

Zoknik

Bogya Norbert

Szegedi Tudományegyetem, Bolyai Intézet

POLYGON Pályázat

2018. április 6.

SET

Geometria

Újra SET?

ProSET

Zoknik

SIN-es zoknik



COS-os zoknik



Tudományos mémek

SET

Geometria

Újra SET?

ProSET

Zoknik



SET

Geometria

Újra SET?

ProSET

Zoknik

SET

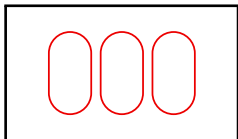
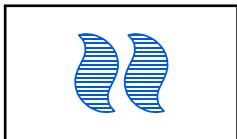
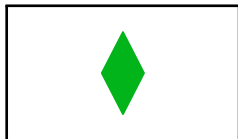
81 különböző kártya:

Jellemző	Változatok		
Szám	1	2	3
Szín	piros	zöld	kék
Minta	üres	tele	csíkos
Alak	ellipszis	rombusz	hullám

Három lap együtt **SET**-et alkot, ha a fenti jellemzők mindegyike vagy **teljesen egyforma**, vagy **teljesen különböző**.

Példák

SET:



SET

Geometria

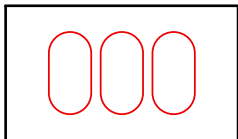
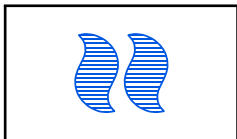
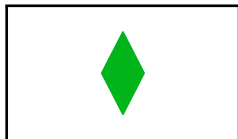
Újra SET?

ProSET

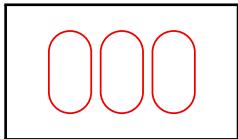
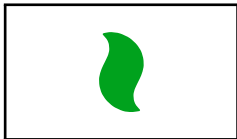
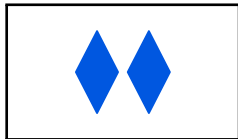
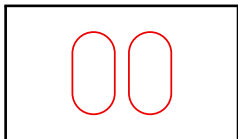
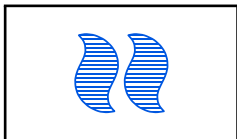
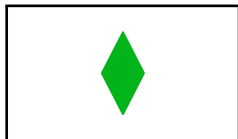
Zoknik

Példák

SET:



Nem SET:



#Játék következik!

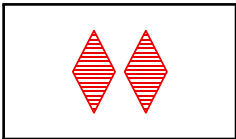
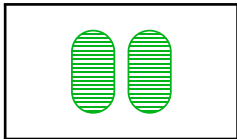
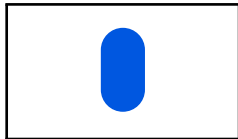
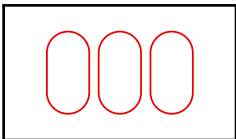
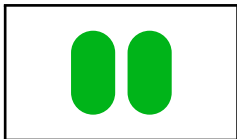
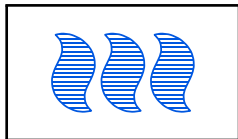
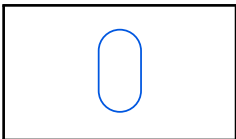
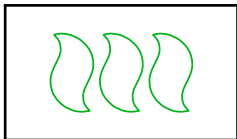
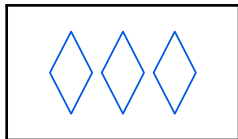
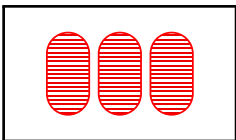
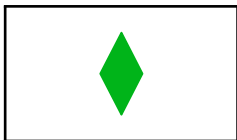
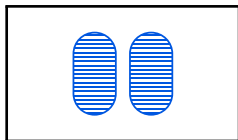
SET

Geometria

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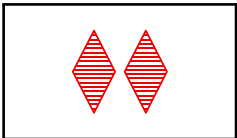
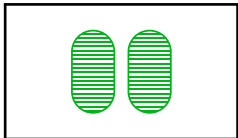
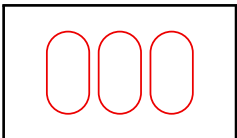
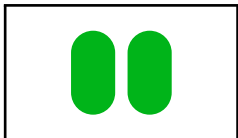
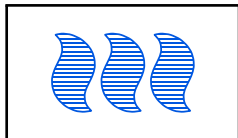
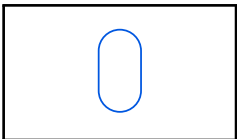
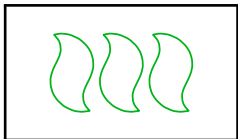
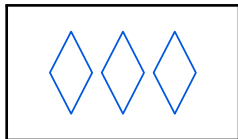
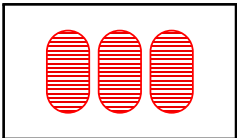
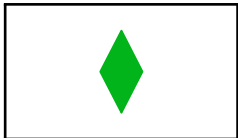
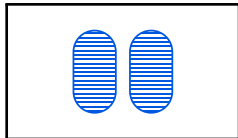
SET

Geometria

Újra SET?

ProSET

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[2, 4, 12], [2, 5, 11], [3, 6, 8], [4, 5, 9], [5, 10, 12], [9, 10, 11]

Hány különböző SET van az egész pakliban?

SET

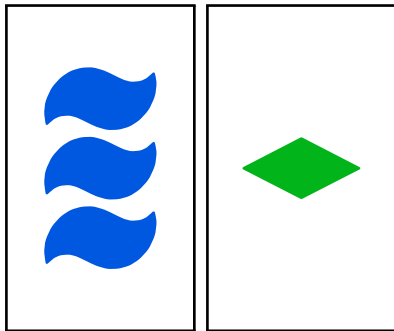
Geometria

Újra SET?

ProSET

Zoknik

Hány különböző SET van az egész pakliban?



SET

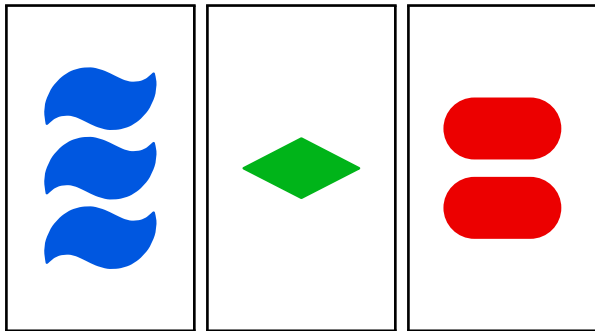
Geometria

Újra SET?

ProSET

Zoknik

Hány különböző SET van az egész pakliban?



SET

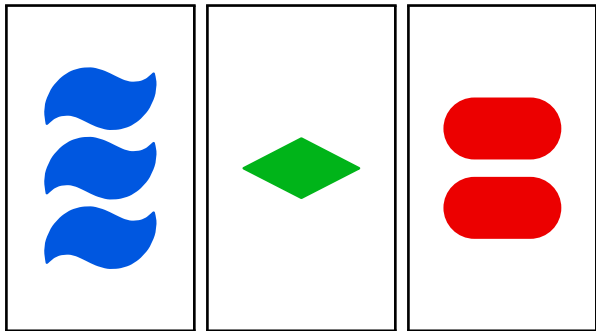
Geometria

Újra SET?

ProSET

Zoknik

Hány különböző SET van az egész pakliban?



$$\frac{81 \times 80}{3!} = 1080$$

#Játék következik!

SET

Geometria

Újra SET?

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Zoknik

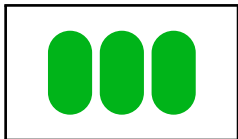
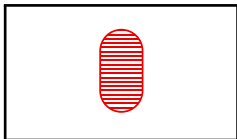
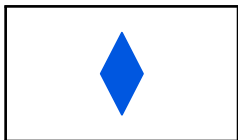
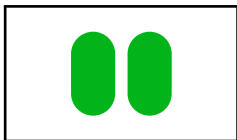
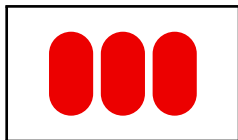
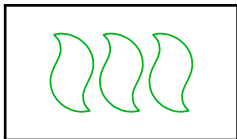
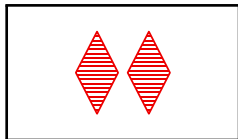
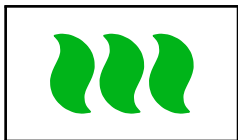
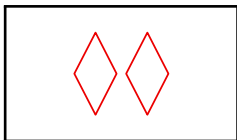
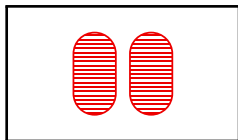
SET

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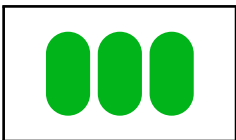
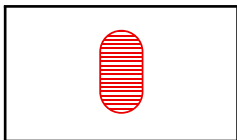
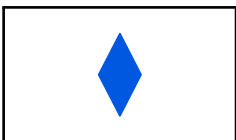
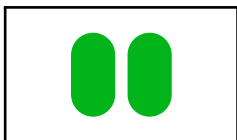
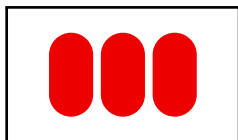
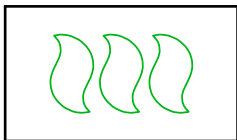
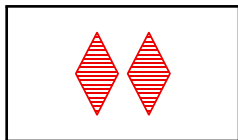
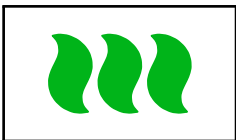
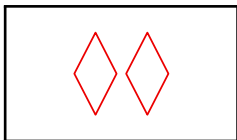
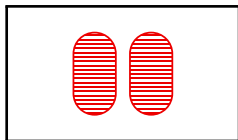
SET

Geometria

Újra SET?

ProSET

Zoknik



[1, 5, 9]

Mennyi a valószínűsége, hogy n kártyában nincs
SET?

SET

Geometria

Újra SET?

ProSET

Zoknik

Mennyi a valószínűsége, hogy n kártyában nincs
SET?

$$n = 3: \quad 1 - \frac{1080}{\binom{81}{3}} = 1 - \frac{1080}{85320} = \frac{78}{79} \approx 0.987341$$

(Triviális)

SET

Geometria

Újra SET?

ProSET

Zoknik

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 1 - \frac{1080}{\binom{81}{3}} = 1 - \frac{1080}{85320} = \frac{78}{79} \approx 0.987341$$

(Triviális)

$$n = 4: \quad 1 - \frac{1080 \cdot 78}{\binom{81}{4}} = 1 - \frac{84240}{1663740} = \frac{75}{79} \approx 0.949367$$

(Pár perc)

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 1 - \frac{1080}{\binom{81}{3}} = 1 - \frac{1080}{85320} = \frac{78}{79} \approx 0.987341$$

(Triviális)

$$n = 4: \quad 1 - \frac{1080 \cdot 78}{\binom{81}{4}} = 1 - \frac{84240}{1663740} = \frac{75}{79} \approx 0.949367$$

(Pár perc)

$$n = 5: \quad 1 - \frac{3180060}{\binom{81}{5}} = \frac{5328}{6083} \approx 0.875884$$

(Körmendi Kristóf, pár óra + számítógép)

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 0.987341$$

$$n = 4: \quad 0.949367$$

$$n = 5: \quad 0.875884$$

$$n = 10: \quad 0.16945041362$$

$$n = 15:$$

SET

Geometria

Újra SET?

ProSET

Zoknik

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 0.987341$$

$$n = 4: \quad 0.949367$$

$$n = 5: \quad 0.875884$$

$$n = 10: \quad 0.16945041362$$

$$n = 15: \quad 0.00036468506$$

$$n = 20:$$

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 0.987341$$

$$n = 4: \quad 0.949367$$

$$n = 5: \quad 0.875884$$

$$n = 10: \quad 0.16945041362$$

$$n = 15: \quad 0.00036468506$$

$$n = 20: \quad 0.0000000000014$$

Mennyi a valószínűsége, hogy n kártyában nincs SET?

$$n = 3: \quad 0.987341$$

$$n = 4: \quad 0.949367$$

$$n = 5: \quad 0.875884$$

$$n = 10: \quad 0.16945041362$$

$$n = 15: \quad 0.00036468506$$

$$n = 20: \quad 0.0000000000014$$

$$n = 21: \quad 0$$

Alexandriai Eukleidész

i. e. 300.

Elemek



Alapfogalmak: pont, egyenes, illeszkedés.

- ▶ Bármely két különböző pontra pontosan egy egyenes illeszkedik.
- ▶ Minden egyenesre legalább két különböző pont illeszkedik.
- ▶ Létezik legalább három pont, melyek nem illeszkednek egy egyenesre.
- ▶ Párhuzamossági axióma

Véges affin geometria

①

④

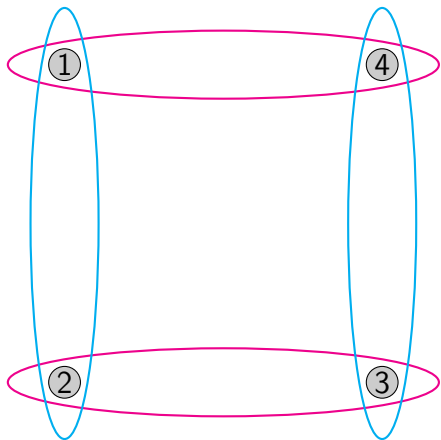
②

③

Véges affin geometria



Véges affin geometria



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Bogya Norbert

SET

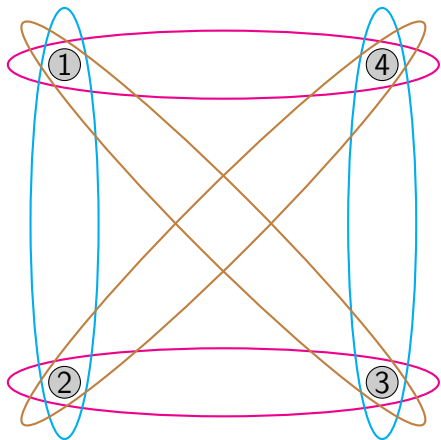
Geometria

Újra SET?

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Véges affin geometria



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Geometria

Újra SET?

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Véges affin geometria

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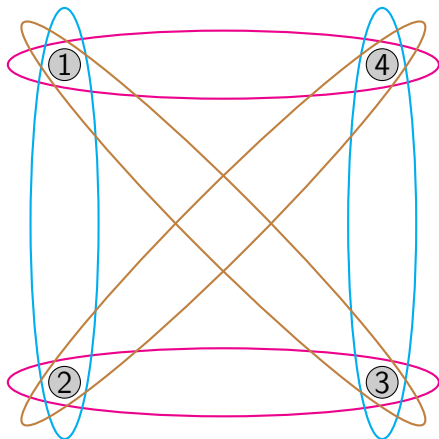
SET

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Újra SET?

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Egyenesek:

$\{1, 3\}$, $\{2, 4\}$, $\{1, 2\}$, $\{3, 4\}$, $\{1, 4\}$, $\{2, 3\}$

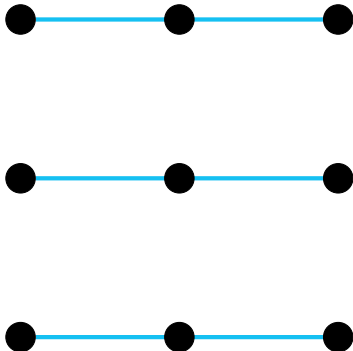
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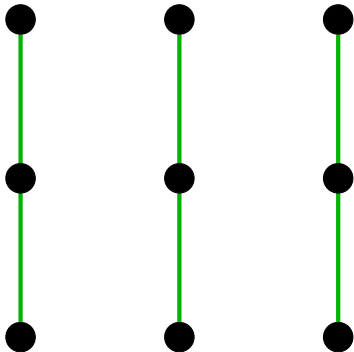
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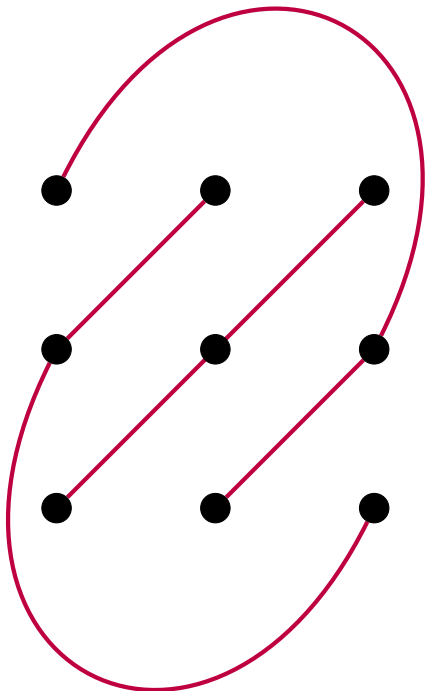
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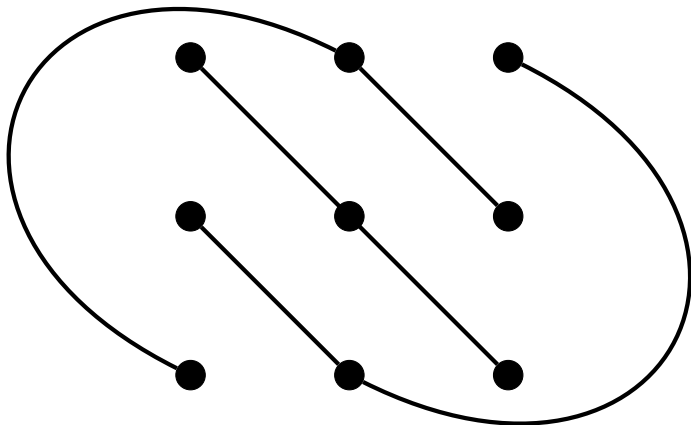
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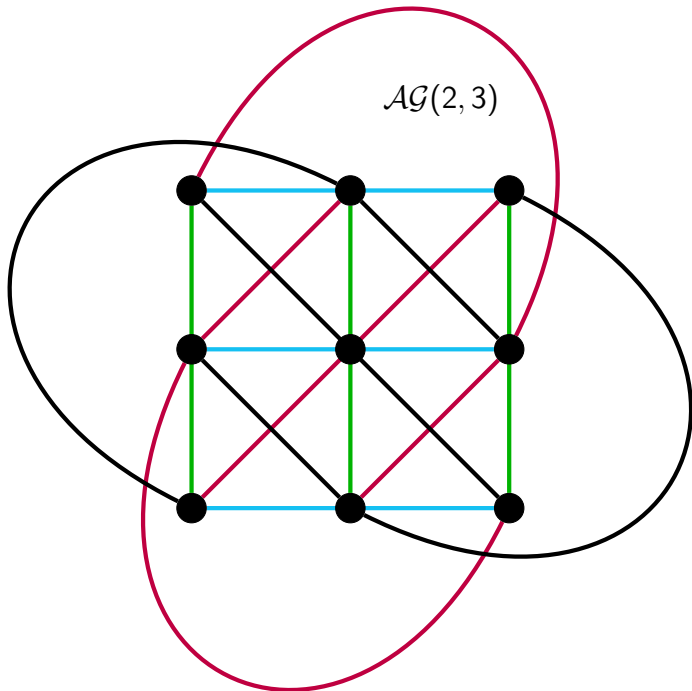
Geometria

Újra SET?

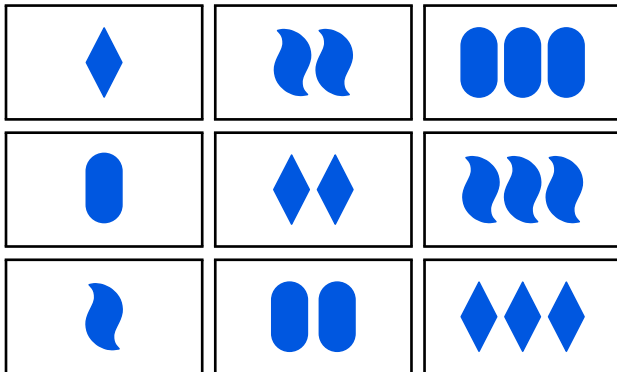
ProSET

Zoknik





Hány SET van az ábrán?



Attribútum	Lehetőségek		
Szám	1 (1)	2 (2)	3 (0)
Szín	piros (1)	zöld (2)	kék (0)
Minta	üres (1)	tele (2)	csíkos (0)
Alak	ellipszis (1)	rombusz (2)	hullám (0)

Matematikai modell

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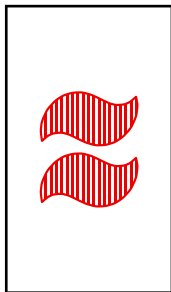
SET

Geometria

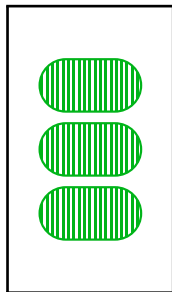
Újra SET?

ProSET

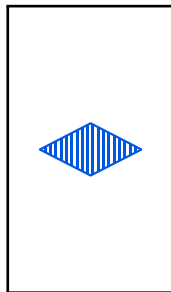
Zoknik



2huPc



3ovZc



1roKc

Matematikai modell

Zoknik

Bogya Norbert

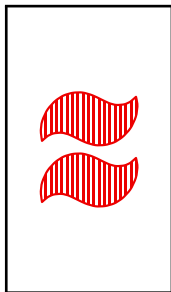
SET

Geometria

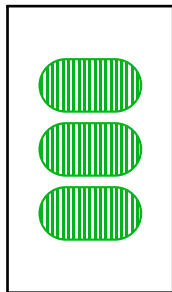
Újra SET?

ProSET

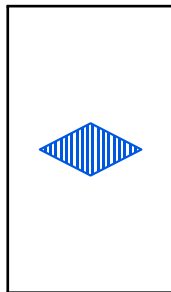
Zoknik



2huPc
(2; 0; 1; 0)



3ovZc
(0; 1; 2; 0)



1roKc
(1; 2; 0; 0)

Matematikai modell

Zoknik

Bogya Norbert

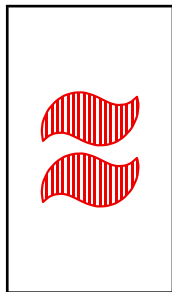
SET

Geometria

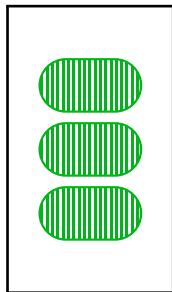
Újra SET?

ProSET

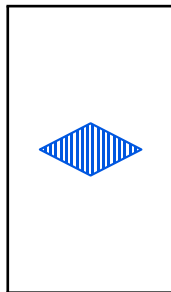
Zoknik



2huPc
(2; 0; 1; 0)



3ovZc
(0; 1; 2; 0)



1roKc
(1; 2; 0; 0)

$$\begin{array}{r} 2 \ 0 \ 1 \ 0 \\ 0 \ 1 \ 2 \ 0 \\ + \ 1 \ 2 \ 0 \ 0 \\ \hline 3 \ 3 \ 3 \ 0 \end{array}$$

Matematikai modell

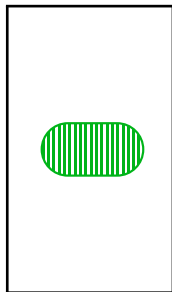
SET

Geometria

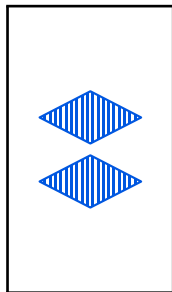
Újra SET?

ProSET

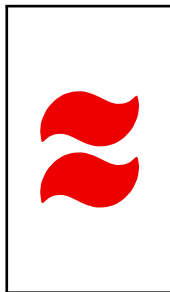
Zoknik



1ovZc
(1; 1; 2; 0)



2roKc
(2; 2; 0; 0)



2huPt
(2; 0; 1; 2)

$$\begin{array}{r} 1 \ 1 \ 2 \ 0 \\ 2 \ 2 \ 0 \ 0 \\ + \ 2 \ 0 \ 1 \ 2 \\ \hline 5 \ 3 \ 3 \ 2 \end{array}$$

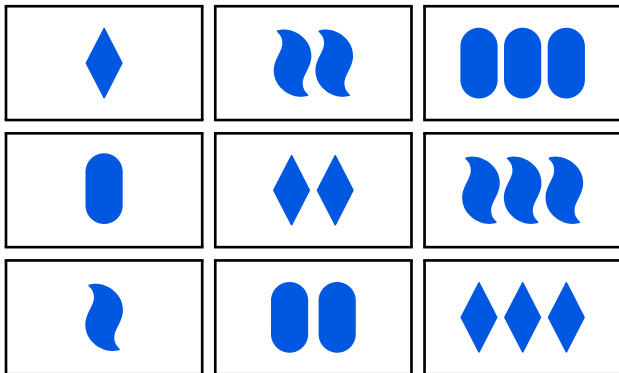
SET

Geometria

Újra SET?

ProSET

Zoknik



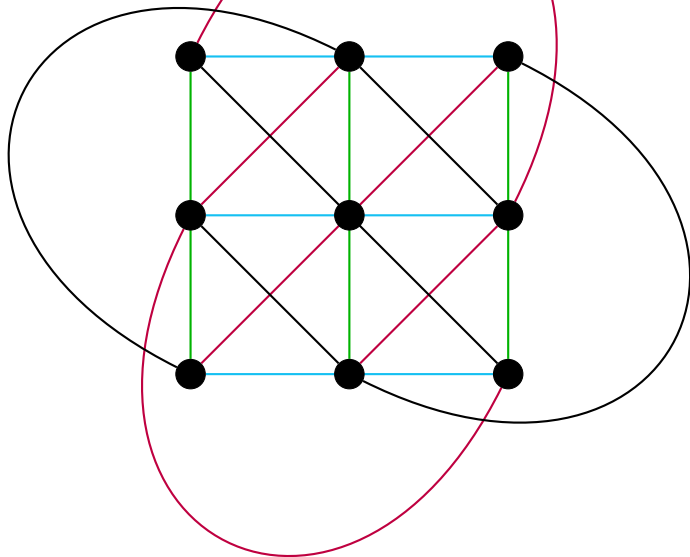
SET

Geometria

Újra SET?

ProSET

Zoknik

 $AG(2, 3)$ 

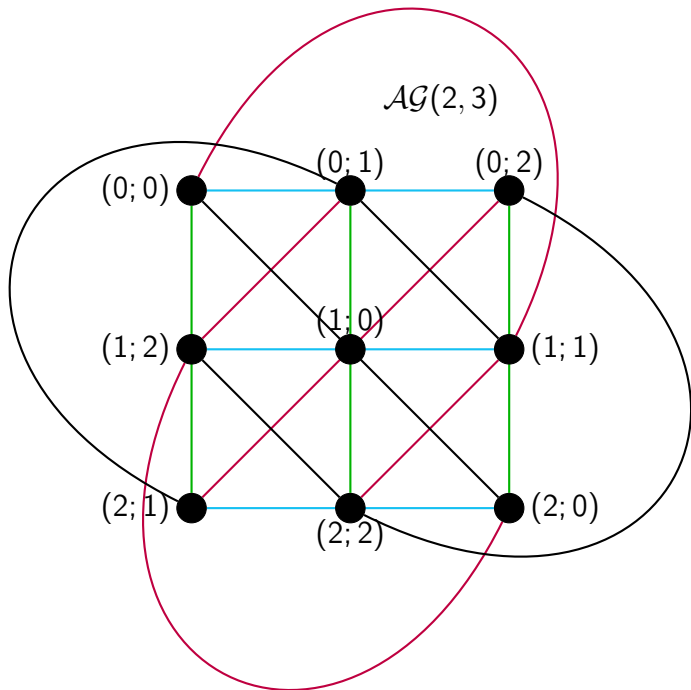
SET

Geometria

Újra SET?

ProSET

Zoknik



SET

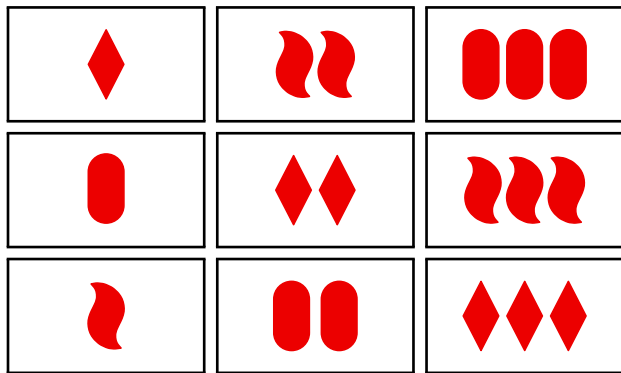
Geometria

Újra SET?

ProSET

Zoknik

$$AG(2, 3) \sim \mathbb{Z}_3^2$$



 2^\uparrow 3^\uparrow

SET

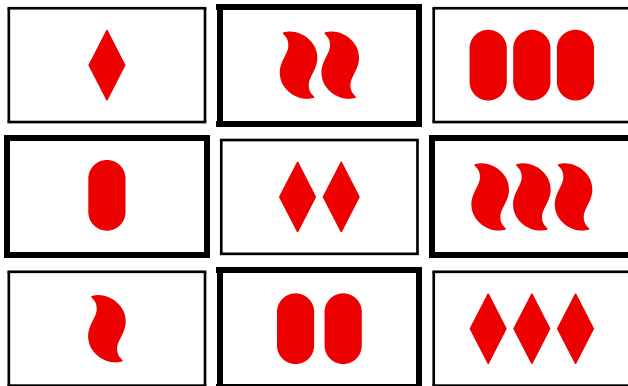
Geometria

Újra SET?

ProSET

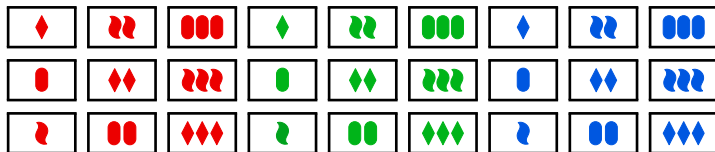
Zoknik

$$AG(2,3) \sim \mathbb{Z}_3^2$$



 2^\uparrow 3^\uparrow

$$\mathcal{AG}(3,3) \sim \mathbb{Z}_3^3$$



SET

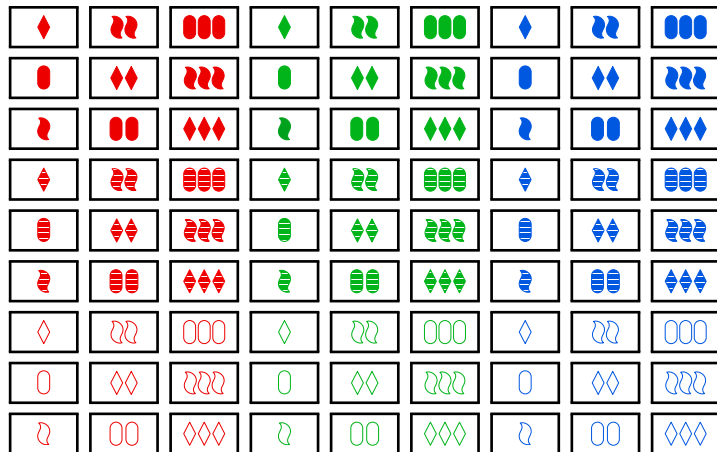
Geometria

Újra SET?

ProSET

Zoknik

$$AG(4, 3) \sim \mathbb{Z}_3^4$$



#Játék következik!

SET

Geometria

Újra SET?

ProSET

Zoknik

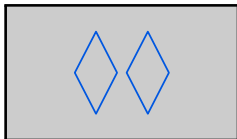
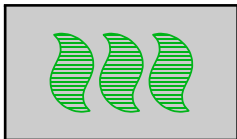
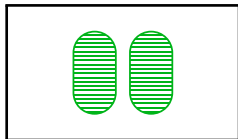
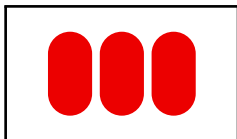
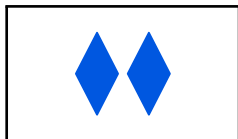
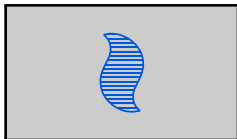
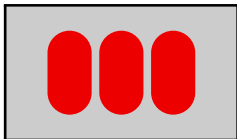
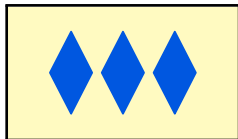
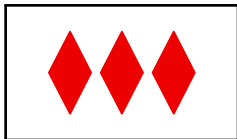
SET

Geometria

Újra SET?

ProSET

Zoknik



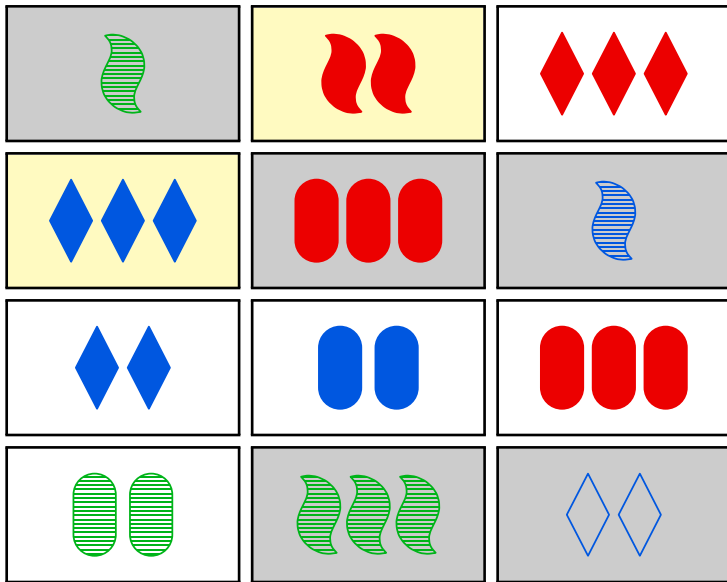
SET

Geometria

Újra SET?

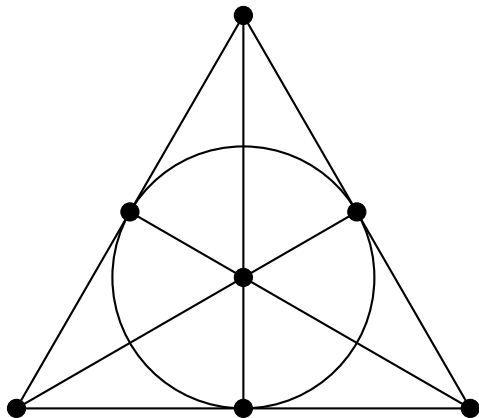
ProSET

Zoknik


 $[1, 5, 12], [2, 10, 12]$

\mathbb{Z}_2^3 – Fano-sík

(projektív sík)



SET

Geometria

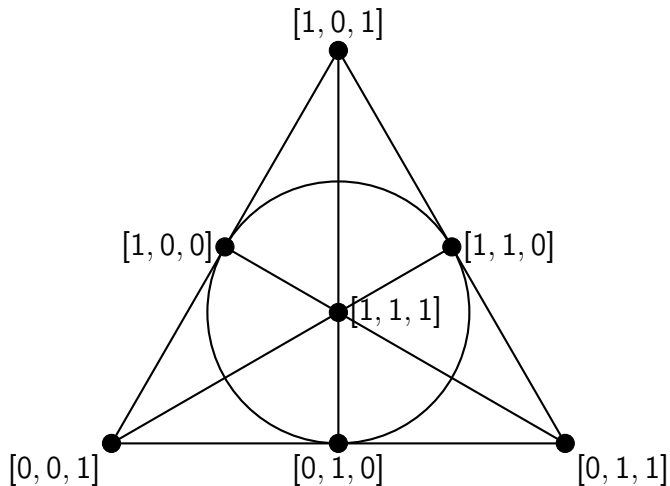
Újra SET?

ProSET

Zoknik

\mathbb{Z}_2^3 – Fano-sík

(projektív sík)



SET

Geometria

Újra SET?

ProSET

Zoknik

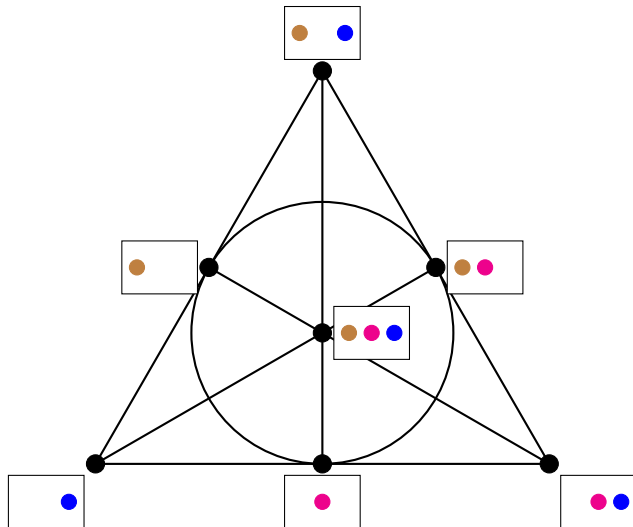
SET

Geometria

Újra SET?

ProSET

Zoknik



#Játék következik!

ProSET

Zoknik

Bogya Norbert

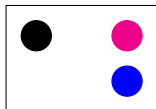
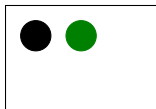
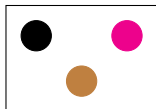
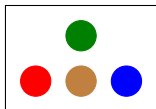
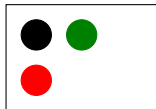
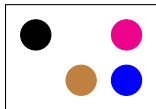
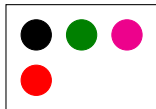
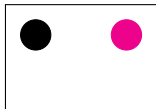
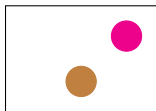
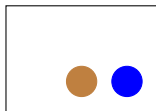
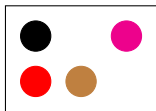
SET

Geometria

Újra SET?

ProSET

Zoknik



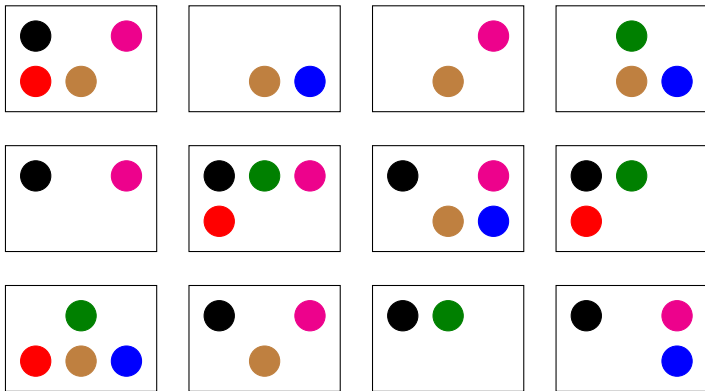
SET

Geometria

Újra SET?

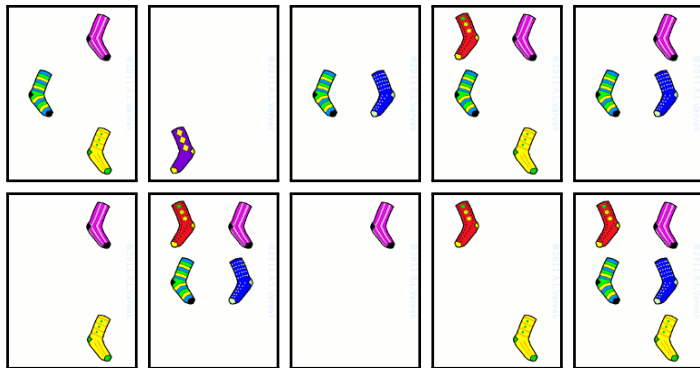
ProSET

Zoknik



$\{2, 5, 7\}$, $\{2, 10, 12\}$, $\{6, 7, 9\}$

#ZOKNI következik!



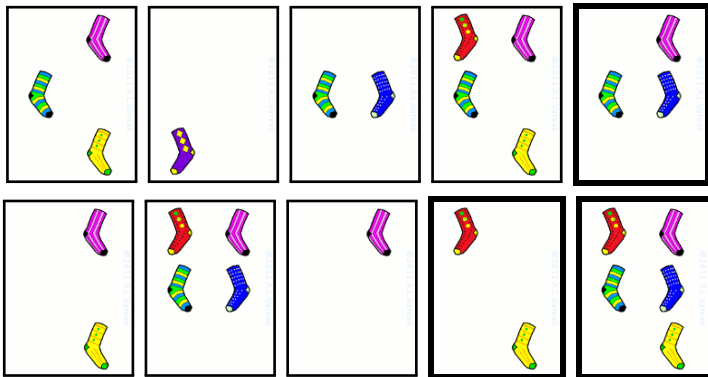
SET

Geometria

Újra SET?

ProSET

Zoknik



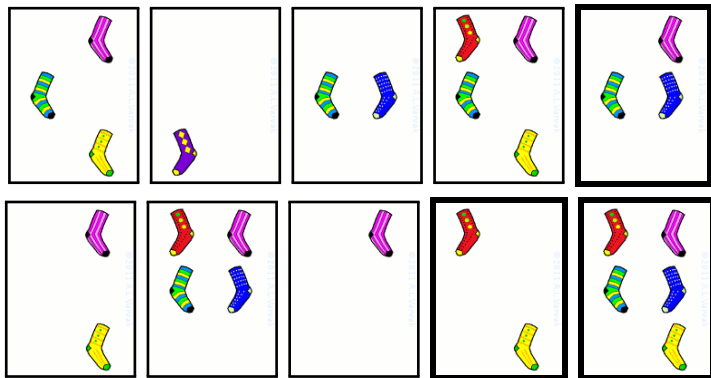
SET

Geometria

Újra SET?

ProSET

Zoknik



SET

Geometria

Újra SET?

ProSET

Zoknik



Socks [▶ link](#)
(2011, \$10.32)

Z_2^6 ERO
SUM Z_2^6

Zero sumZ [▶ link](#)
(2012, \$16.99)

Köszönöm a figyelmet!

Zoknik

Bogya Norbert

SET

Geometria

Újra SET?

ProSET

Zoknik

„A matematika nem nehéz, csak kicsit szokni kell.”
(Dr. Szakács Nóra)

www.math.u-szeged.hu/~nbogya nbogya@math.u-szeged.hu