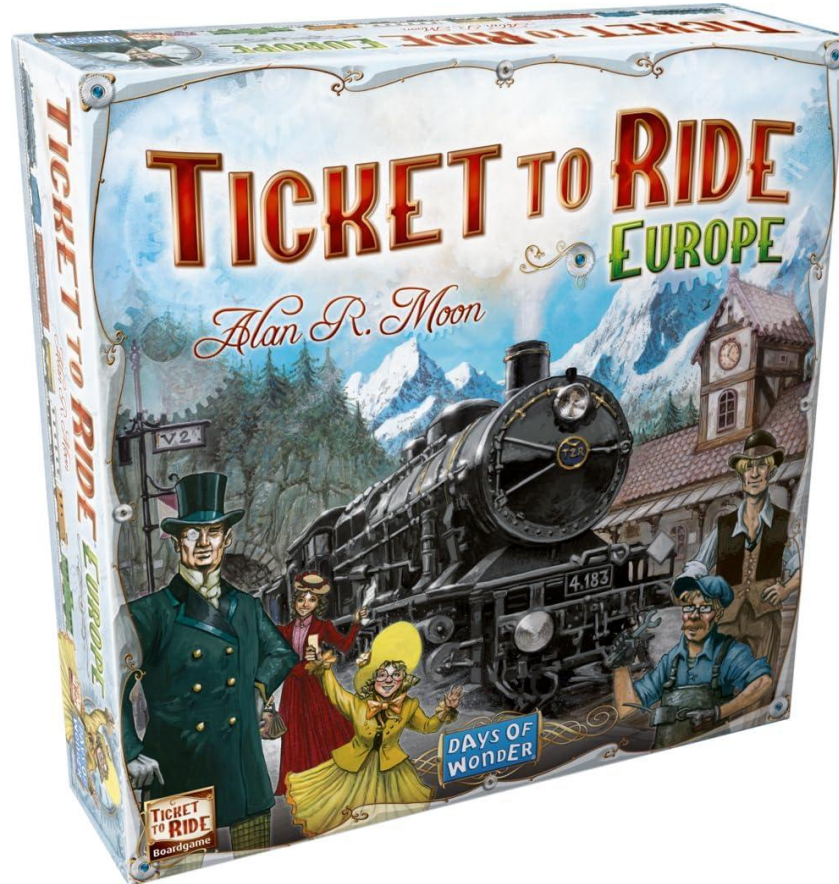
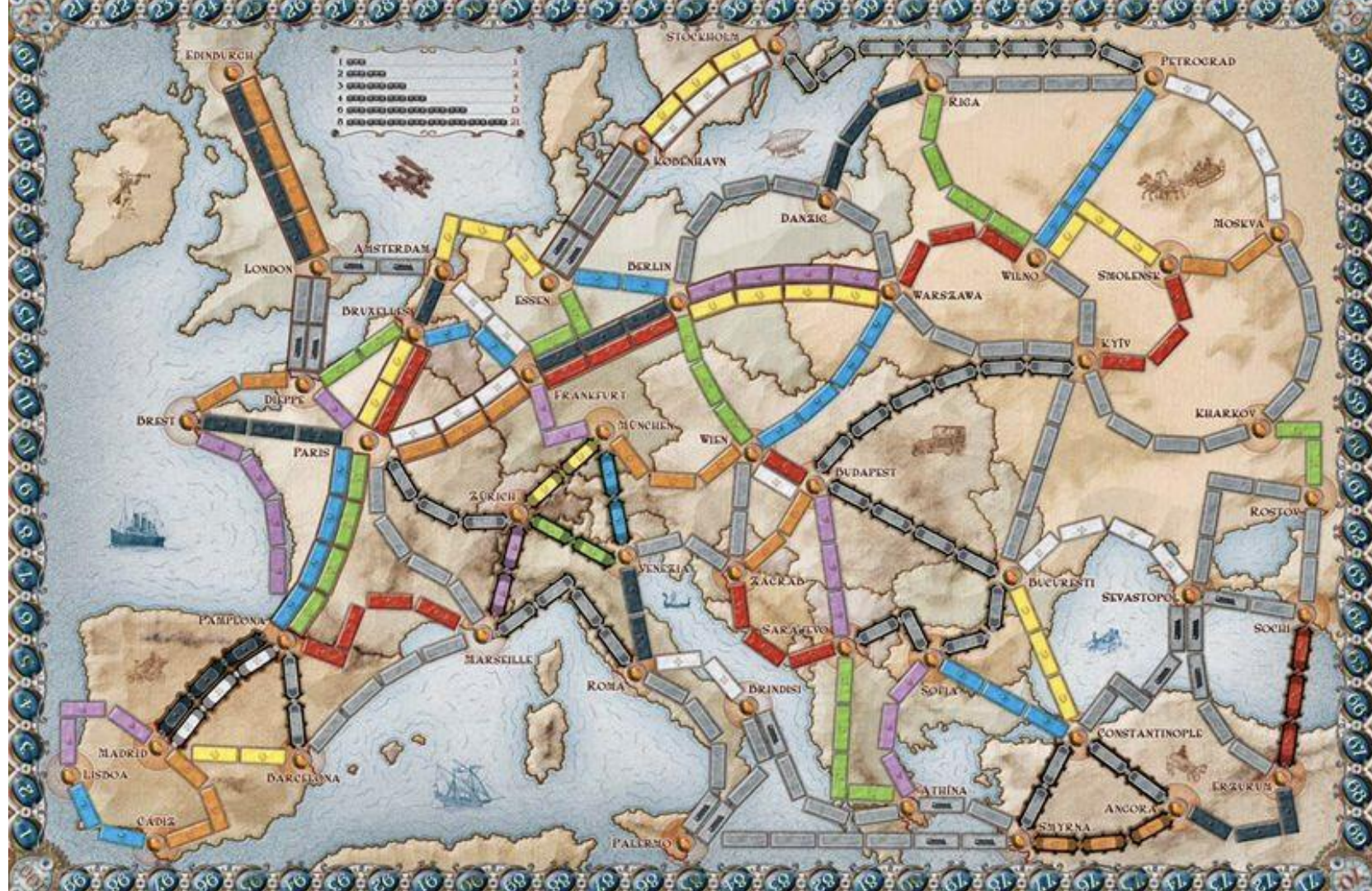


Játssz okosan!

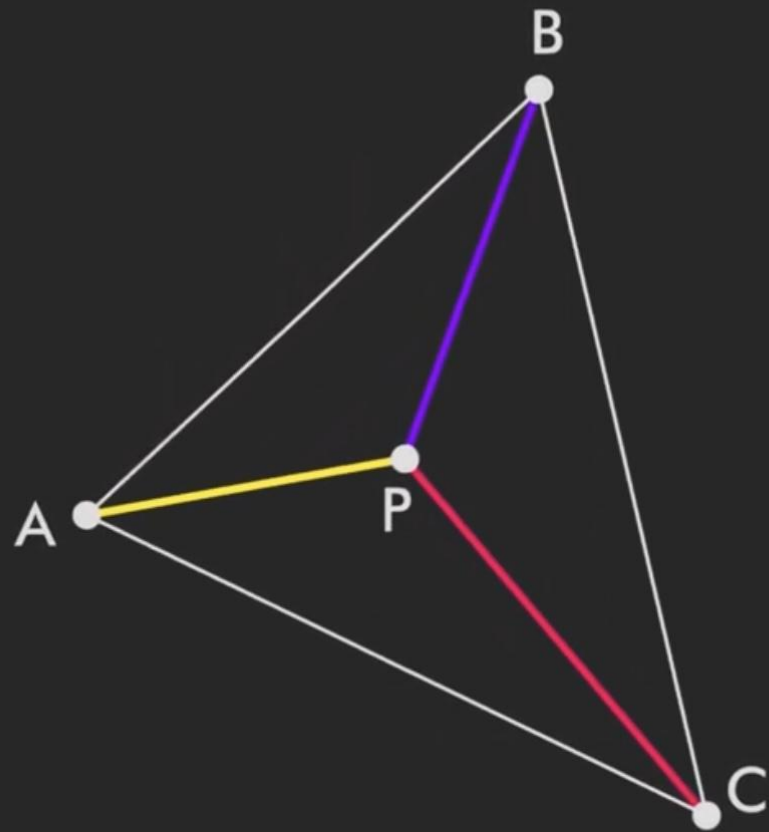
Nemes Viola, Knuth Ákos, Stock Ildikó Petra
2025A

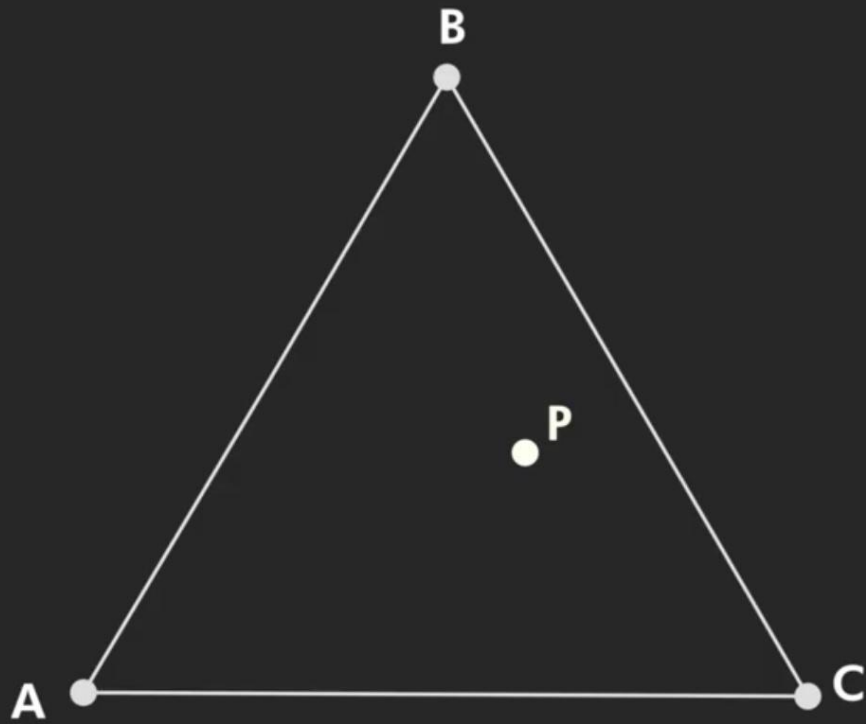
Ticket to ride

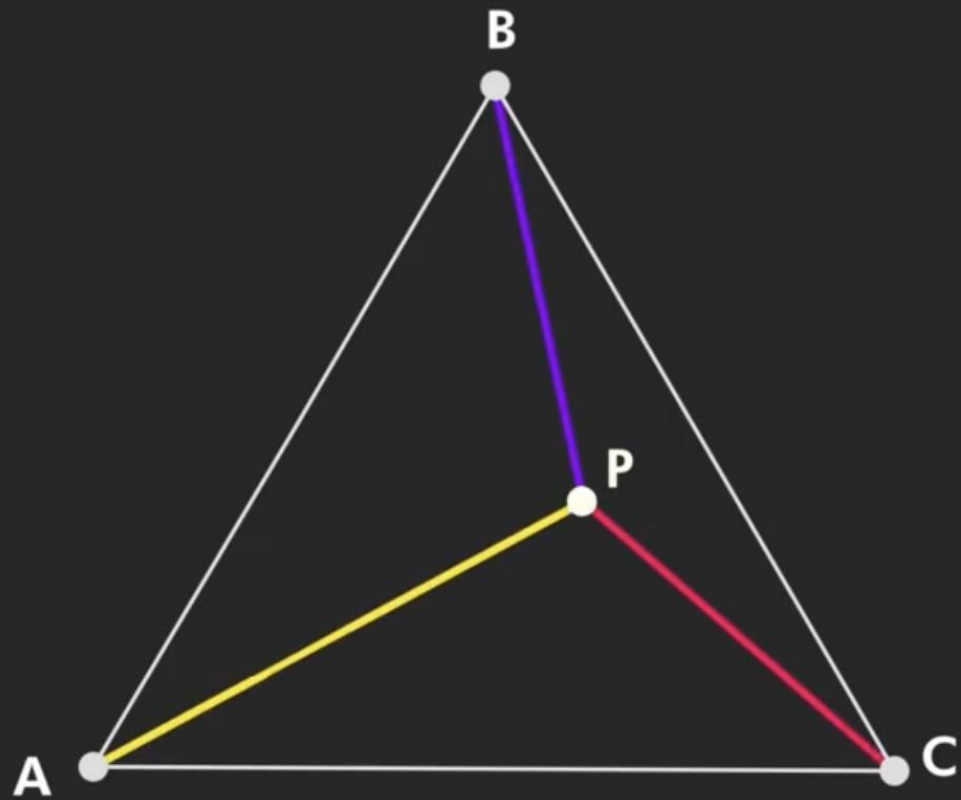


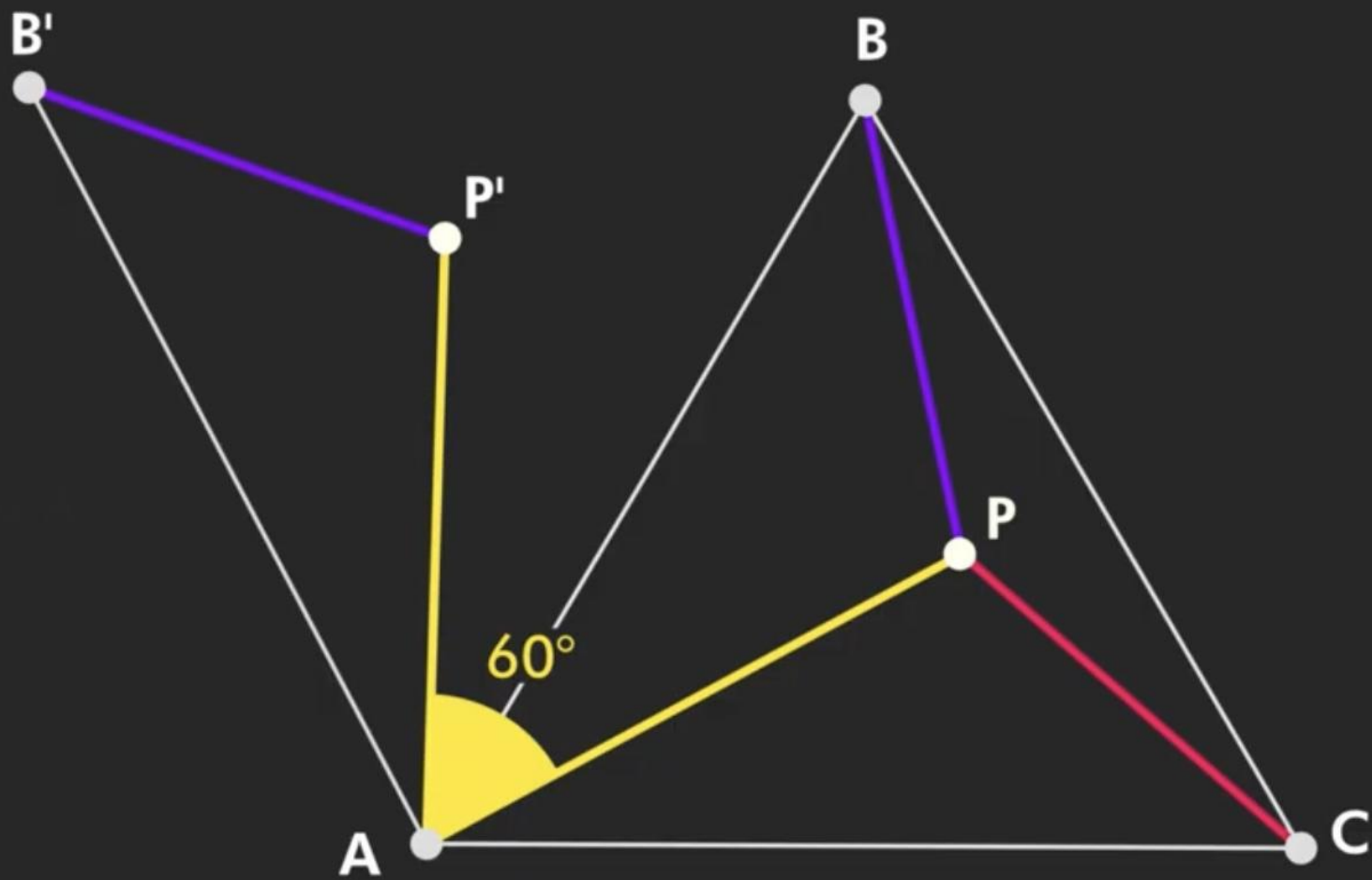


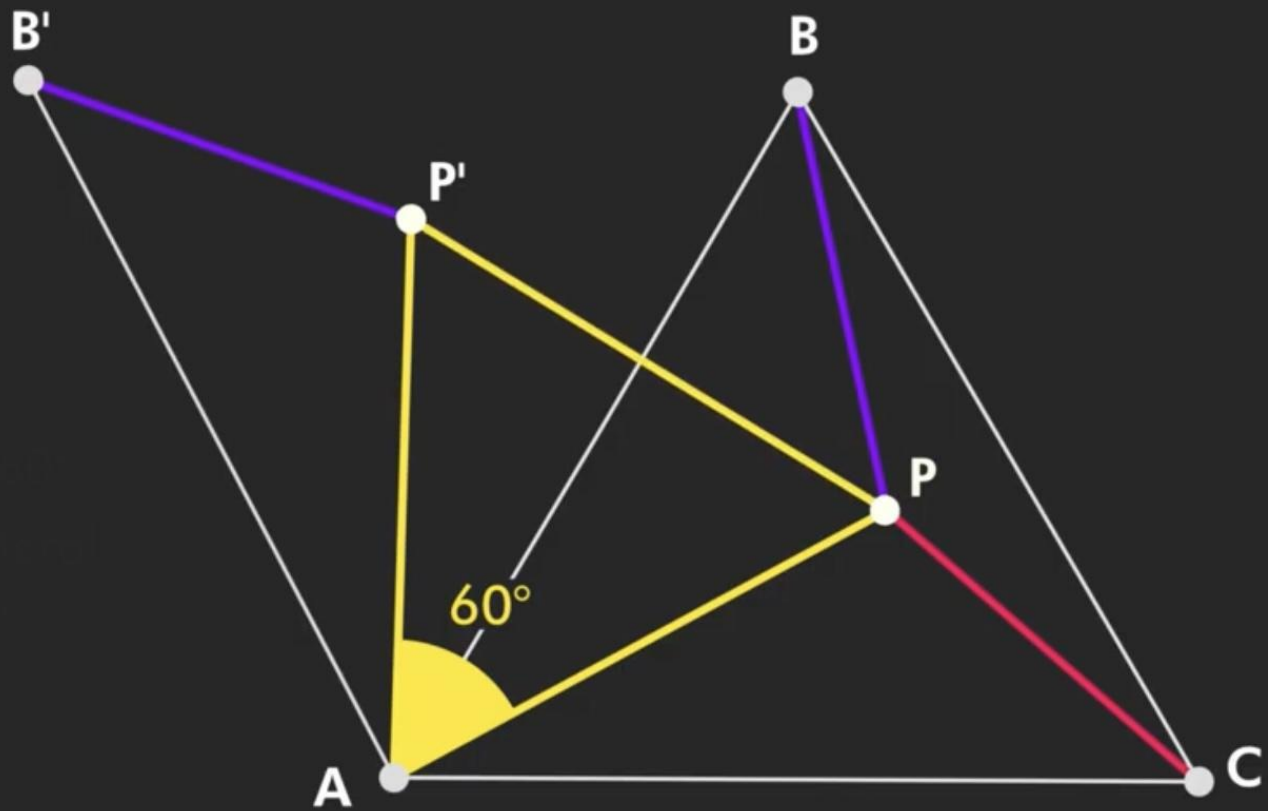


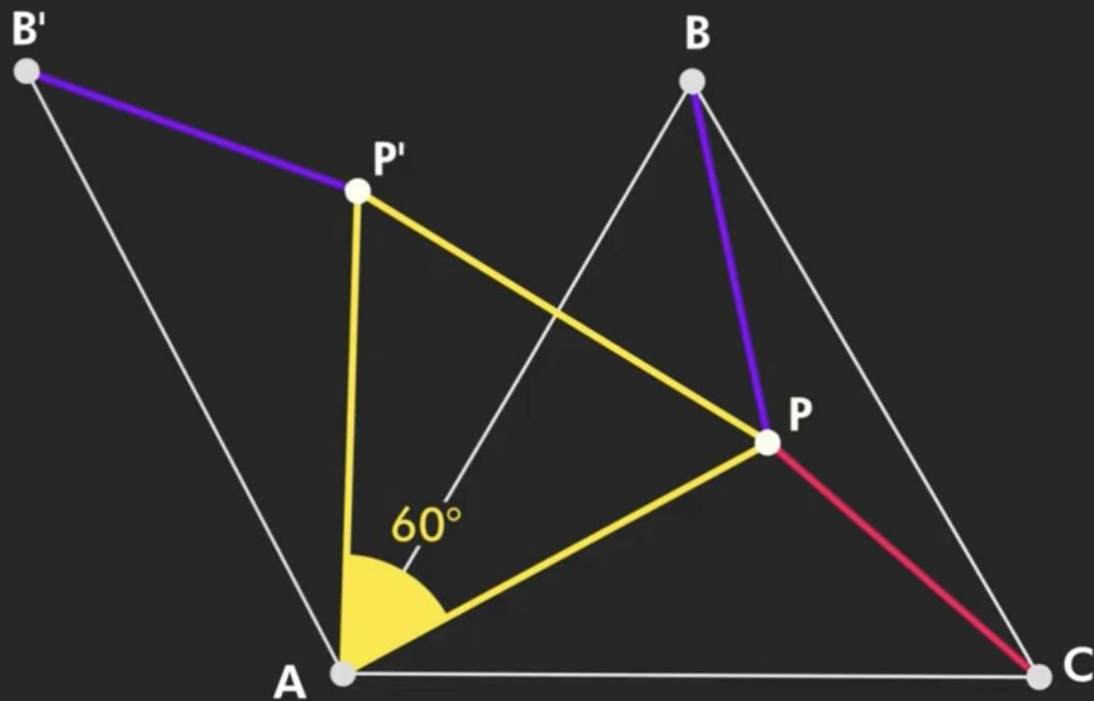




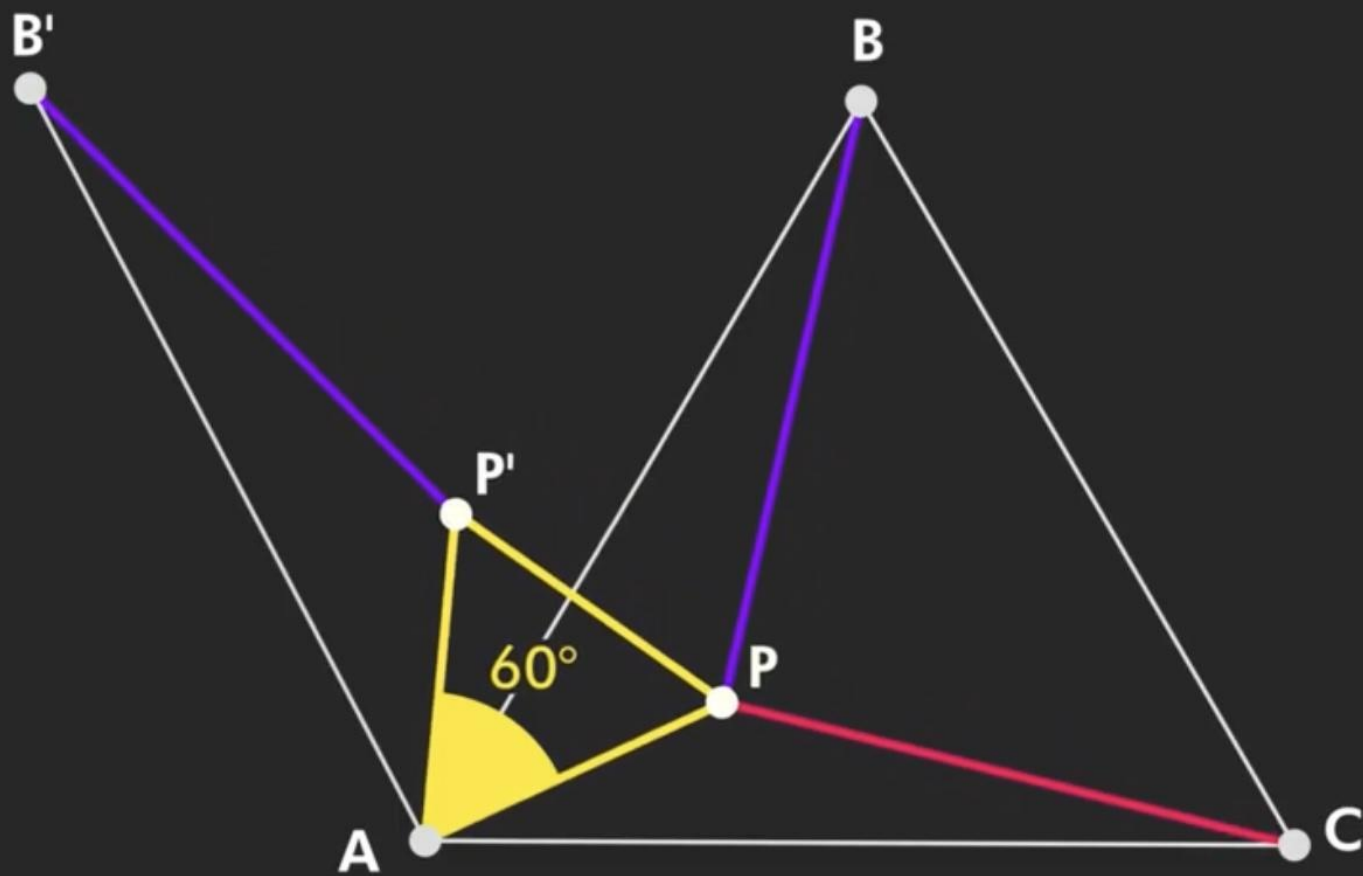


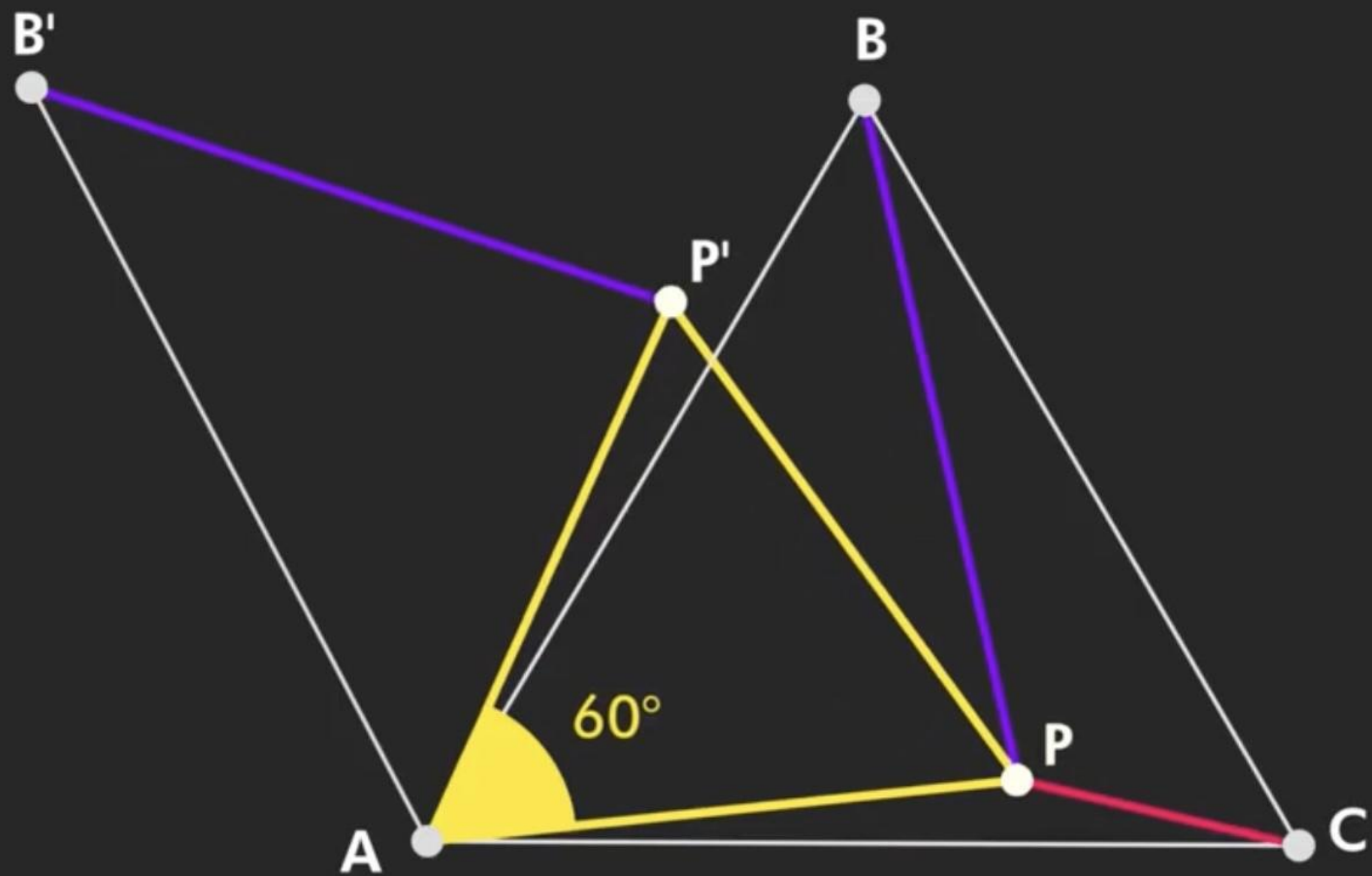




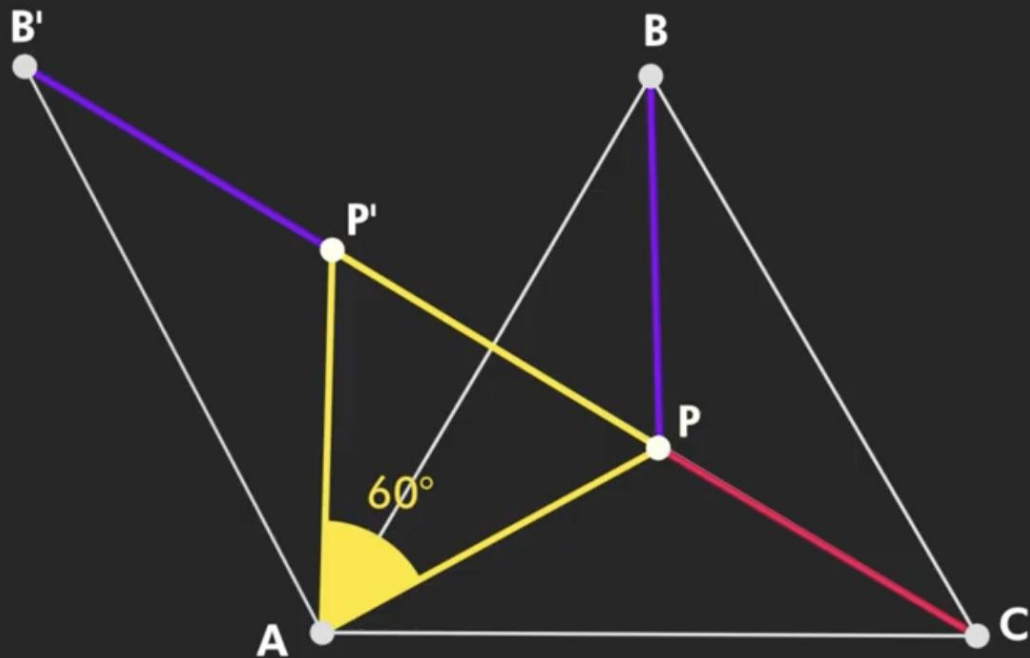


$$\begin{array}{l} PA = PP' \\ PB = P'B' \end{array} \Rightarrow PA + PB + PC = PP' + P'B' + PC$$

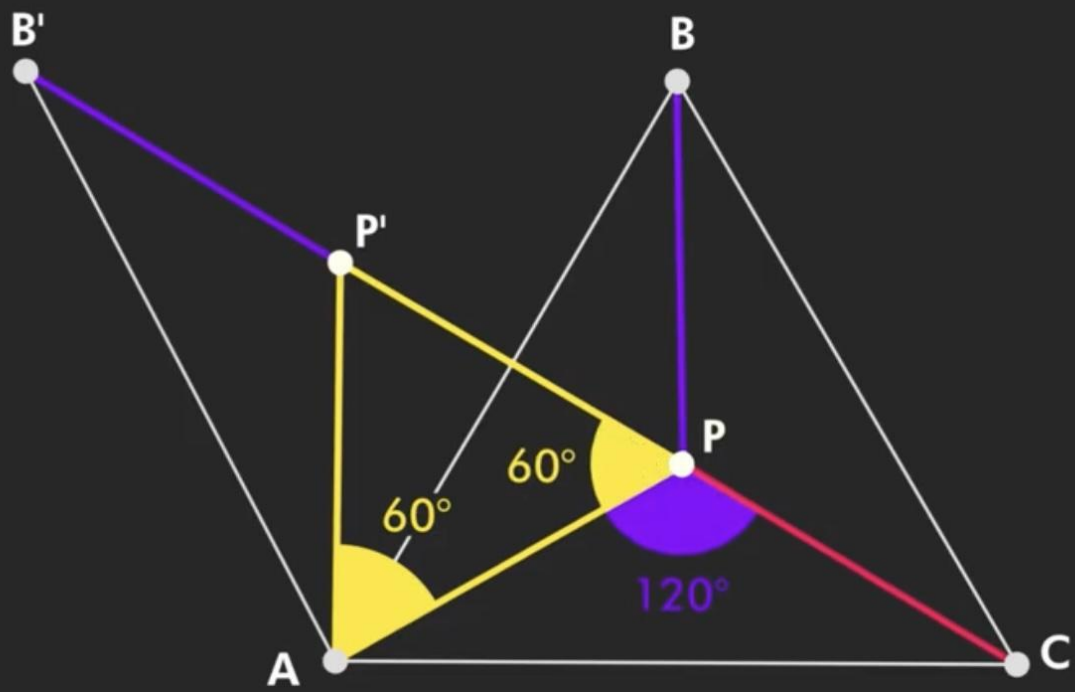


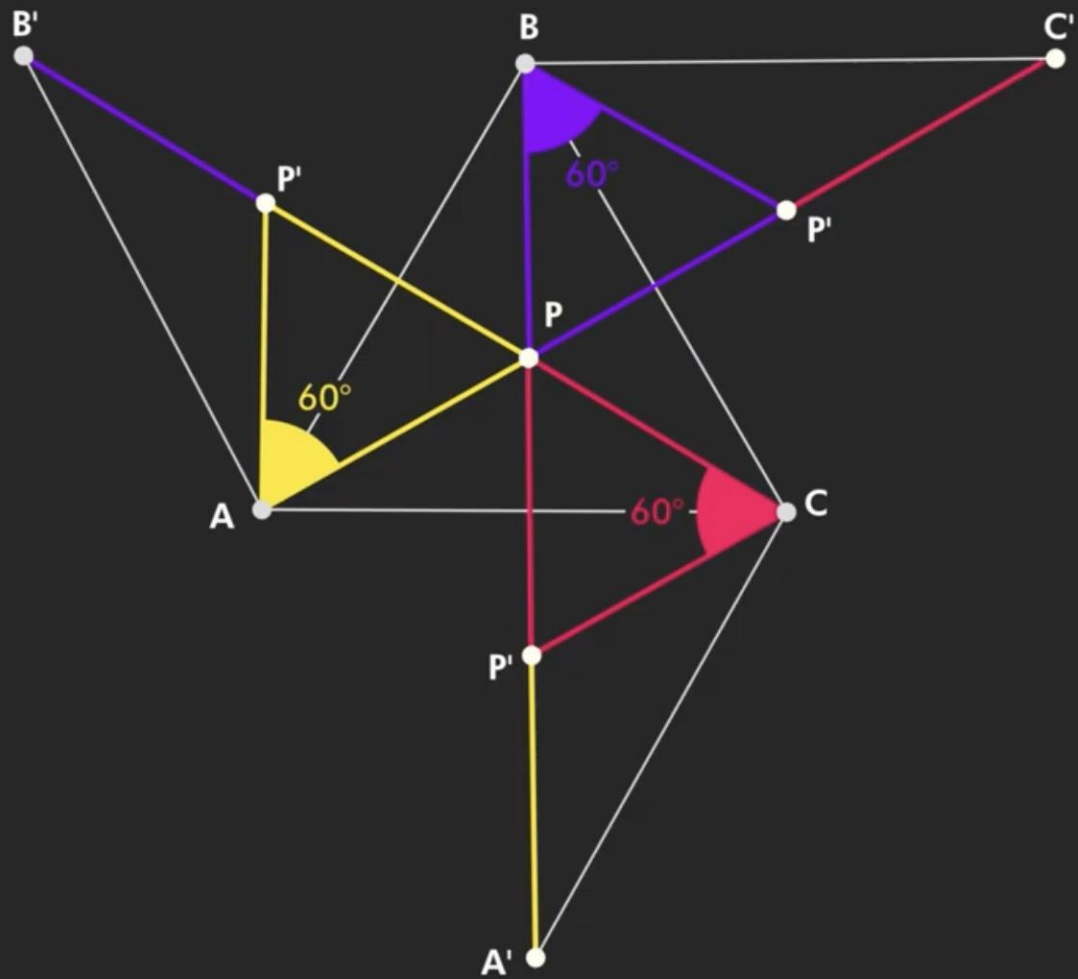


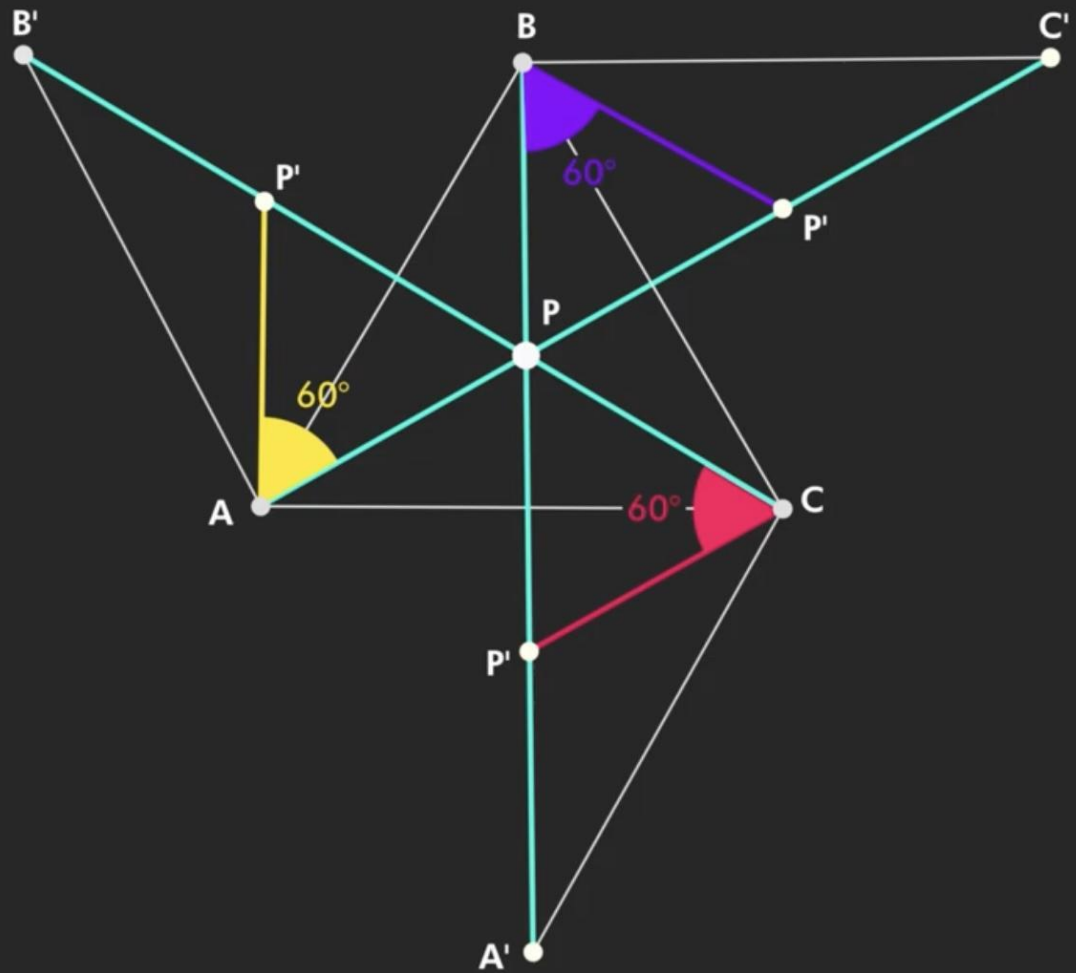




$$PA + PB + PC = P'A + P'B' + P'C$$









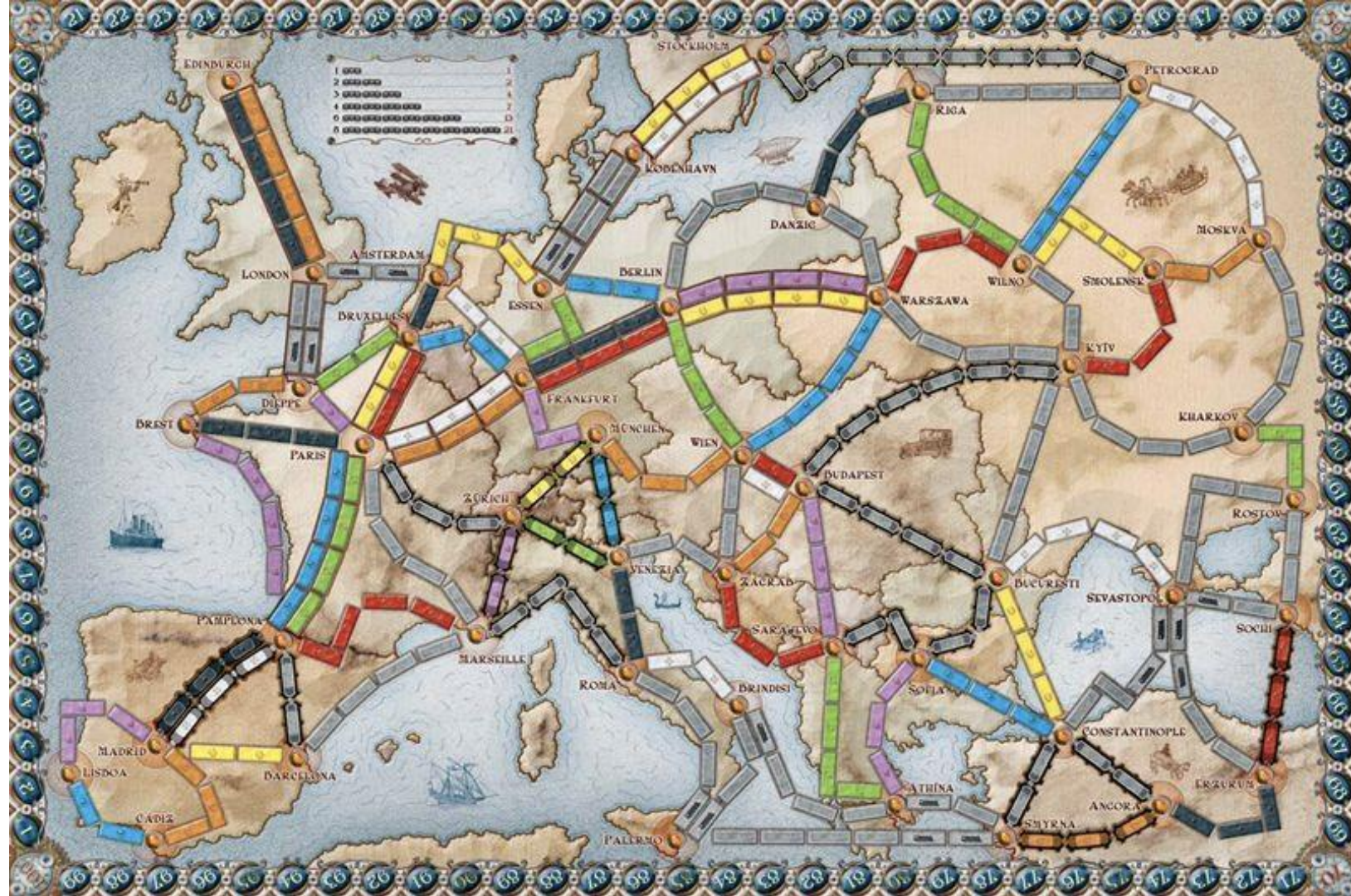














1

1

1,33

1,75

2,5 → akár 3 körrel hamarabb vége

2,625





Monopoly



⇒ Melyik szett a legjobb?





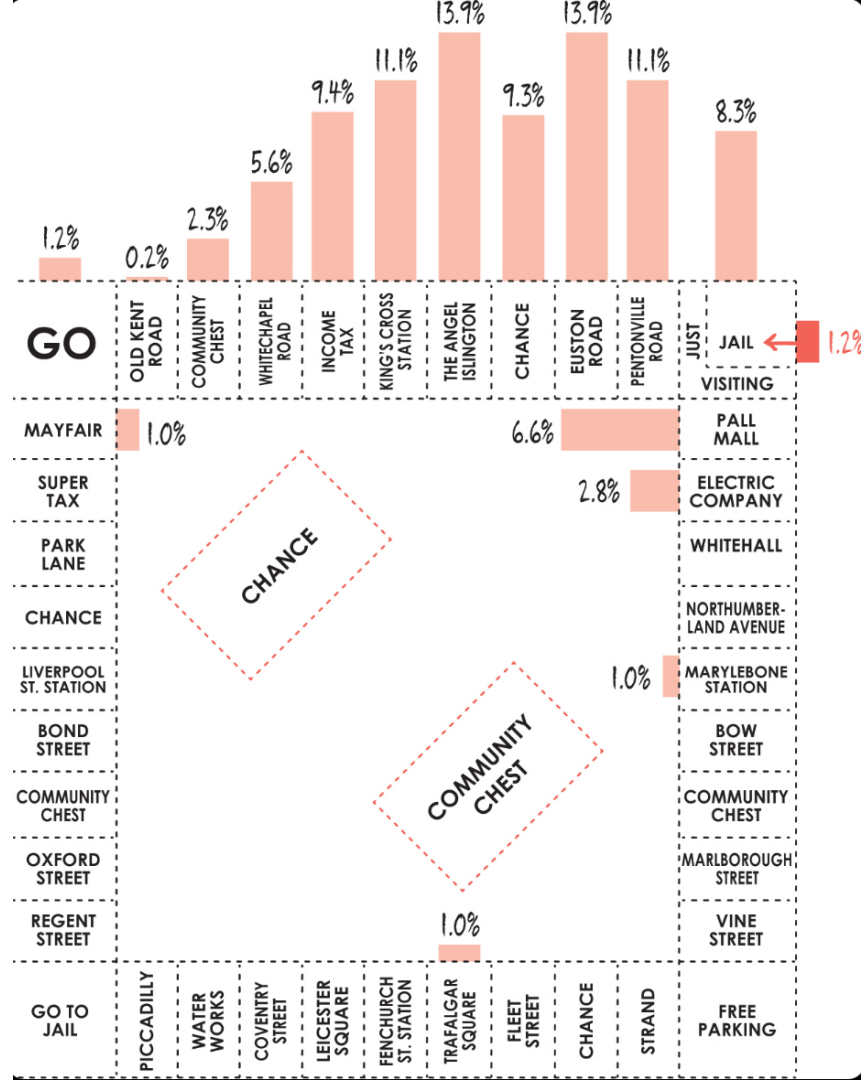
TULAJDONI LAP	
KISFALUDY ÚT	
Bérleti díj	¥¥8
Bérleti díj színszettel	¥¥16
Bérleti díj 	¥¥40
Bérleti díj 	¥¥100
Bérleti díj 	¥¥300
Bérleti díj 	¥¥450
Bérleti díj 	¥¥600
Házak ára	¥¥50 mindegyik
Hotelek ára	¥¥50 mindegyik (plusz 4 ház)
© 1935, 2021 HASBRO.	

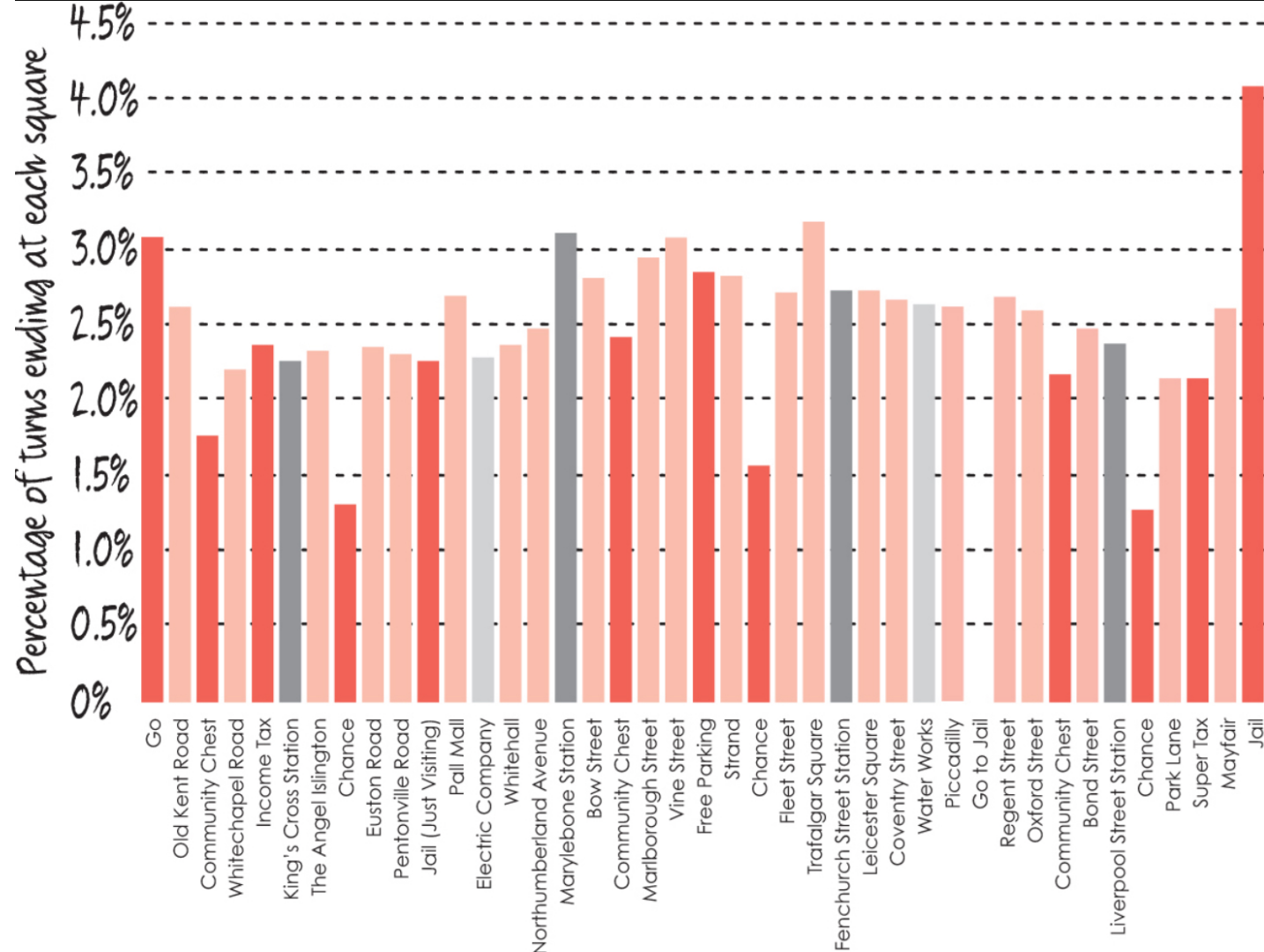
Mennyibe kerül megépíteni?

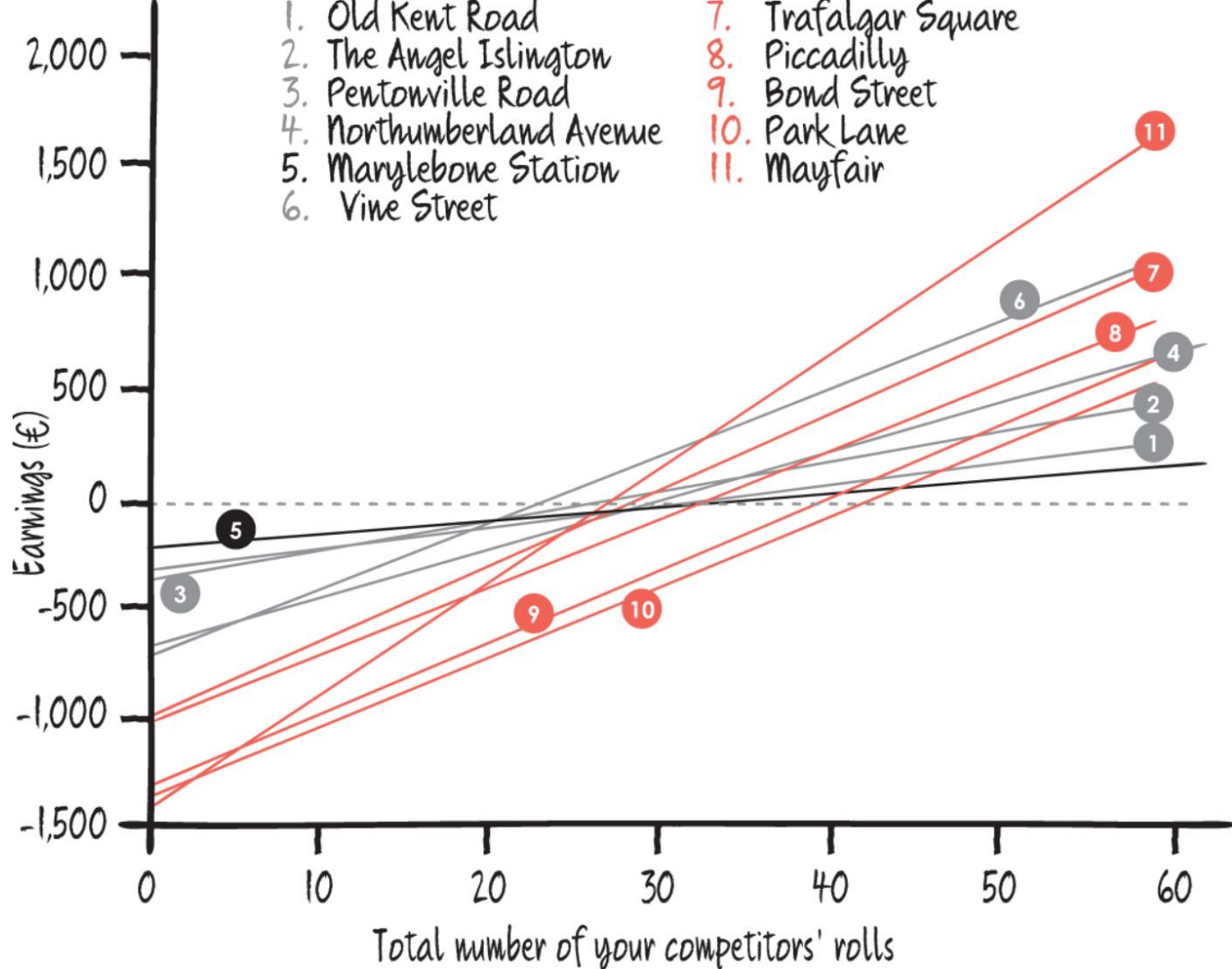
Mennyit fizetnek, amikor rálépnek?

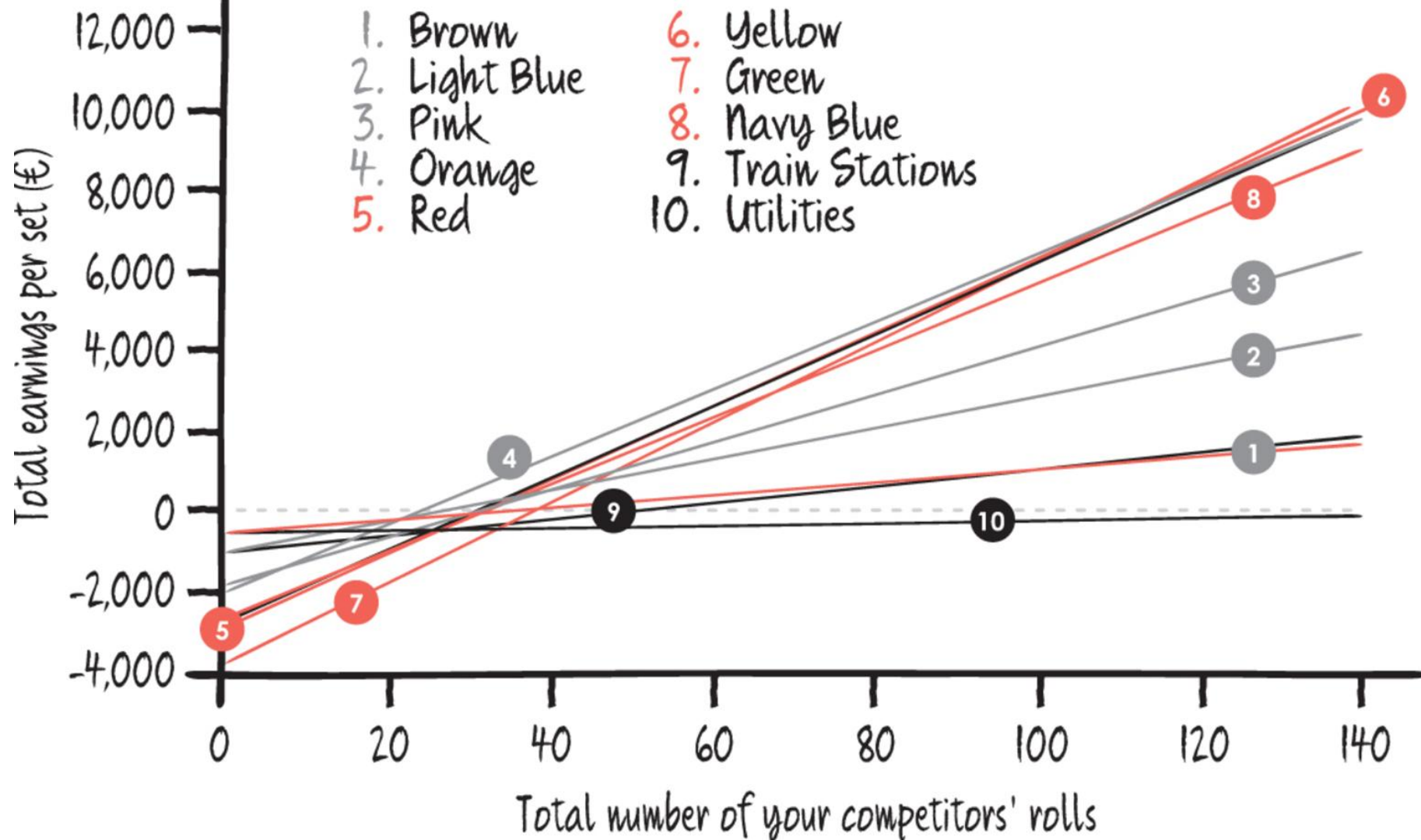
Mennyi a valószínűsége annak, hogy rálépnek?

x kör alatt hányszor lépnek rá az adott mezőre?









Nyerő szettek

- 1 ellenfél - narancs / világos kék
- 2 / 3 ellenfél - narancs / piros
 - 4+ ellenfél - zöld

Ákos források

monopoly:

Hannah Fry: The indisputable existence of Santa Claus

<https://medium.com/@divijgarg04/the-mathematics-of-monopoly-1e45d5c1402b>

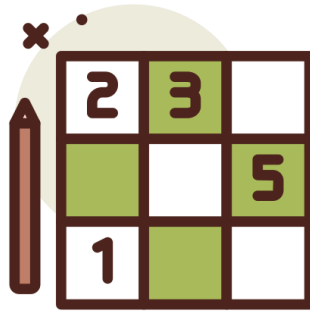
markov-lánc:

<https://www.youtube.com/watch?v=i3AkTO9HLXo>

<https://www.youtube.com/watch?v=330zBO7fIDA>

<https://youtu.be/rzztwQPFID8?si=nnEBJjKpkicGmDgc>

Sudoku

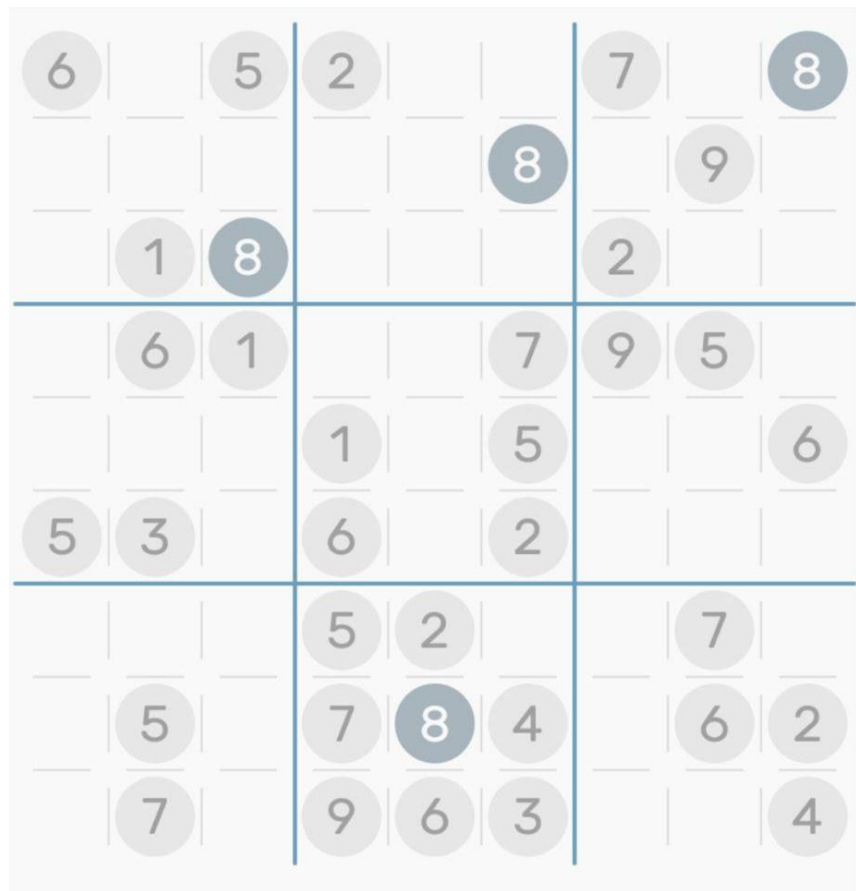


			2	6		7		1
6	8			7			9	
1	9				4	5		
8	2		1				4	
		4	6		2	9		
	5				3		2	8
		9	3				7	4
	4			5			3	6
7		3		1	8			

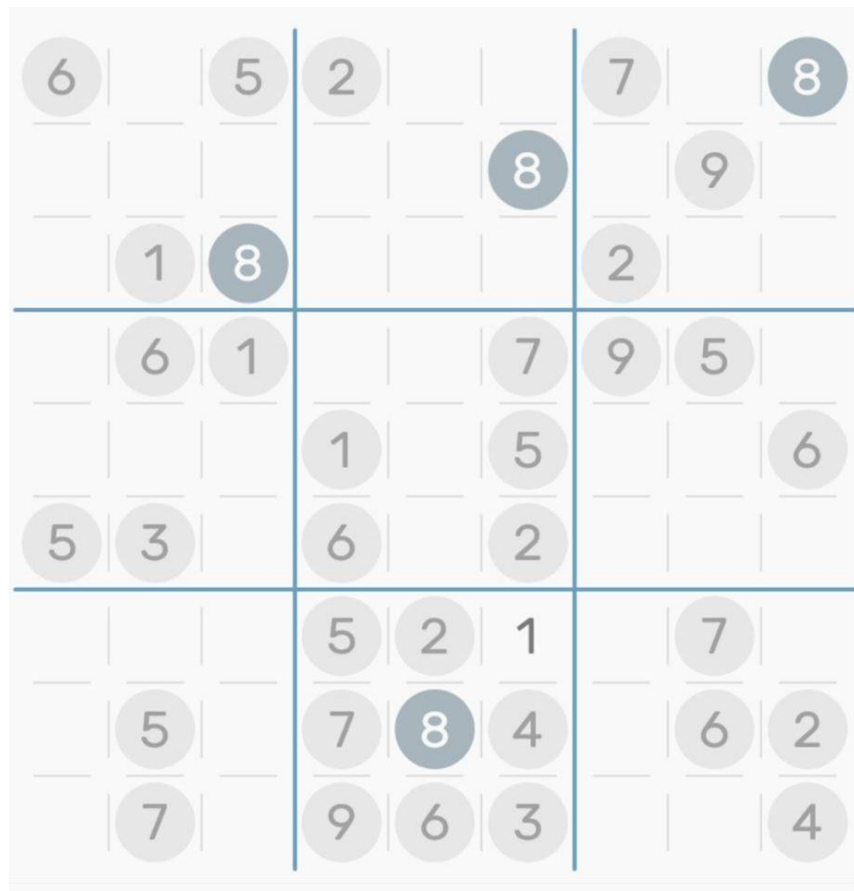
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6	8	2	5	7	1	4	9	3
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8	2	6	1	9	5	3	4	7
3	7	4	6	8	2	9	1	5
9	5	1	7	4	3	6	2	8
5	1	9	3	2	6	8	7	4
2	4	8	9	5	7	1	3	6
7	6	3	4	1	8	2	5	9

6		5	2			7		8
					8		9	
	1	8				2		
	6	1			7	9	5	
			1		5			6
5	3		6		2			
			5	2			7	
	5		7		4		6	2
	7		9	6	3			4

6		5	2			7		8
					8		9	
	1	8				2		
	6	1			7	9	5	
			1		5			6
5	3		6		2			
			5	2			7	
	5		7		4		6	2
	7		9	6	3			4



6		5	2			7		8
					8		9	
	1	8				2		
	6	1			7	9	5	
			1		5			6
5	3		6		2			
			5	2	1		7	
	5		7	8	4		6	2
	7		9	6	3			4

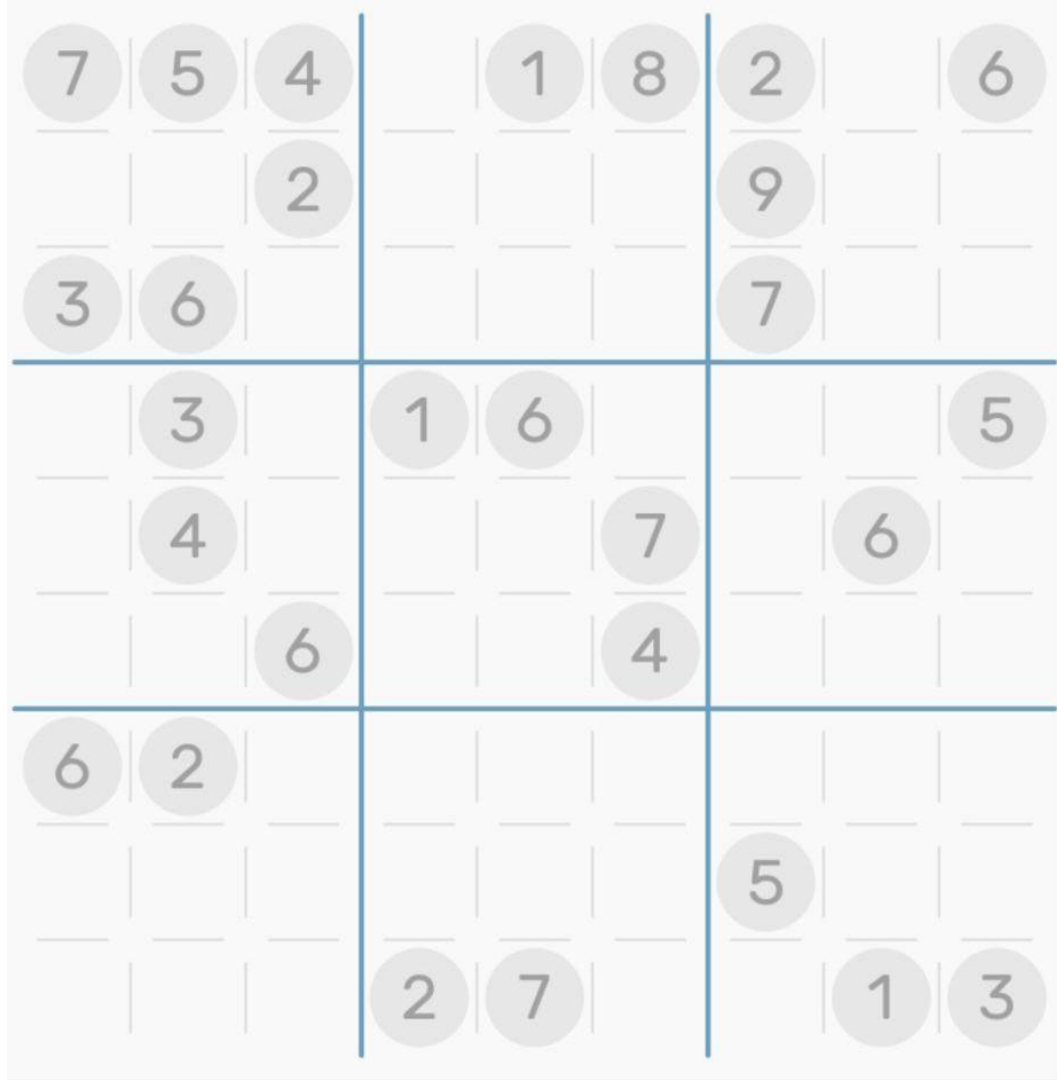


6		5	2			7		8
					8		9	
	1	8				2		
	6	1	8		7	9	5	
			1		5			6
5	3		6		2			
			5	2	1		7	
	5		7	8	4		6	2
	7		9	6	3			4

6		5	2			7		8
			3 4		8		9	
	1	8	3 4			2		
	6	1	8		7	9	5	
			1		5			6
5	3		6		2			
			5	2	1		7	
	5		7	8	4		6	2
	7		9	6	3			4

6		5	2			7		8
			3 4		8		9	
	1	8	3 4			2		
	6	1	8		7	9	5	
			1		5			6
5	3		6		2			
			5	2	1		7	
	5		7	8	4		6	2
	7		9	6	3			4

6 23 34 47	49 24 1	5 23 8 47	2 34 34	19 1 5 57	9 8 69	7 134 2	1 34 34	8 1 35
24 247 89	6 24 89	1 24 79	8 1 6	34 3 49	7 5 2	9 3 48	5 23 48	3 6 17
34 89	4 89	34 69	5 7	2 8	1 4	3 48	7 6	39 2
1 39	5 7	39 2	9 6	6 3	3 58	18	4	



7	5	4	39	1	8	2	3	6
18	18	2	345 67	34 57	3 56	9	34 58	13 48
3	6	1 89	45 79	245 79	2 59	7	4 58	1 48
2 89	3	7 89	1	6	29	48	247 89	5
125 89	4	15 89	35 89	235 89	7	1 38	6	12 89
125 89	17 89	6	35 89	235 89	4	1 38	1237 89	127 89
6	2	1357 89	345 89	345 89	13 59	48	47 89	47 89
14 89	17 89	137 89	346 89	34 89	13 69	5	247 89	247 89
45 89	89	5 89	2	7	5 69	4 68	1	3

7	5	4	39	1	8	2	3	6
18	18	2	345 67	34 57	3 56	9	34 58	13 48
3	6	1 89	45 79	245 79	2 59	7	4 58	1 48
2 89	3	7 89	1	6	29	48	247 89	5
125 89	4	15 89	35 89	235 89	7	1 38	6	12 89
125 89	17 89	6	35 89	235 89	4	1 38	1237 89	127 89
6	2	1357 89	345 89	345 89	13 59	48	47 89	47 89
14 89	17 89	137 89	346 89	34 89	13 69	5	247 89	247 89
45 89	89	5 89	2	7	5 69	4 68	1	3

7	5	4	9	1	8	2	3	6
18	18	2	345 67	34 57	3 56	9	4 58	1 48
3	6	9	4 57	24 57	25	7	4 58	1 48
2 89	3	78	1	6	29	48	247 89	5
125 89	4	1 58	3 58	235 89	7	1 38	6	12 89
125 89	17 89	6	3 58	235 89	4	1 38	127 89	127 89
6	2	135 78	34 58	345 89	13 59	48	47 89	47 89
14 89	17 89	13 78	34 68	34 89	13 69	5	247 89	247 89
45 89	89	58	2	7	59	6	1	3

7	5	4	9	1	8	2	3	6
18	18	2	345 67	34 57	3 56	9	4 58	1 48
3	6	9	4 57	24 57	25	7	4 58	1 48
2 89	3	78	1	6	29	48	247 89	5
125 89	4	1 58	3 58	235 89	7	1 38	6	12 89
125 89	17 89	6	3 58	235 89	4	1 38	127 89	127 89
6	2	135 78	34 58	345 89	13 59	48	47 89	47 89
14 89	17 89	13 78	34 68	34 89	13 69	5	247 89	247 89
45 89	89	58	2	7	59	6	1	3

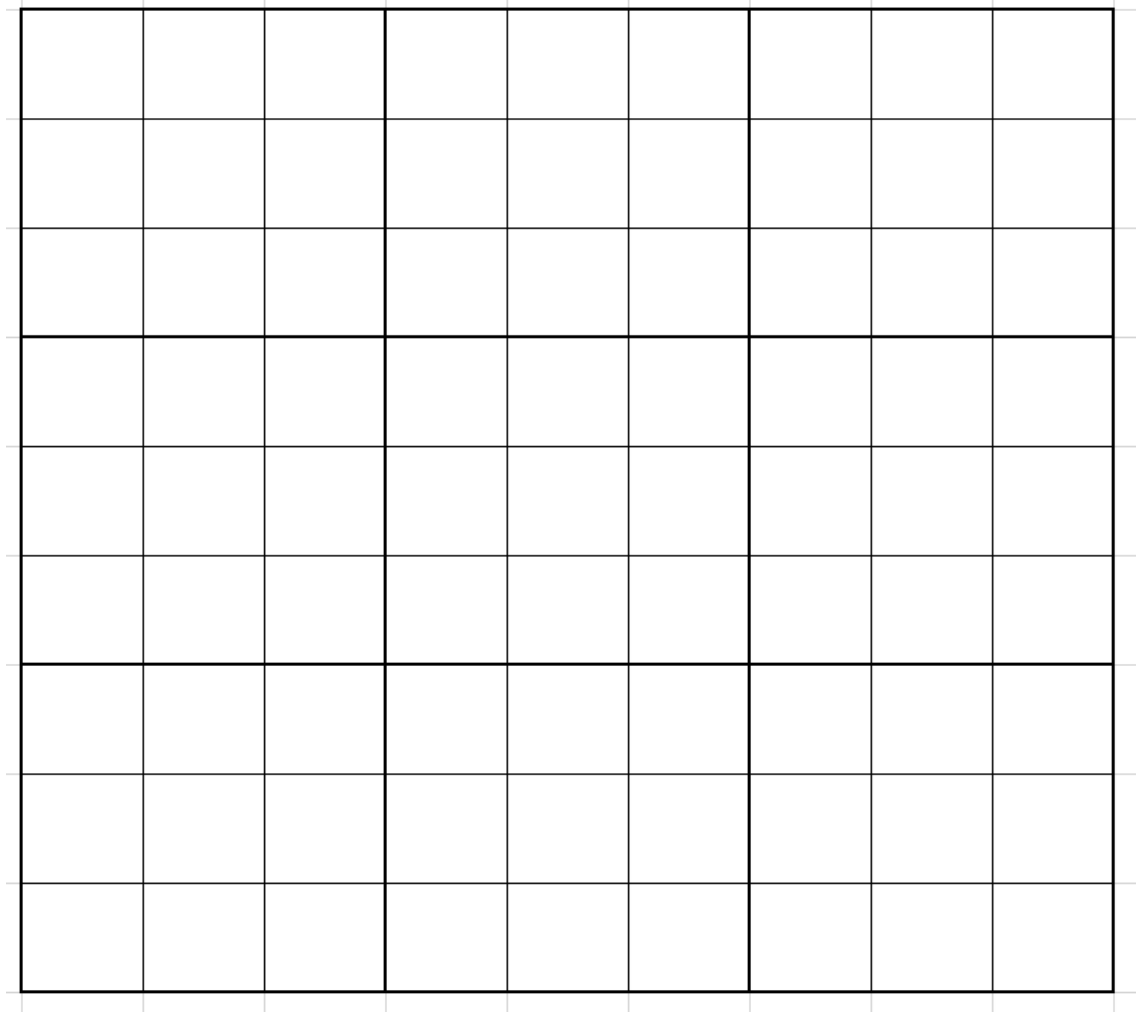
7	5	4	9	1	8	2	3	6
18	18	2	345 67	34 57	3 56	9	4 58	48
3	6	9	4 57	24 57	25	7	4 58	1 48
2 89	3	78	1	6	29	48	247 89	5
125 89	4	1 58	3 58	235 89	7	1 38	6	12 89
125 89	17 89	6	3 58	235 89	4	1 38	127 89	127 89
6	2	135 78	34 58	345 89	13 59	48	47 89	47 89
14 89	17 89	13 78	34 68	34 89	13 69	5	247 89	247 89
45 89	89	58	2	7	59	6	1	3

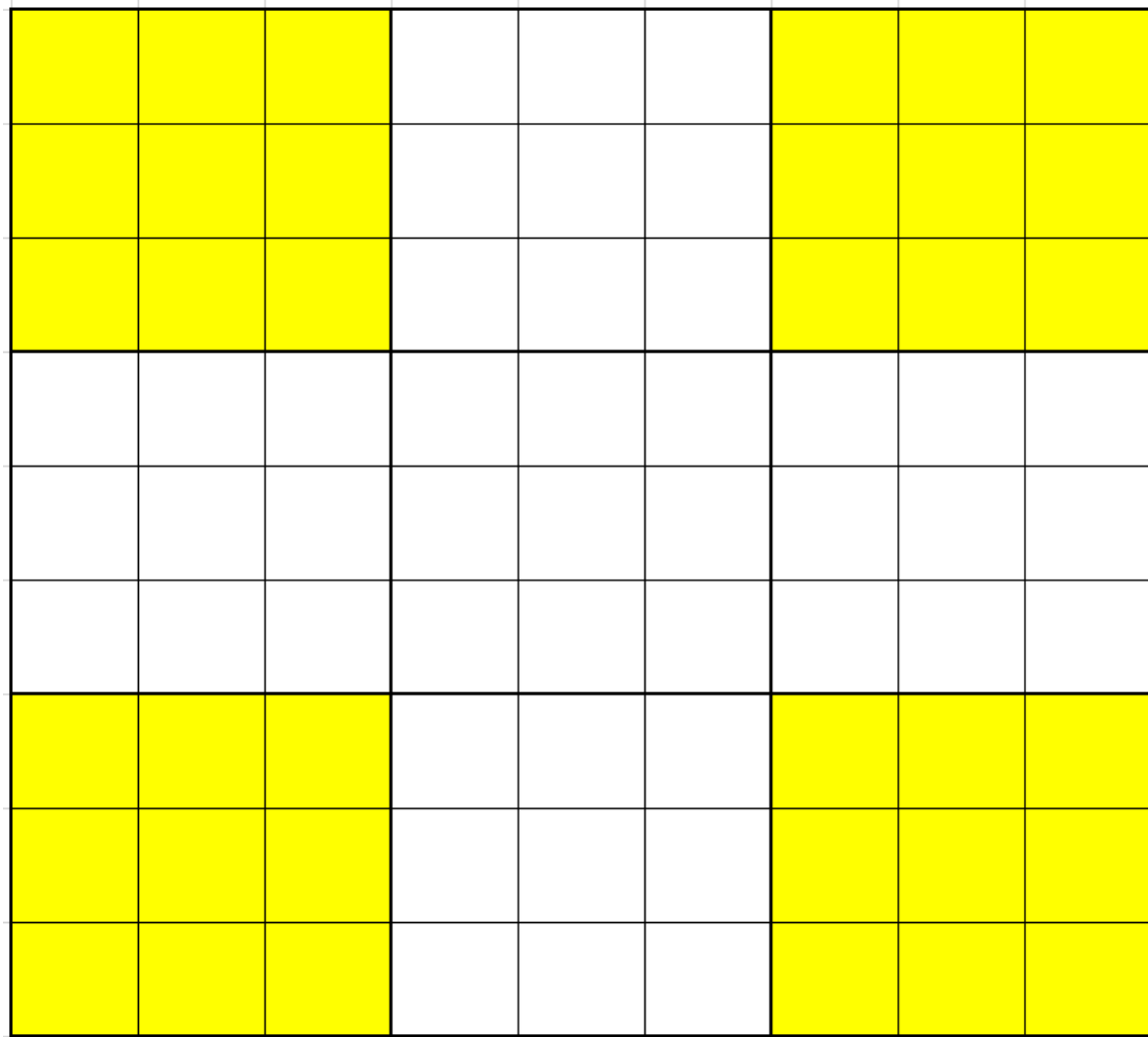
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18	18	2	$\frac{3}{67}$	37	36	9	5	4
3	6	9	$\frac{4}{57}$	$\frac{24}{57}$	25	7	8	1
$\frac{2}{89}$	3	78	1	6	29	48	$\frac{24}{79}$	5
$\frac{125}{89}$	4	$\frac{1}{58}$	$\frac{3}{58}$	$\frac{235}{89}$	7	$\frac{1}{38}$	6	$\frac{2}{89}$
$\frac{125}{89}$	$\frac{17}{89}$	6	$\frac{3}{58}$	$\frac{235}{89}$	4	$\frac{1}{38}$	$\frac{12}{79}$	$\frac{27}{89}$
6	2	$\frac{135}{78}$	$\frac{34}{58}$	$\frac{345}{89}$	$\frac{13}{59}$	48	$\frac{4}{79}$	$\frac{7}{89}$
$\frac{14}{89}$	$\frac{17}{89}$	$\frac{13}{78}$	$\frac{34}{68}$	$\frac{34}{89}$	$\frac{13}{69}$	5	$\frac{24}{79}$	$\frac{27}{89}$
$\frac{45}{89}$	89	58	2	7	59	6	1	3

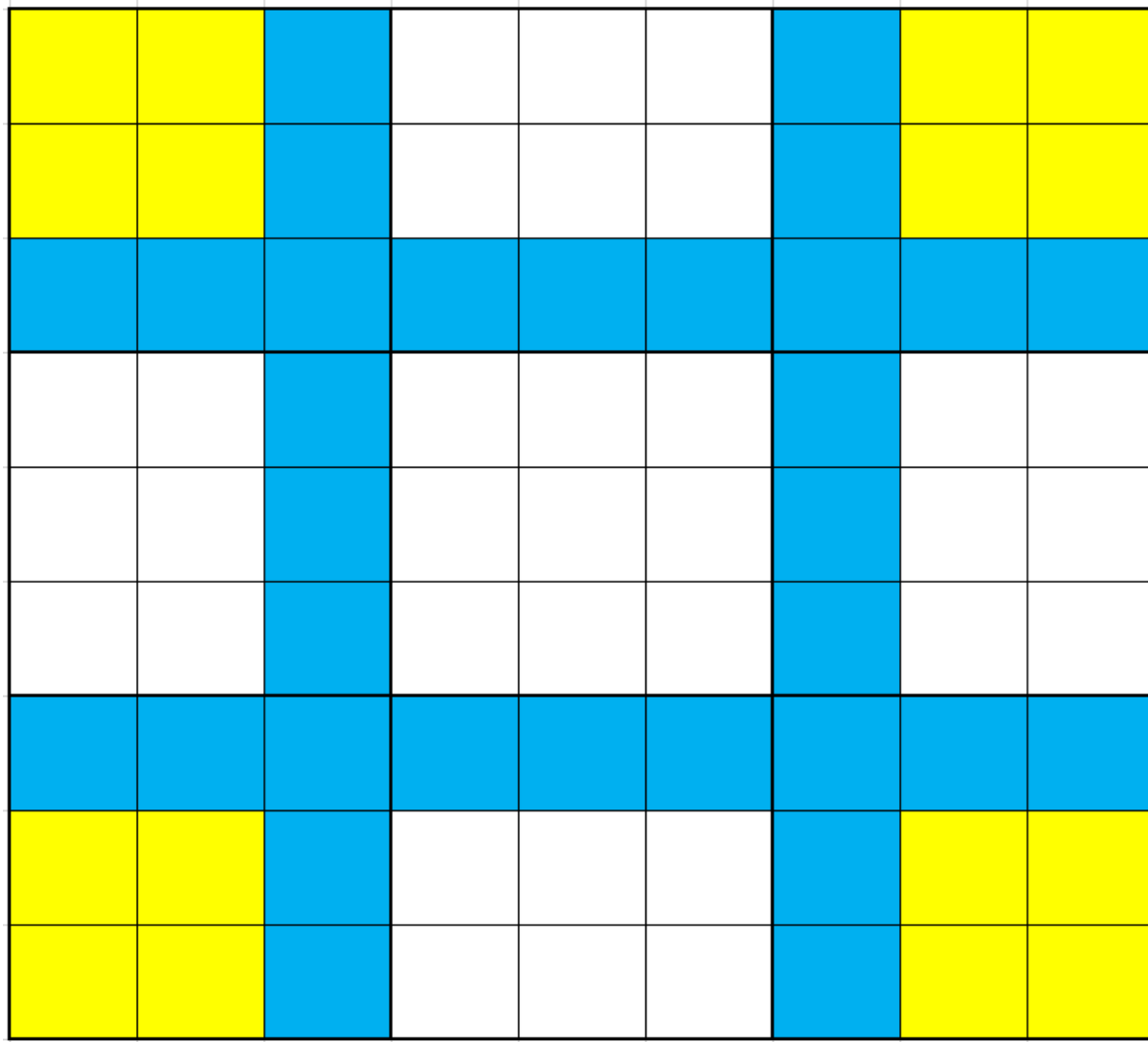
7	5	4	9	1	8	2	3	6
18	18	2	$\frac{3}{67}$	37	36	9	5	4
3	6	9	$\frac{4}{57}$	$\frac{24}{57}$	25	7	8	1
$\frac{2}{89}$	3	78	1	6	29	$\frac{48}{48}$	$\frac{24}{79}$	5
$\frac{125}{89}$	4	$\frac{1}{58}$	$\frac{3}{58}$	$\frac{235}{89}$	7	$\frac{1}{38}$	6	$\frac{2}{89}$
$\frac{125}{89}$	$\frac{17}{89}$	6	$\frac{3}{58}$	$\frac{235}{89}$	4	$\frac{1}{38}$	$\frac{12}{79}$	$\frac{27}{89}$
6	2	$\frac{135}{78}$	$\frac{34}{58}$	$\frac{345}{89}$	$\frac{13}{59}$	$\frac{48}{48}$	$\frac{4}{79}$	$\frac{7}{89}$
$\frac{14}{89}$	$\frac{17}{89}$	$\frac{13}{78}$	$\frac{34}{68}$	$\frac{34}{89}$	$\frac{13}{69}$	5	$\frac{24}{79}$	$\frac{27}{89}$
$\frac{45}{89}$	89	58	2	7	59	6	1	3

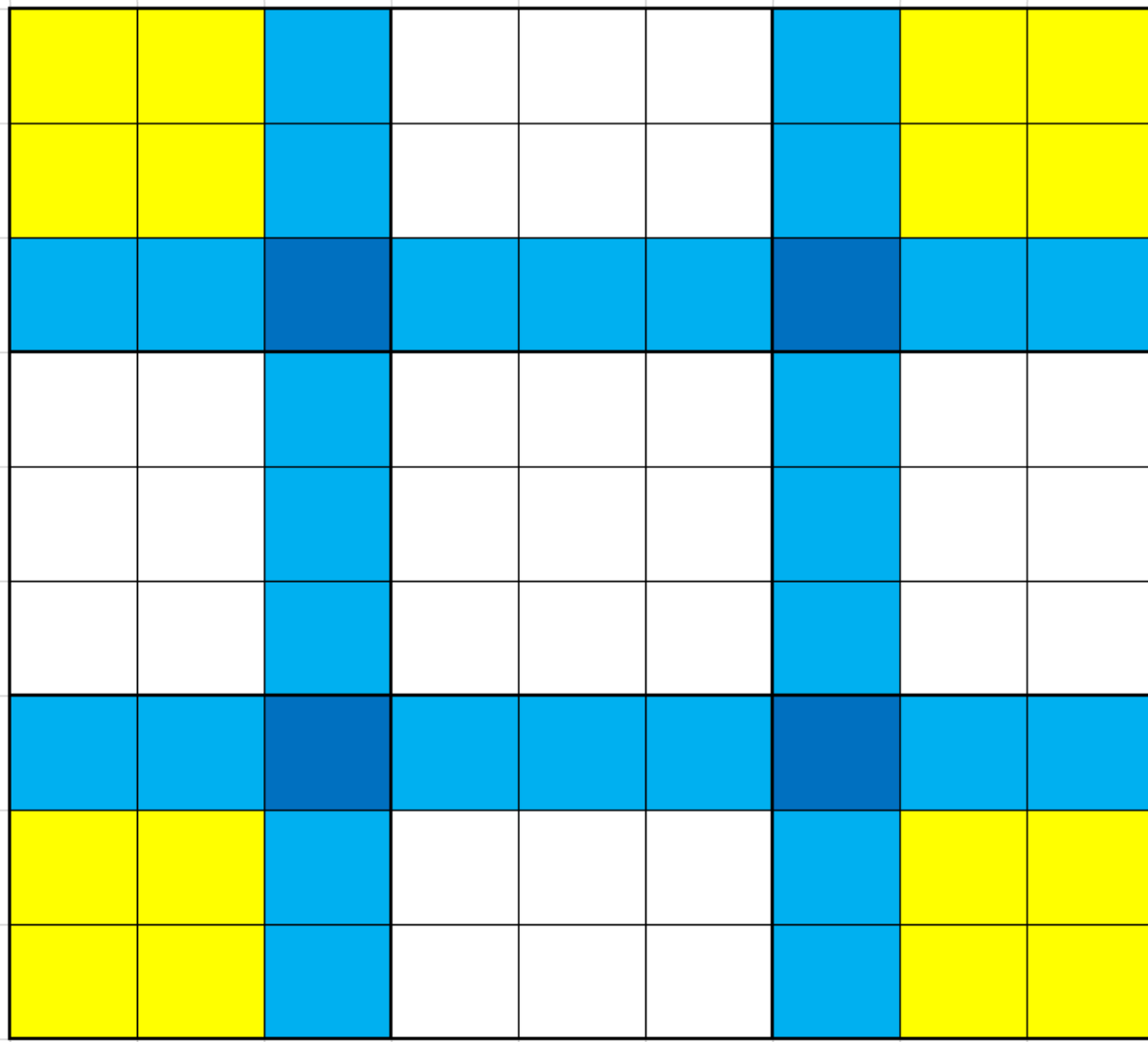
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18	18	2	$\frac{3}{67}$	37	36	9	5	4
3	6	9	$\frac{4}{57}$	$\frac{24}{57}$	25	7	8	1
$\frac{2}{89}$	3	$\frac{7}{8}$	1	6	29	$\frac{4}{8}$	$\frac{24}{79}$	5
$\frac{125}{89}$	4	18	$\frac{3}{58}$	$\frac{235}{89}$	7	$\frac{1}{38}$	6	$\frac{2}{89}$
$\frac{125}{89}$	$\frac{17}{89}$	6	$\frac{3}{58}$	$\frac{235}{89}$	4	$\frac{1}{38}$	$\frac{12}{79}$	$\frac{27}{89}$
6	2	$\frac{135}{78}$	$\frac{34}{58}$	$\frac{345}{89}$	$\frac{13}{59}$	$\frac{4}{8}$	$\frac{7}{89}$	
$\frac{1}{89}$	$\frac{17}{89}$	$\frac{13}{78}$	$\frac{34}{68}$	$\frac{34}{89}$	$\frac{13}{69}$	5	$\frac{24}{79}$	$\frac{27}{89}$
4	$\frac{8}{9}$	$\frac{5}{8}$	2	7	59	6	1	3

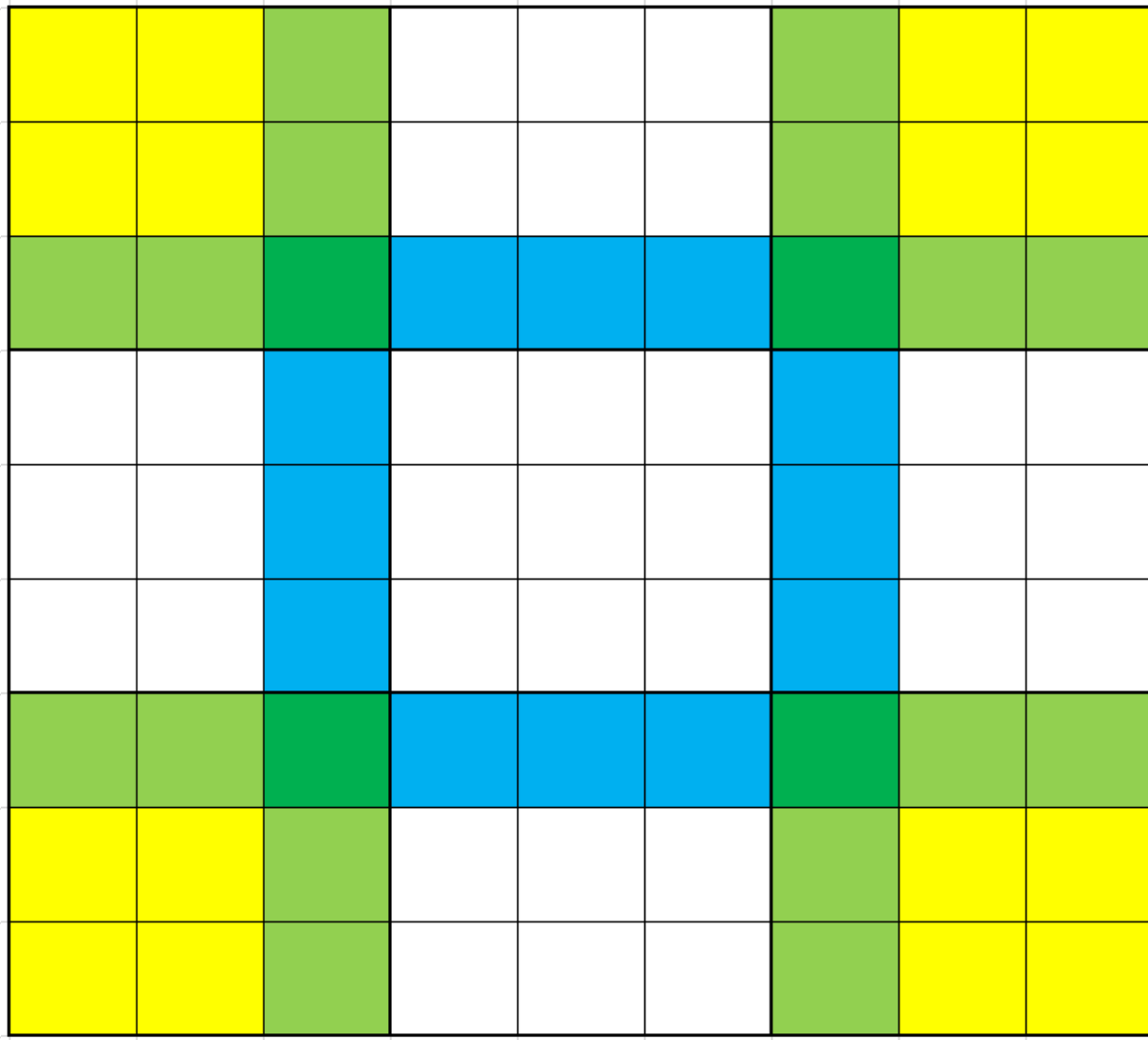
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3	6	9	$\begin{smallmatrix} 4 \\ 57 \end{smallmatrix}$	$\begin{smallmatrix} 24 \\ 57 \end{smallmatrix}$	25	7	8	1
$\begin{smallmatrix} 2 \\ 89 \end{smallmatrix}$	3	78	1	6	29	48	$\begin{smallmatrix} 24 \\ 79 \end{smallmatrix}$	5
$\begin{smallmatrix} 125 \\ 89 \end{smallmatrix}$	4	18	$\begin{smallmatrix} 3 \\ 58 \end{smallmatrix}$	$\begin{smallmatrix} 235 \\ 89 \end{smallmatrix}$	7	13	6	$\begin{smallmatrix} 2 \\ 89 \end{smallmatrix}$
$\begin{smallmatrix} 125 \\ 89 \end{smallmatrix}$	$\begin{smallmatrix} 17 \\ 89 \end{smallmatrix}$	6	$\begin{smallmatrix} 3 \\ 58 \end{smallmatrix}$	$\begin{smallmatrix} 235 \\ 89 \end{smallmatrix}$	4	13	$\begin{smallmatrix} 2 \\ 79 \end{smallmatrix}$	$\begin{smallmatrix} 27 \\ 89 \end{smallmatrix}$
6	2	$\begin{smallmatrix} 135 \\ 78 \end{smallmatrix}$	$\begin{smallmatrix} 34 \\ 58 \end{smallmatrix}$	$\begin{smallmatrix} 345 \\ 89 \end{smallmatrix}$	13	48	$\begin{smallmatrix} 4 \\ 79 \end{smallmatrix}$	$\begin{smallmatrix} 7 \\ 89 \end{smallmatrix}$
$\begin{smallmatrix} 1 \\ 89 \end{smallmatrix}$	$\begin{smallmatrix} 17 \\ 89 \end{smallmatrix}$	$\begin{smallmatrix} 13 \\ 78 \end{smallmatrix}$	$\begin{smallmatrix} 34 \\ 68 \end{smallmatrix}$	$\begin{smallmatrix} 34 \\ 89 \end{smallmatrix}$	$\begin{smallmatrix} 1 \\ 36 \end{smallmatrix}$	5	$\begin{smallmatrix} 24 \\ 79 \end{smallmatrix}$	$\begin{smallmatrix} 27 \\ 89 \end{smallmatrix}$
4	89	58	2	7	59	6	1	3

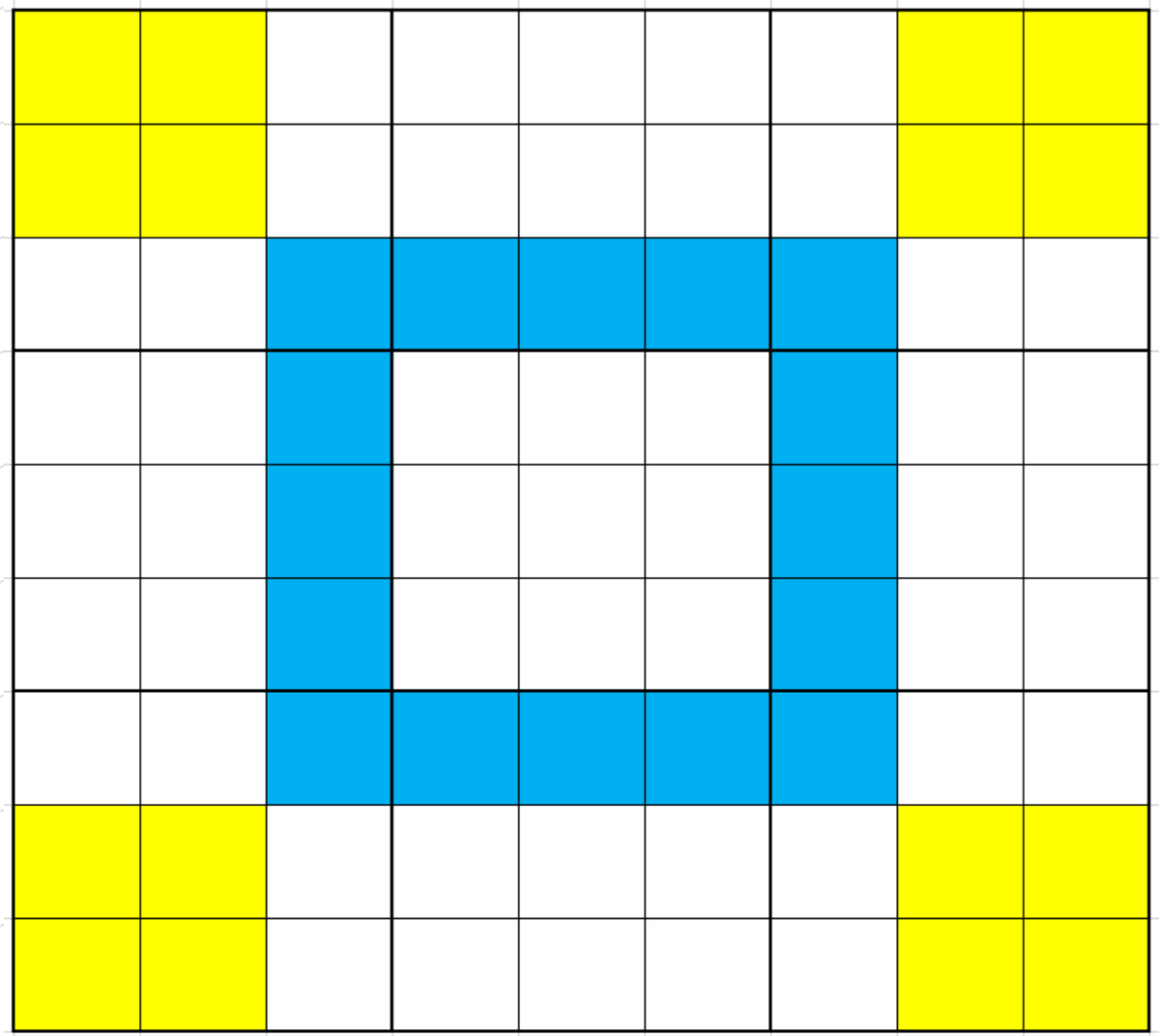












Miért matek?

6,670,903,752,021,072,936,960

100,000,000,000

5,472,730,538

1	3	7	9	8	6	4	5	2
9	2	5	3	4	7	1	6	8
8	6	4	5	2	1	9	7	3
7	5	3	8	1	4	6	2	9
6	1	2	7	3	9	8	4	5
4	8	9	6	5	2	3	1	7
5	7	1	4	9	3	2	8	6
2	9	8	1	6	5	7	3	4
3	4	6	2	7	8	5	9	1

7	3	5	6	1	2			4
6	4	9	3	8	5	1	2	7
1	2	8	4	7	9	3	5	6
2	5	1	9	6	3	7	4	8
4	9	6	8	2	7	5	3	1
8	7	3	1	5	4	2	6	9
9	8	4	2	3	1	6	7	5
5	1	2	7	4	6			3
3	6	7	5	9	8	4	1	2

a_{11}	a_{12}	a_{13}	a_{14}
a_{21}	a_{22}	a_{23}	a_{24}
a_{31}	a_{32}	a_{33}	a_{34}
a_{41}	a_{42}	a_{43}	a_{44}

$$A = \begin{bmatrix} A_{11} & A_{12} & A_{13} & A_{14} \\ A_{21} & A_{22} & A_{23} & A_{24} \\ A_{31} & A_{32} & A_{33} & A_{34} \\ A_{41} & A_{42} & A_{43} & A_{44} \end{bmatrix}$$

a_{11}	a_{12}	b_{13}	b_{14}
a_{21}	a_{22}	b_{23}	b_{24}
c_{31}	c_{32}	d_{33}	d_{34}
c_{41}	c_{42}	d_{43}	d_{44}

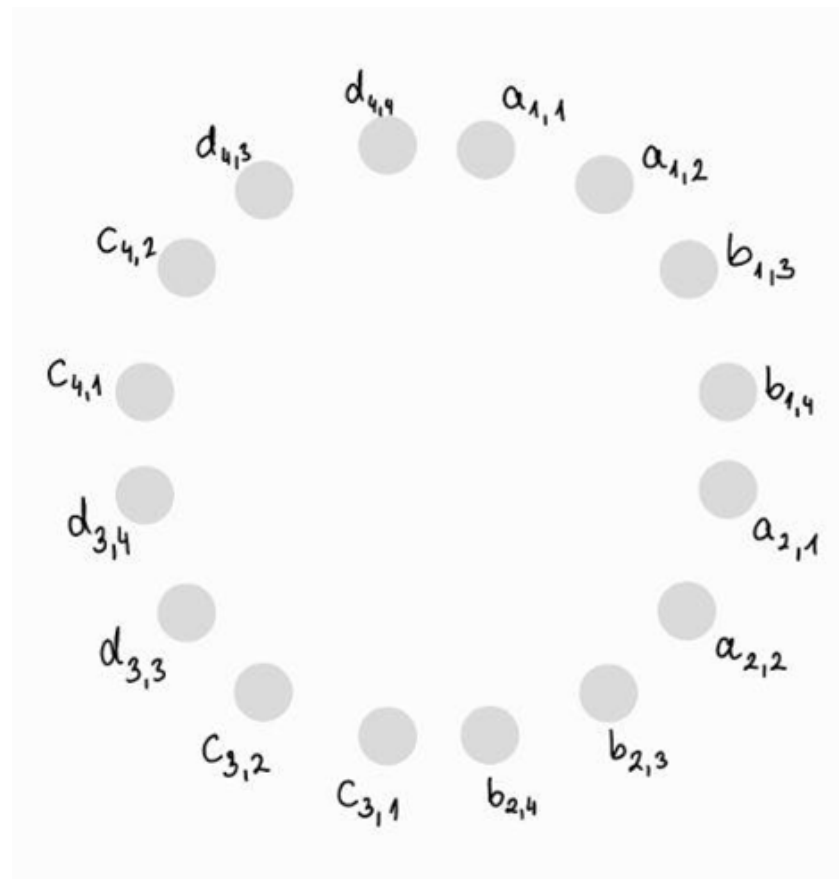
1		3	
		1	
4			3
	2		

$$\begin{bmatrix} 1 & - & 3 & - \\ - & - & 1 & - \\ 4 & - & - & 3 \\ - & 2 & - & - \end{bmatrix}$$

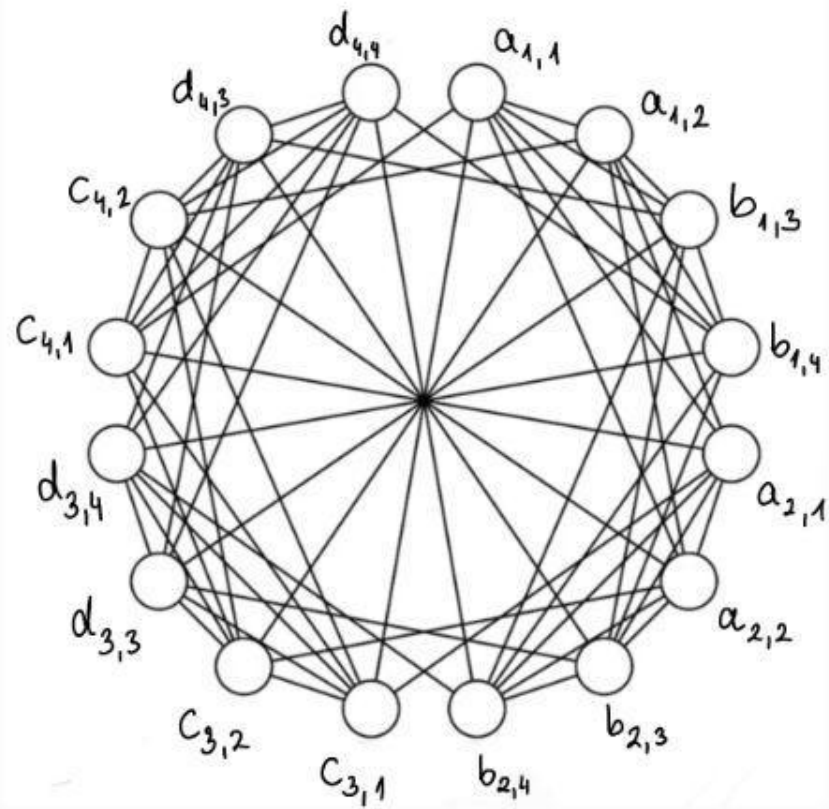
$$A = \begin{bmatrix} 1 & - \\ - & - \end{bmatrix} \quad B = \begin{bmatrix} 3 & - \\ 1 & - \end{bmatrix} \quad C = \begin{bmatrix} 4 & - \\ - & 2 \end{bmatrix} \quad D = \begin{bmatrix} - & 3 \\ - & - \end{bmatrix}$$

a_{11}	a_{12}	b_{13}	b_{14}
a_{21}	a_{22}	b_{23}	b_{24}
c_{31}	c_{32}	d_{33}	d_{34}
c_{41}	c_{42}	d_{43}	d_{44}

a_{11}	a_{12}	b_{13}	b_{14}
a_{21}	a_{22}	b_{23}	b_{24}
c_{31}	c_{32}	d_{33}	d_{34}
c_{41}	c_{42}	d_{43}	d_{44}



a_{11}	a_{12}	b_{13}	b_{14}
a_{21}	a_{22}	b_{23}	b_{24}
c_{31}	c_{32}	d_{33}	d_{34}
c_{41}	c_{42}	d_{43}	d_{44}

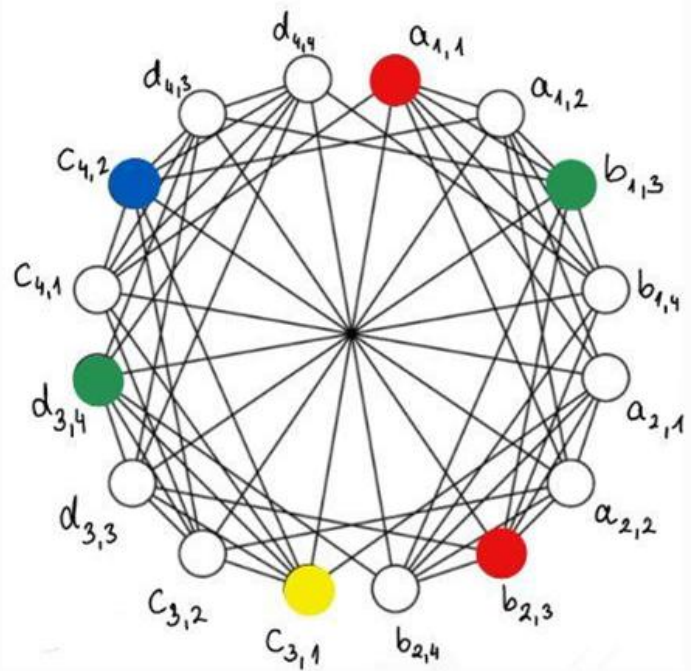


1		3	
		1	
4			3
	2		

1
2
3
4

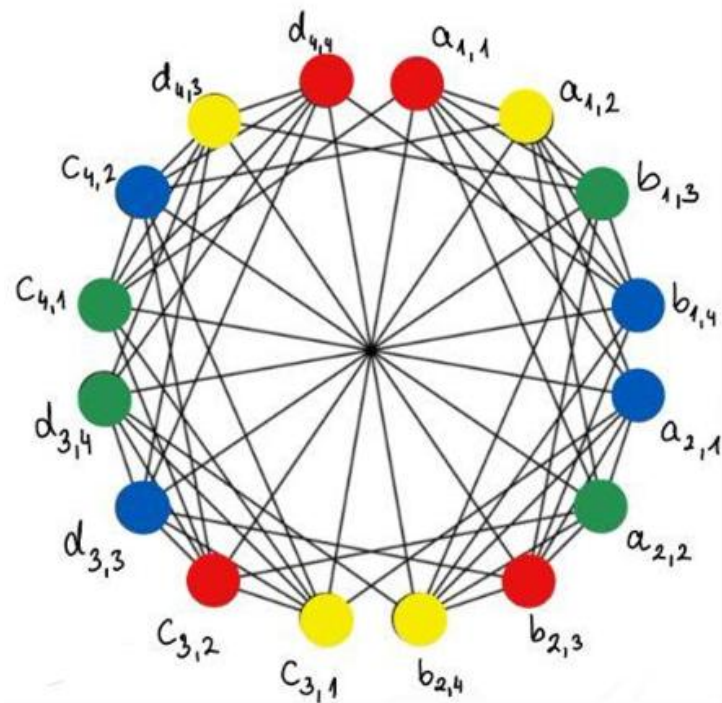
1		3	
		1	
4			3
	2		

1
2
3
4



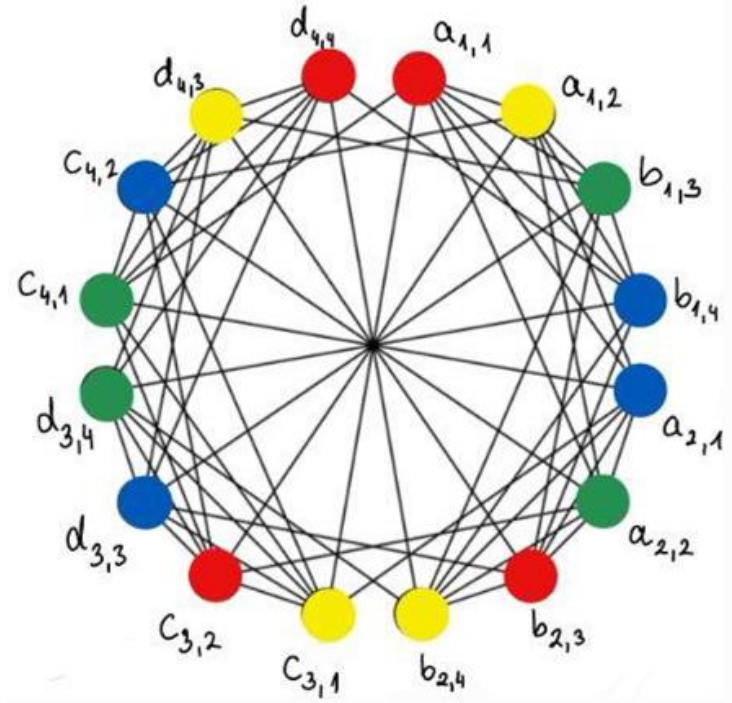
1		3	
		1	
4			3
	2		

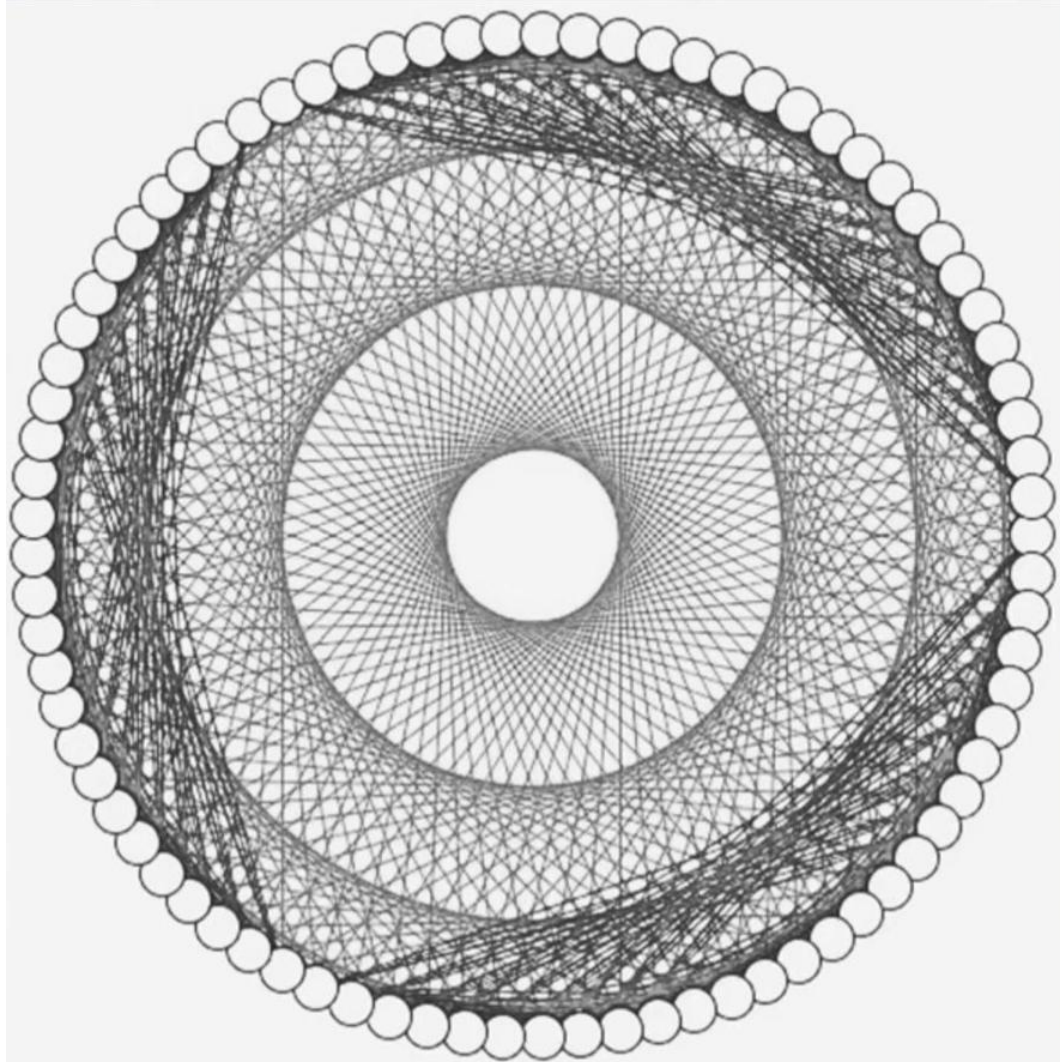
1
2
3
4



1	4	3	2
2	3	1	4
4	1	2	3
3	2	4	1

1
2
3
4





Petra források

<https://www.youtube.com/watch?v=h8Aulgkjylc>

<https://www.youtube.com/watch?v=KNcqE1t06aA>

<https://www.youtube.com/watch?v=pezlnN4X52g>

<https://pi.math.cornell.edu/~mec/Summer2009/Mahmood/Intro.html>

<https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1393&context=honors>

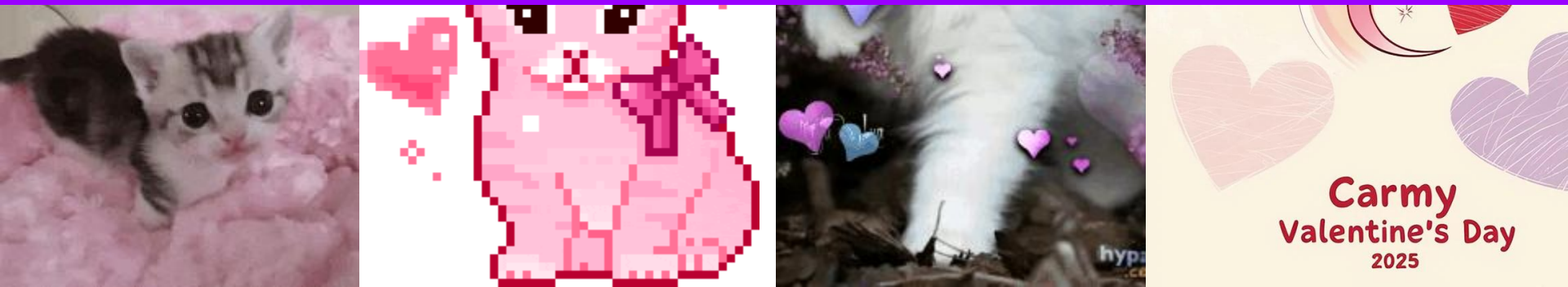
<https://web.mae.ufl.edu/uhk/SUDOKU.pdf>

<https://educ.jmu.edu/~arnoldea/cmjarnoldlucastaalman.pdf>

https://www.siue.edu/~aweyhau/teaching/seniorprojects/thomas_courtney_final.pdf



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Carmy
Valentine's Day
2025