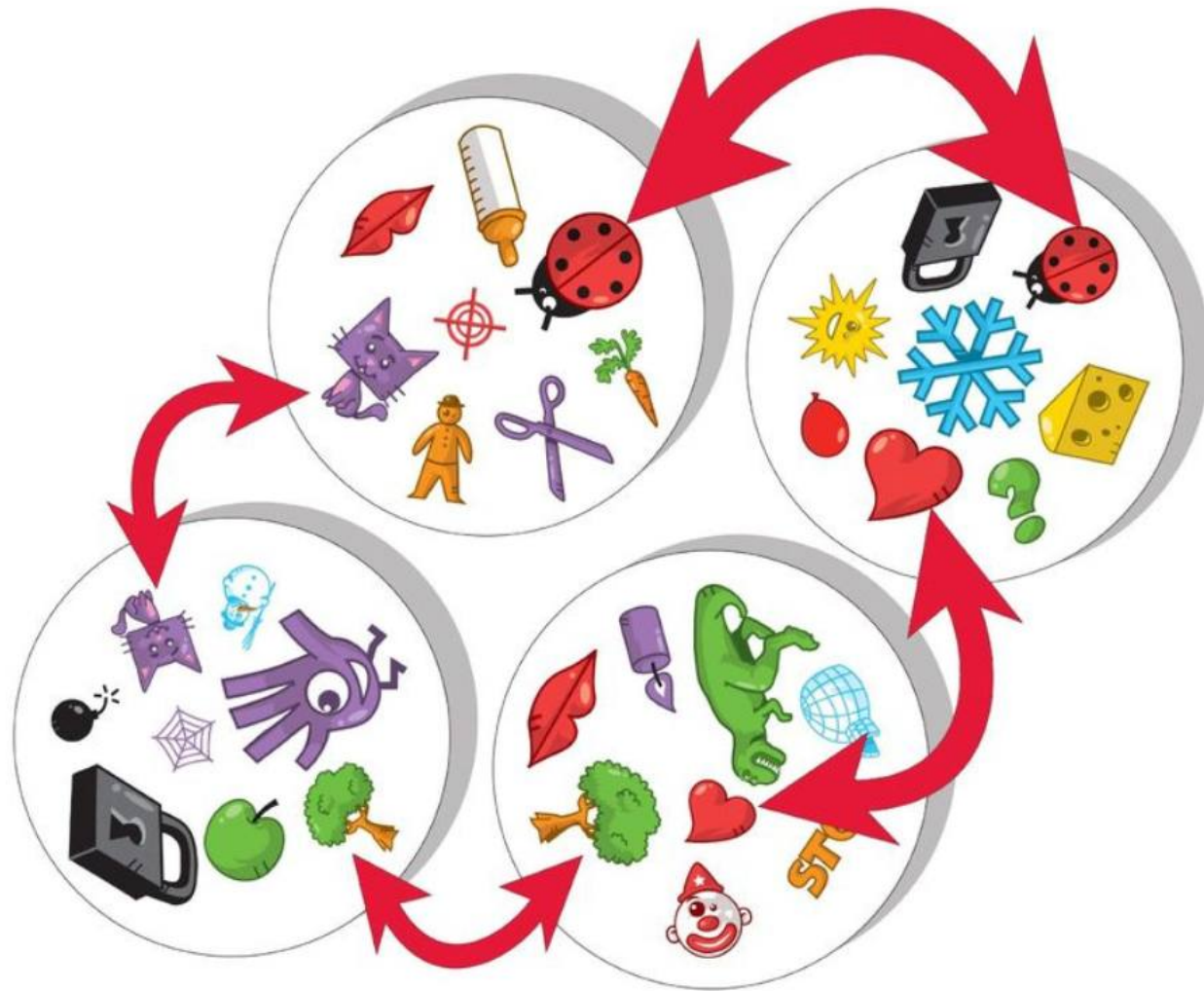
STEAM Conference in Linz,  
19-20 April 2018.

# MateMorfózis - MathMorphosis

- MateMorfózis is a lecture series about mathematical topics in Hungarian festivals and pubs, for non-mathematical audience.
- Mathematicial "poetry" evenings
- Slides: [matemorfozis.hu](http://matemorfozis.hu)

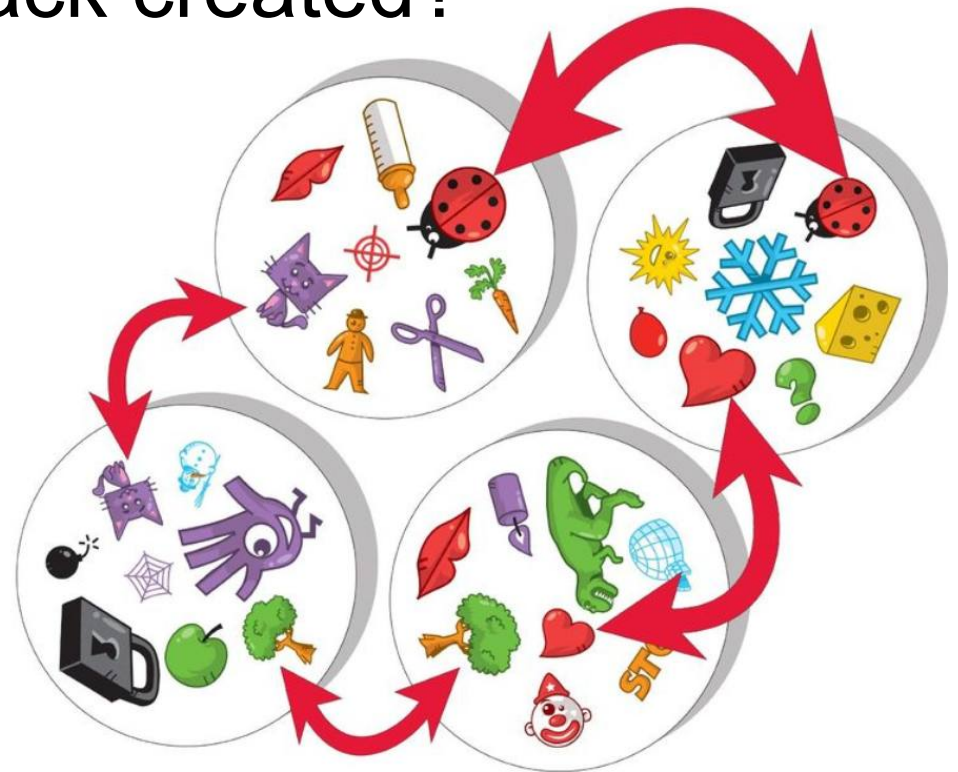
**MateMorfóziS** tudományos  
ismeretterjesztő  
előadássorozat

# Dobble



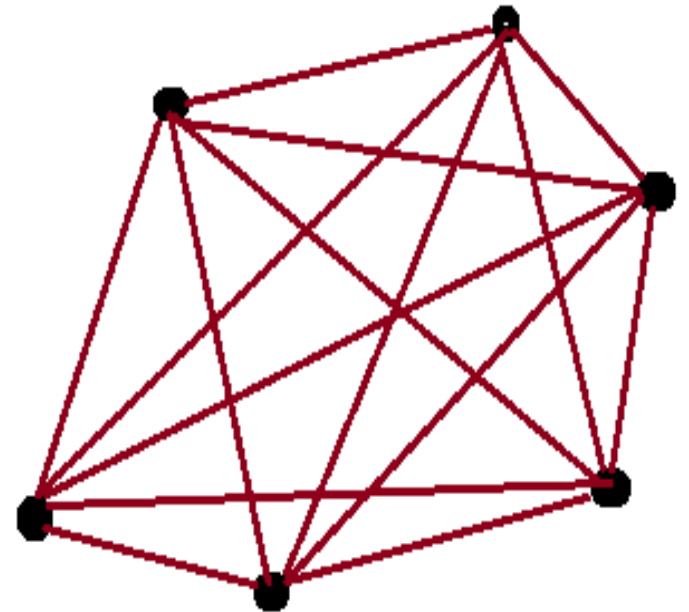
# Dobble

- 8 figures on each card
- Exactly 1 common figure on each pair of cards
- How can be such a pack created?



# A usual idea: complete graph

- Cards: vertices
- Figures: edges
- Too many figures! To create 50 cards:  
49 figures/card,  
 $50 \cdot 49 / 2$  figures.
- Every figure plays only once!



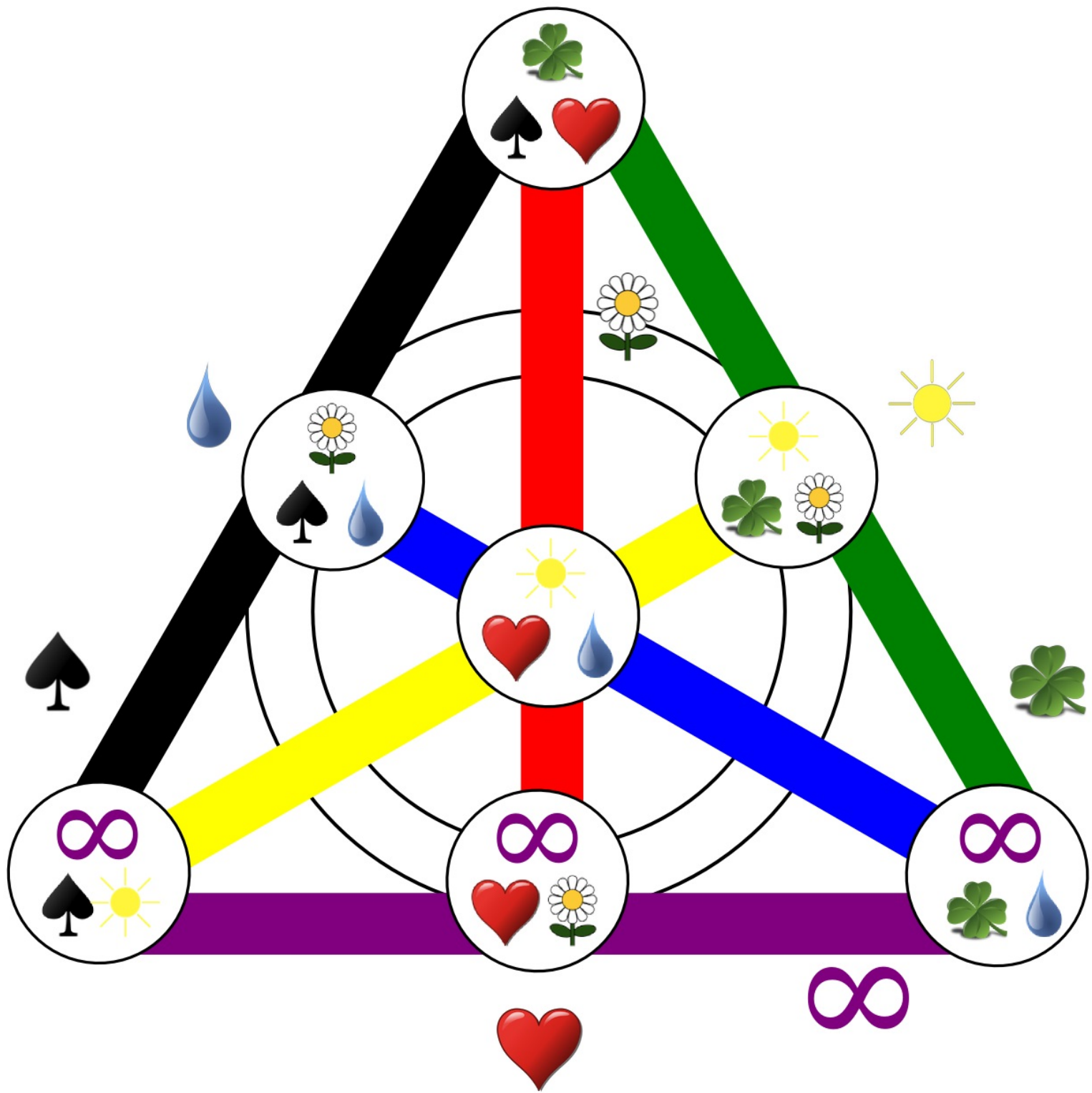
# Dobble

- 55 cards
- 57 figures
- 8 figures/card

**2 cards are missing!**

# Exercise

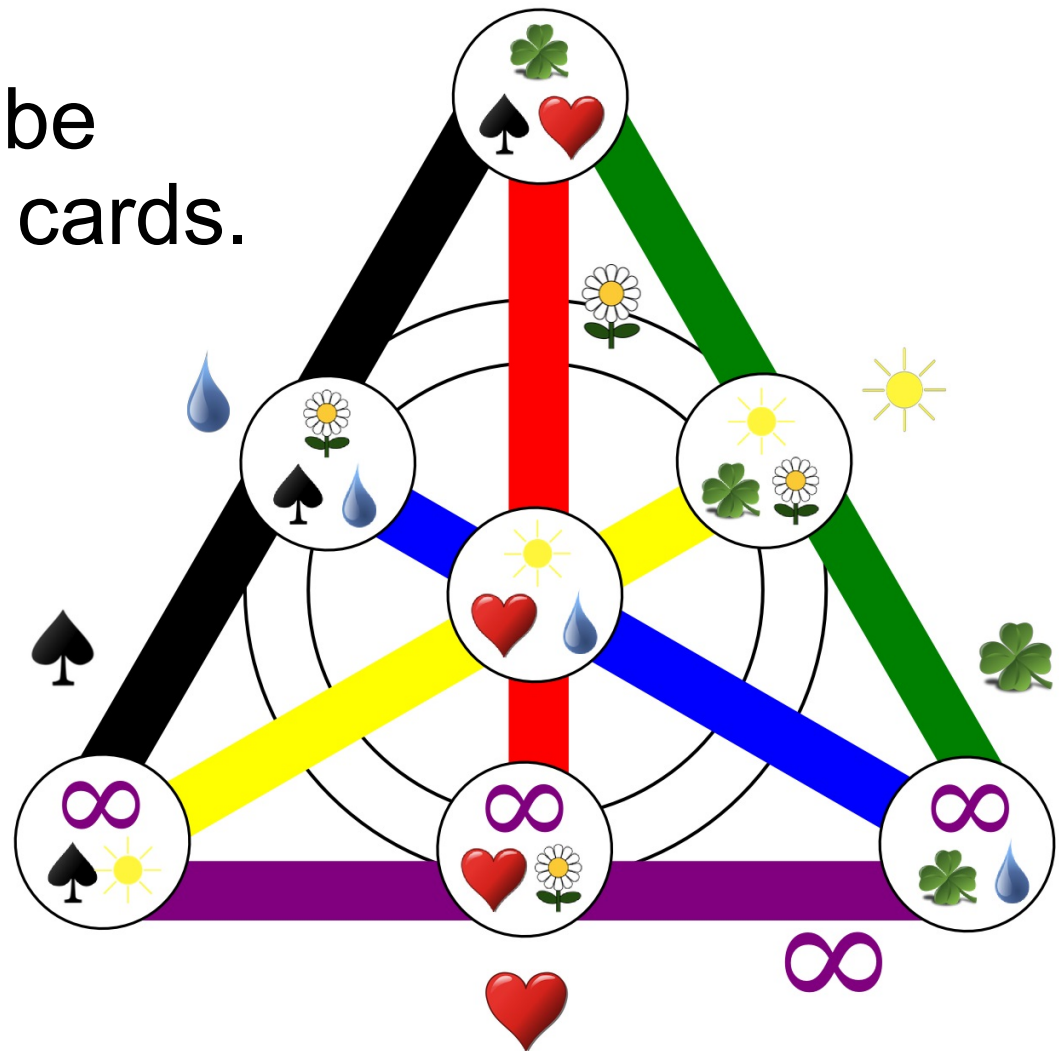
- Create a pack using 7 figures, 3 figures/card.
- How many cards can be created?





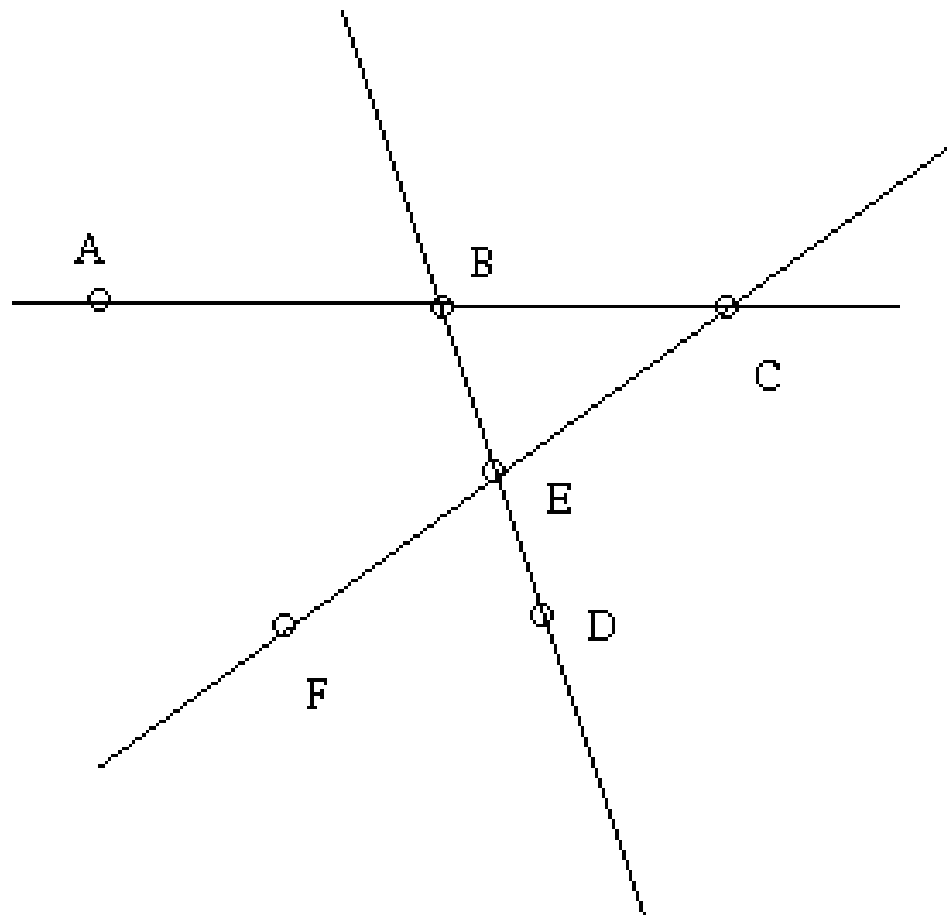
# Have we found all the cards?

- Exactly one common card for every pair of figures!
- The pack cannot be extended by new cards.



# A far-reaching association: points and lines on the plane!

- 2 points determine 1 line
- 2 lines determine 1 point

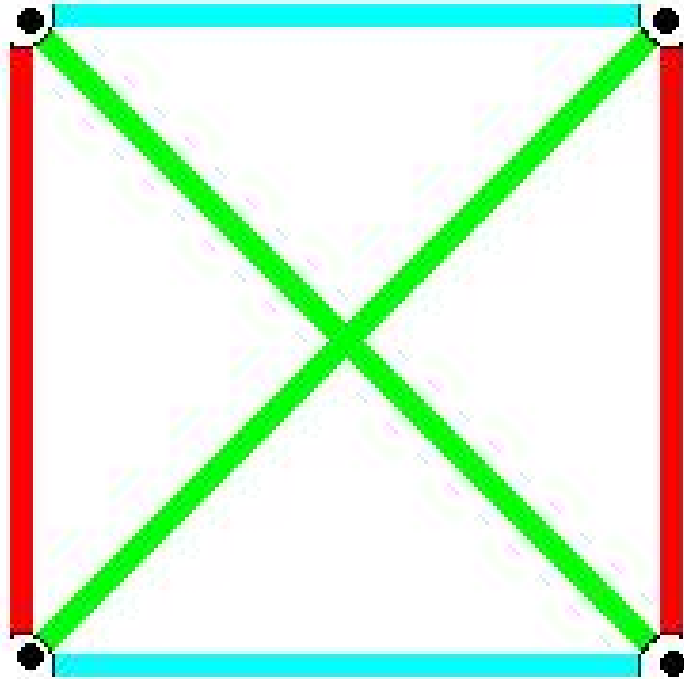


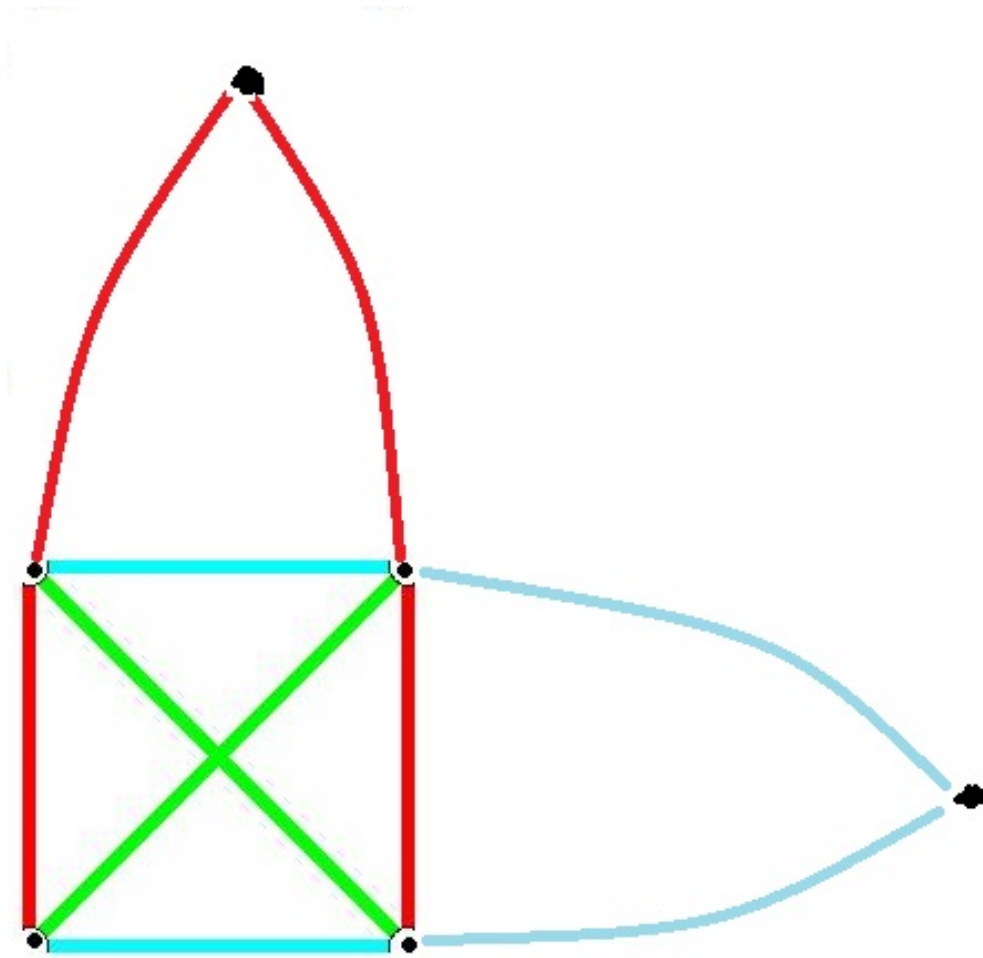
# Problems

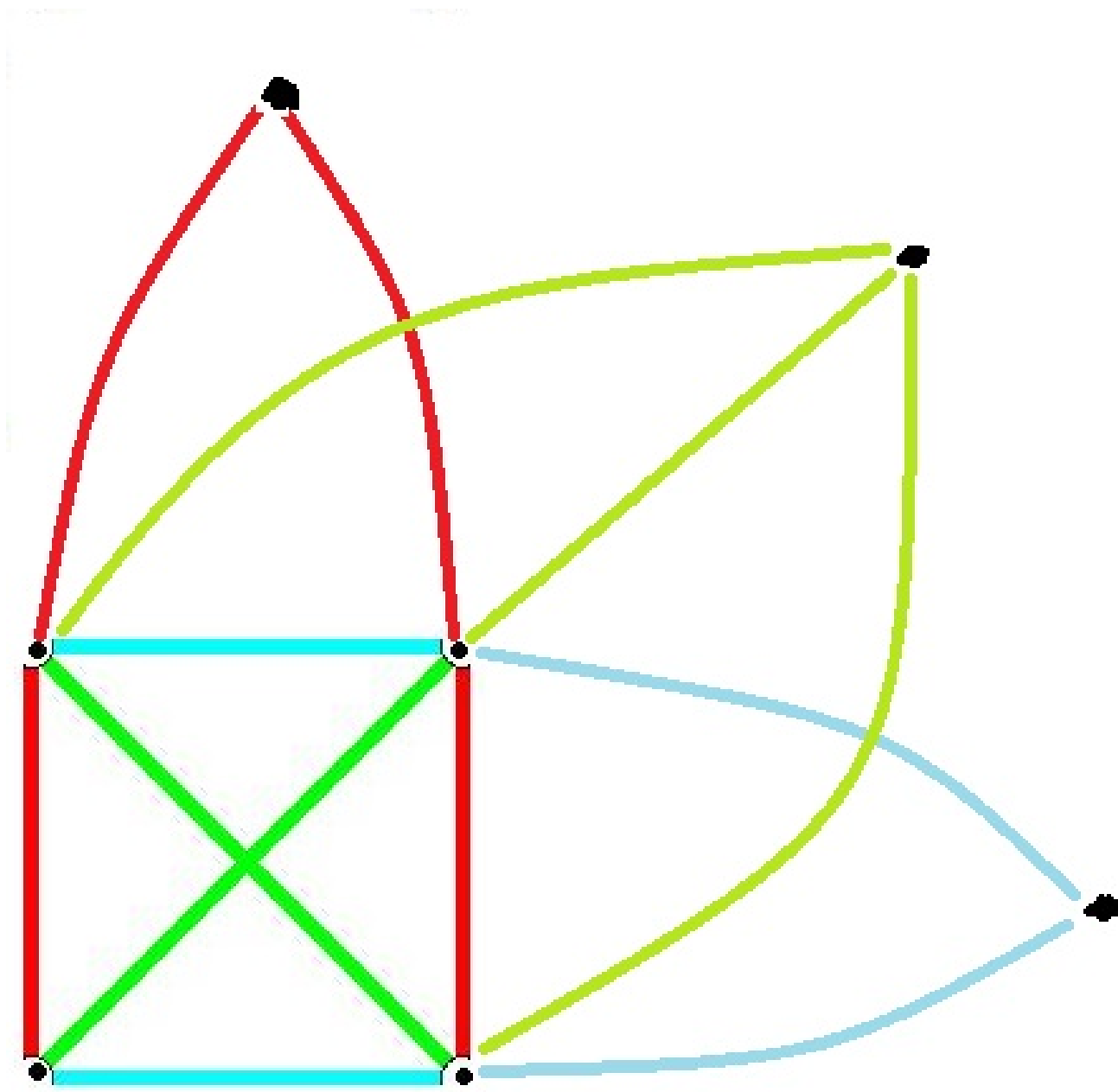
- Parallel lines do not have any common point.
- Infinitely many points and lines

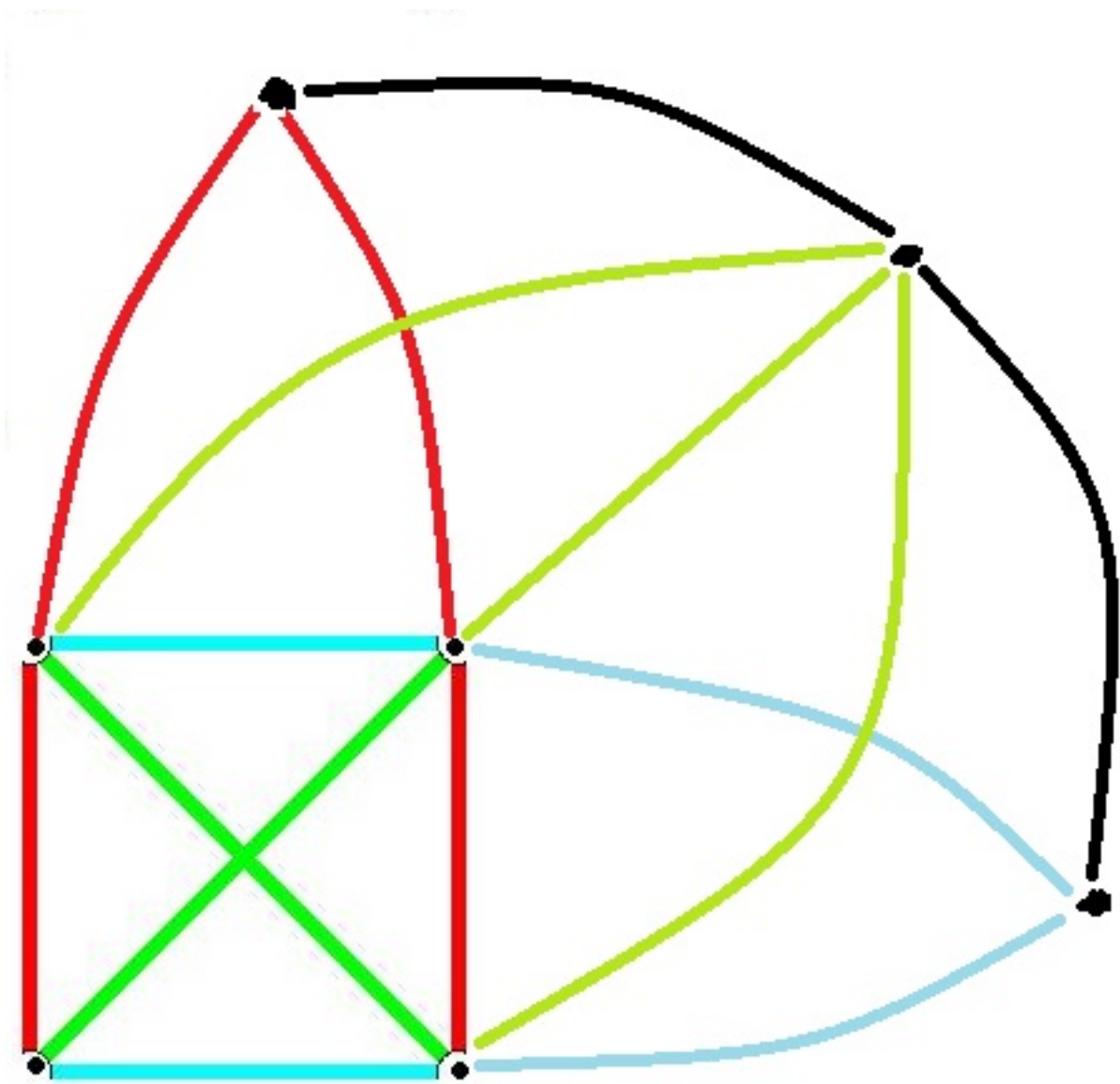
# Solution

- Projective plane: the plane extended with points at infinity in all directions
- In fact, Dobbles is a finite projective plane!

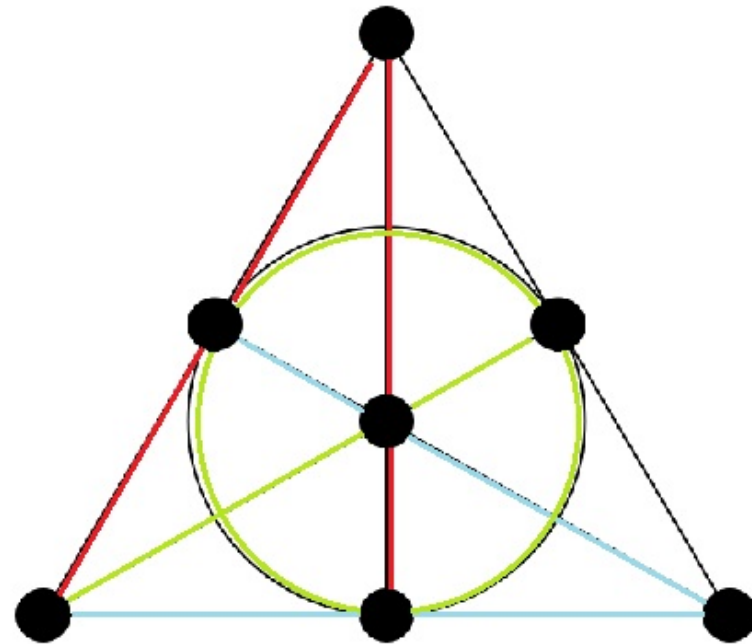
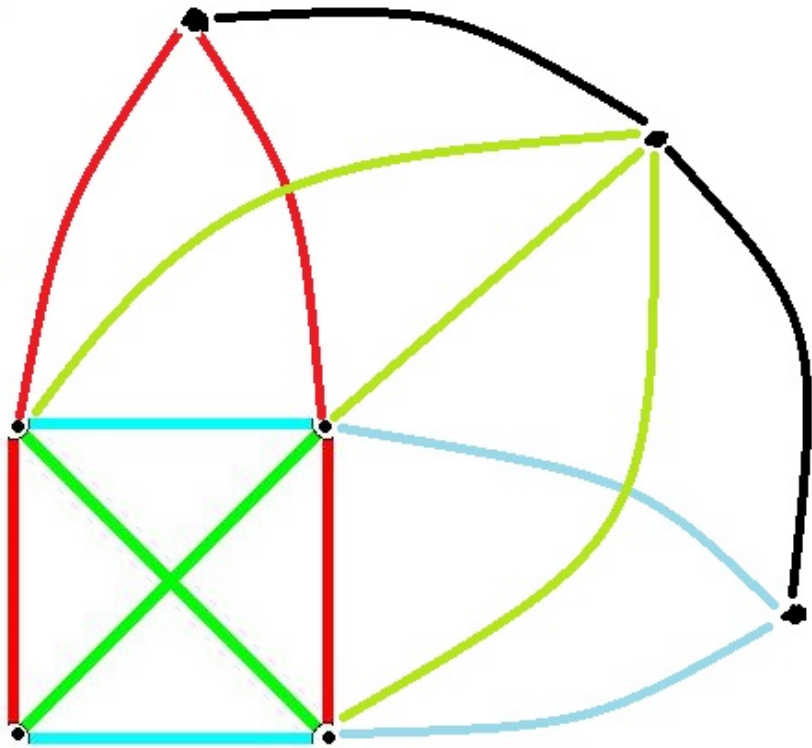






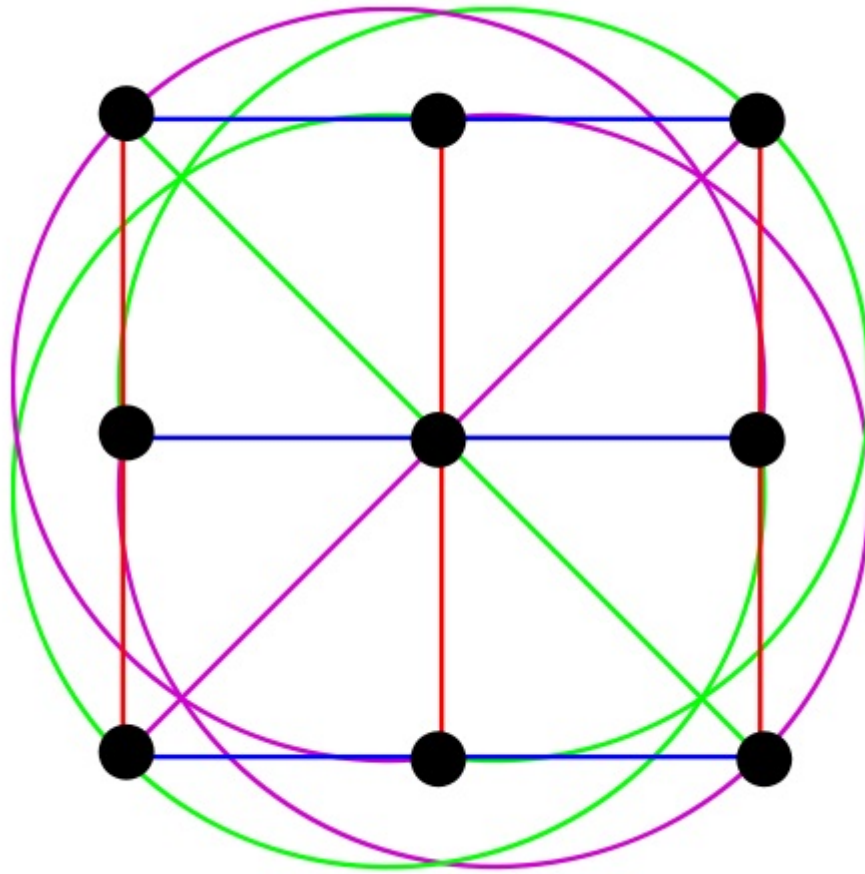


# Fano plane: projective plane of order 2

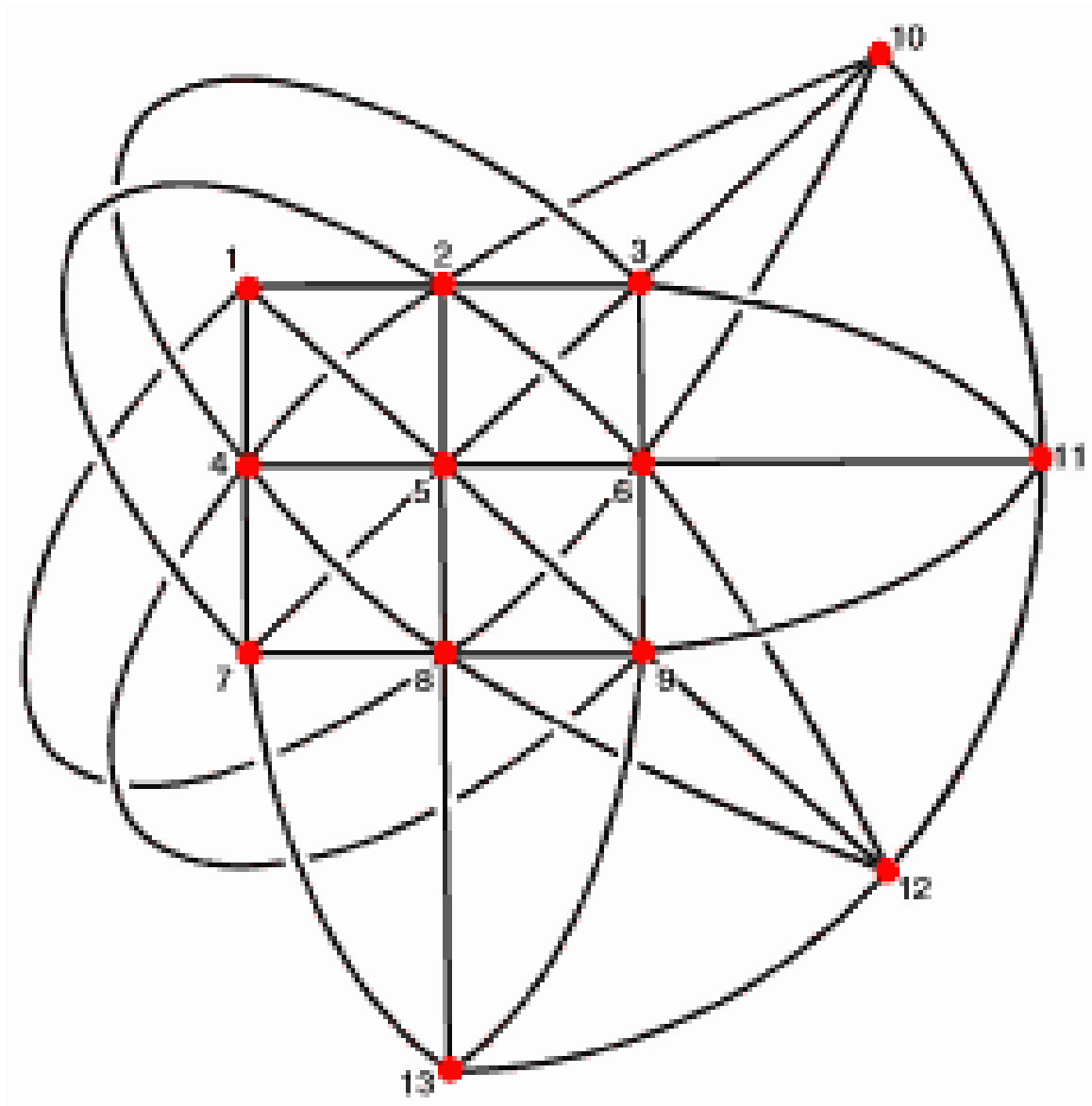




# Order 3



# Order 3



# Puzzle

- Build the 7-order projective plane from the Dobble cards!
- A very symmetric object, which cannot be visualized perfectly in our space!



# Algebra, number theory

- Cyclic rings: Monday, Tuesday, Wednesday, ...
- $7=0$
- $-2/3=4$ , cause  $4*3=12=14-2=-2$
- Which cards are missing?

Thank you for your attention!

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előadássorozat

E-mail: [pinter.gergo@renyi.mta.hu](mailto:pinter.gergo@renyi.mta.hu)

[matemorfozis@gmail.com](mailto:matemorfozis@gmail.com)

Web page: [matemorfozis.hu](http://matemorfozis.hu)

(only in Hungarian yet)