

Polyomino Collinearity

(or: The Joy of Recreational Maths)

Dots on a Tiling

2024 Competition

by

Declan O'Donnell

Dots on a Tiling

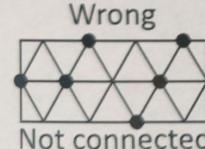
Place points on the vertices of the tiling such that:

- 1) All points are connected by the edges of length 1.
- 2) No 4 points are colinear

How many can points can you place?

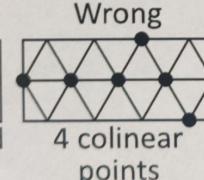
Prize: 3 mini Toblerones

Examples:



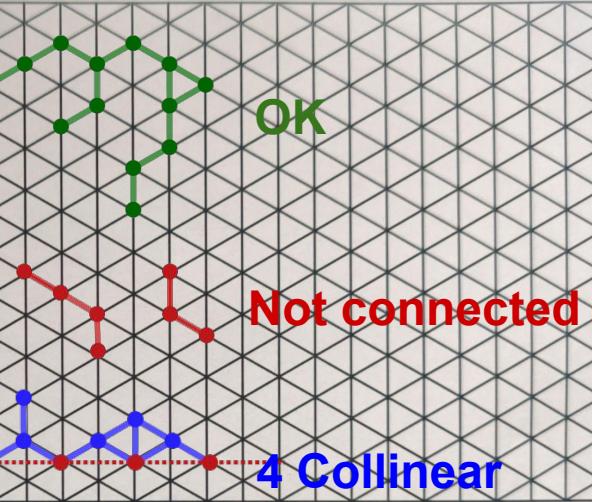
Wrong

Not connected



Wrong

4 colinear points



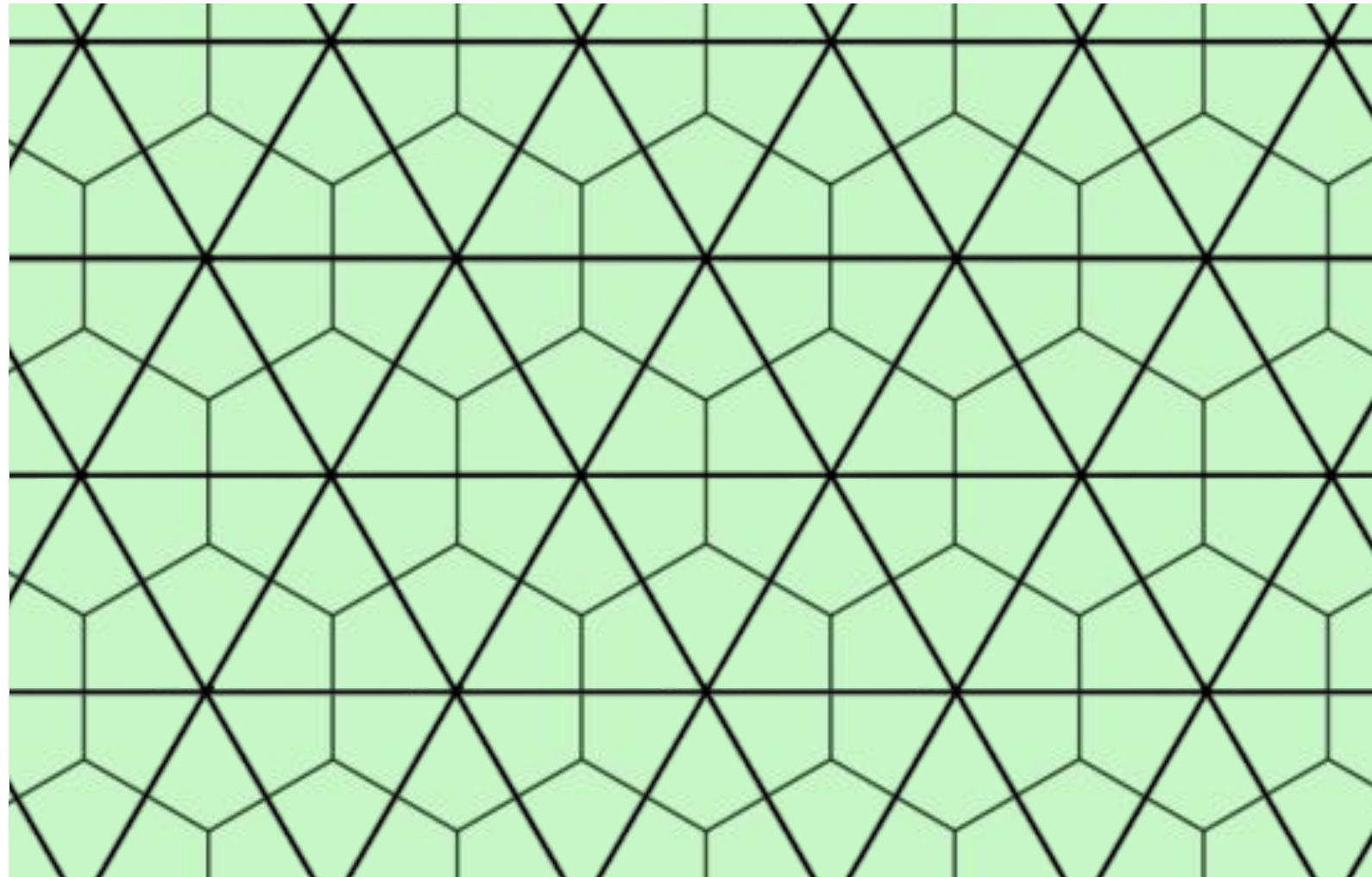
OK

Not connected

4 Collinear

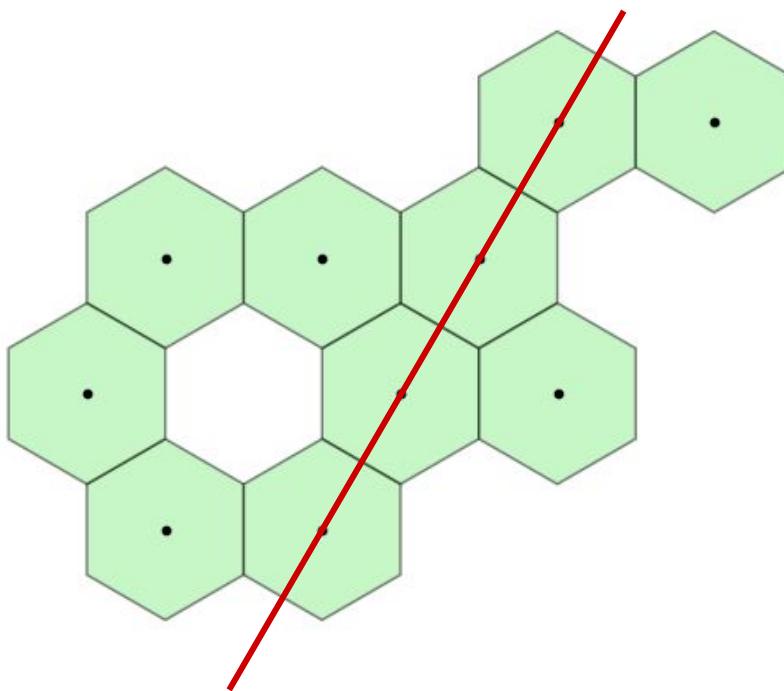
Name _____

Points _____



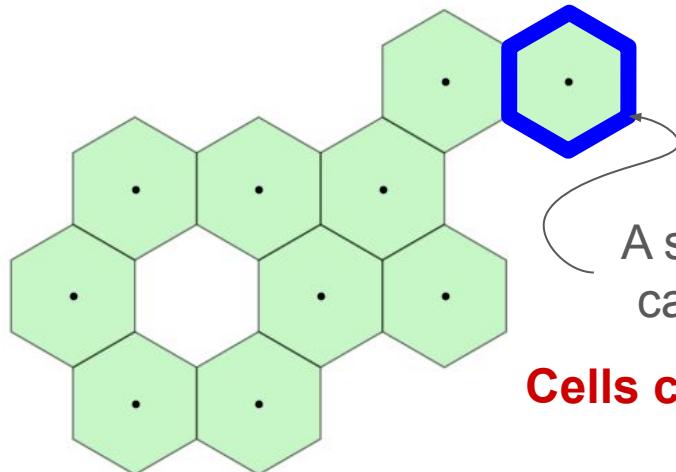
Make a single pattern of tiled hexagons

With no more than 3 tile centres on any line in the plane



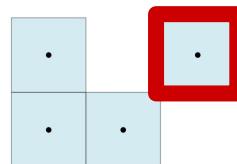
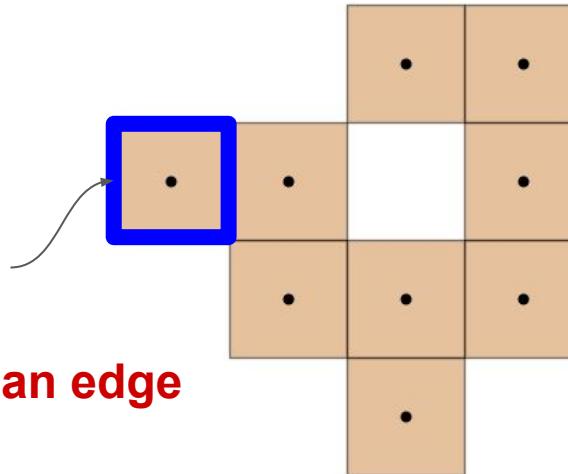
Pattern of Tiles = Polyomino

Hexagonal Polyomino (or Polyhex)

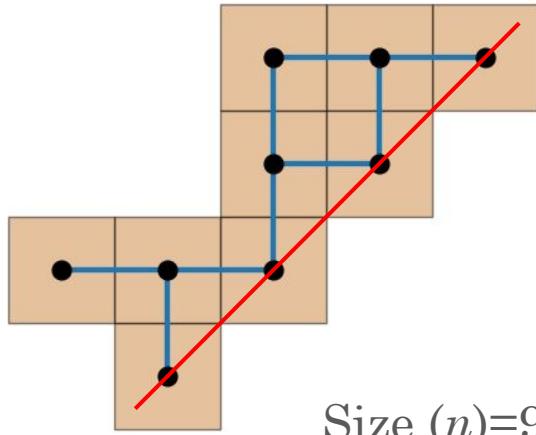


Cells connect via an edge

Square Polyomino (or Polyomino)



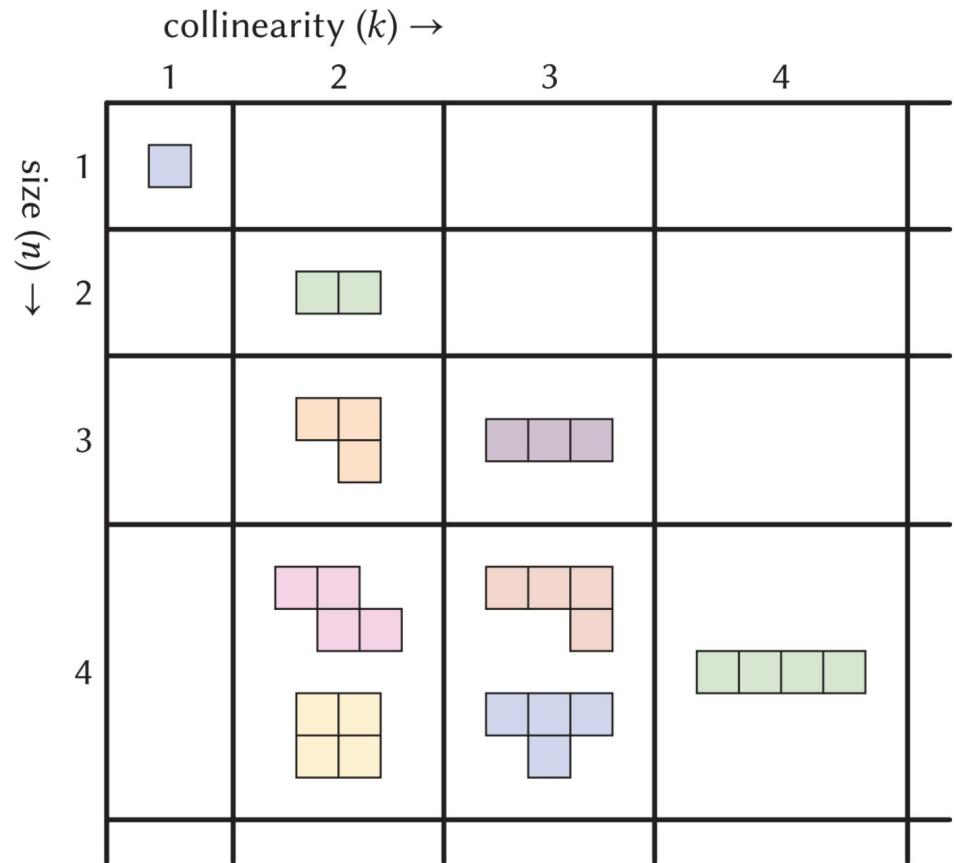
Not a polyomino - cell not connected

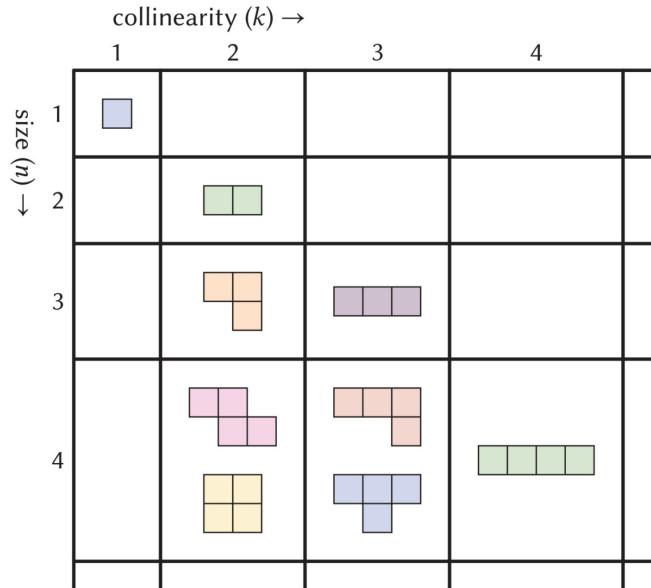


Collinearity (k)

The largest number of cell centres on any line in the plane.

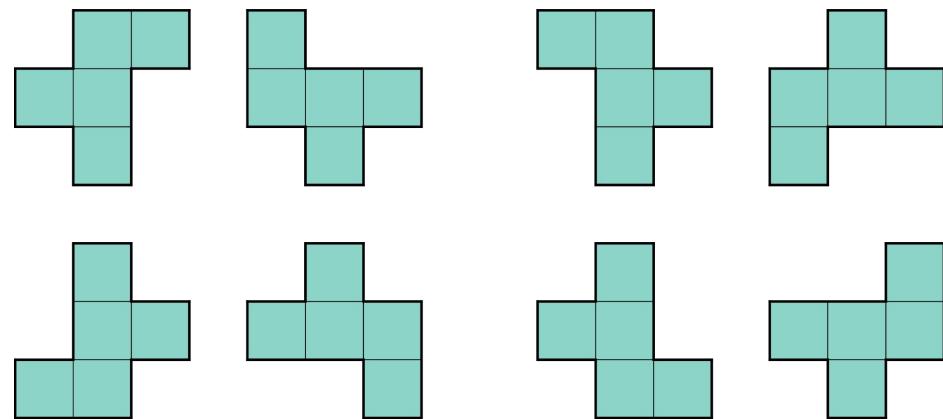
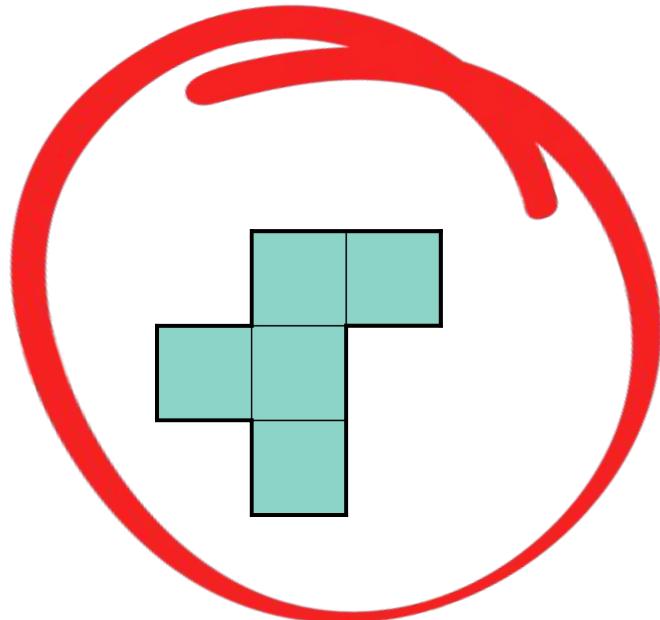
$$k = 4$$



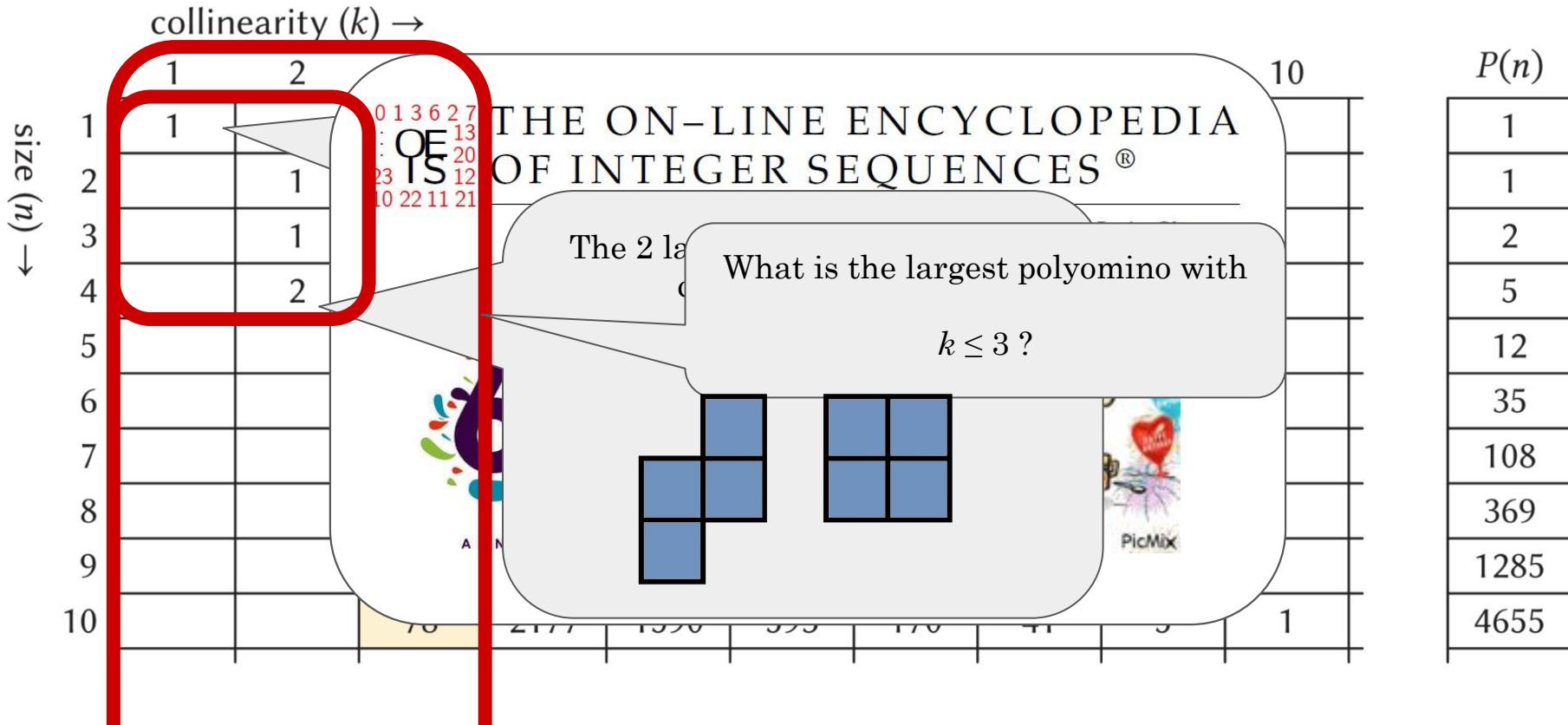
$$P(n,k) = \{ \text{ polyominoes with Size} = n \text{ and Collinearity} = k \}$$


n	k				$ P(n) $
	1	2	3	4	
1	1				1
2		1			1
3		1	1		2
4		2	2	1	5

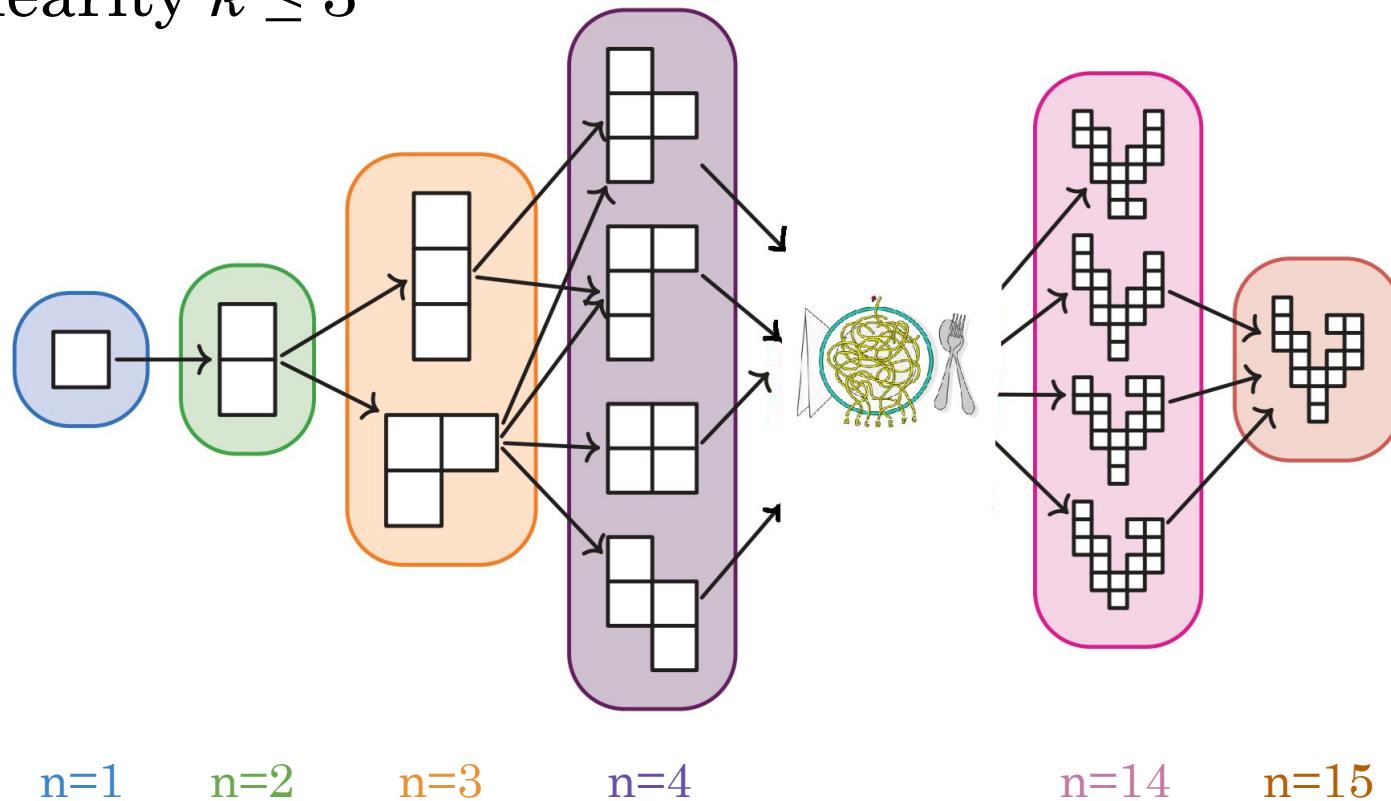
What am I Counting ?



$|P(n,k)|$ for the Square (oeis: A378169)

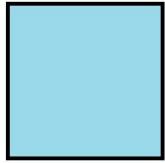


Collinearity $k \leq 3$



Largest square solutions for a limited collinearity (k)

$k \leq 1$



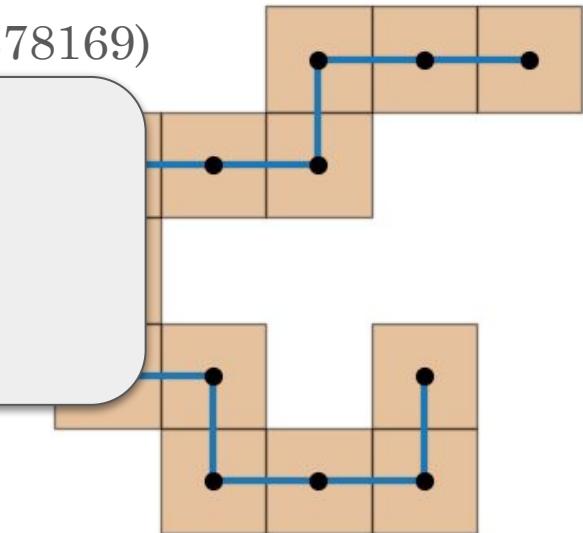
$k \leq 2$



$k \leq 3$

(oeis: A378169)

$k \leq 4 ?$



$n = 1$

$n = 4$

$n = 15$

tinyurl.com/comp-polyfiller



Poly Filler

Poly Filler

Hi 😊

Hope your are settling into the weekend and up for some puzzling!

💡

To win this competition, find the largest polyomino that has no more than 4 cell centres collinear on any line in the plane.

This single page app will save you piles of screwed up paper 📄 and allow to submit your entry without having to draw it out.

Ties will be resolved using the order they were submitted. So get your skates on 🎩

Click ? help for more details on things.

Ok, I got it

Close

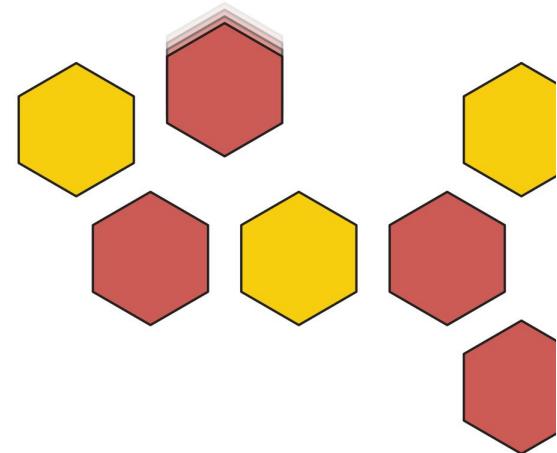
A screenshot of a mobile application window titled "Poly Filler". The window contains text instructions and a small icon of a thinking person. Below the text is a green 4x4 square grid with a single black dot in its center. At the bottom of the window are two buttons: "Ok, I got it" and "Close".



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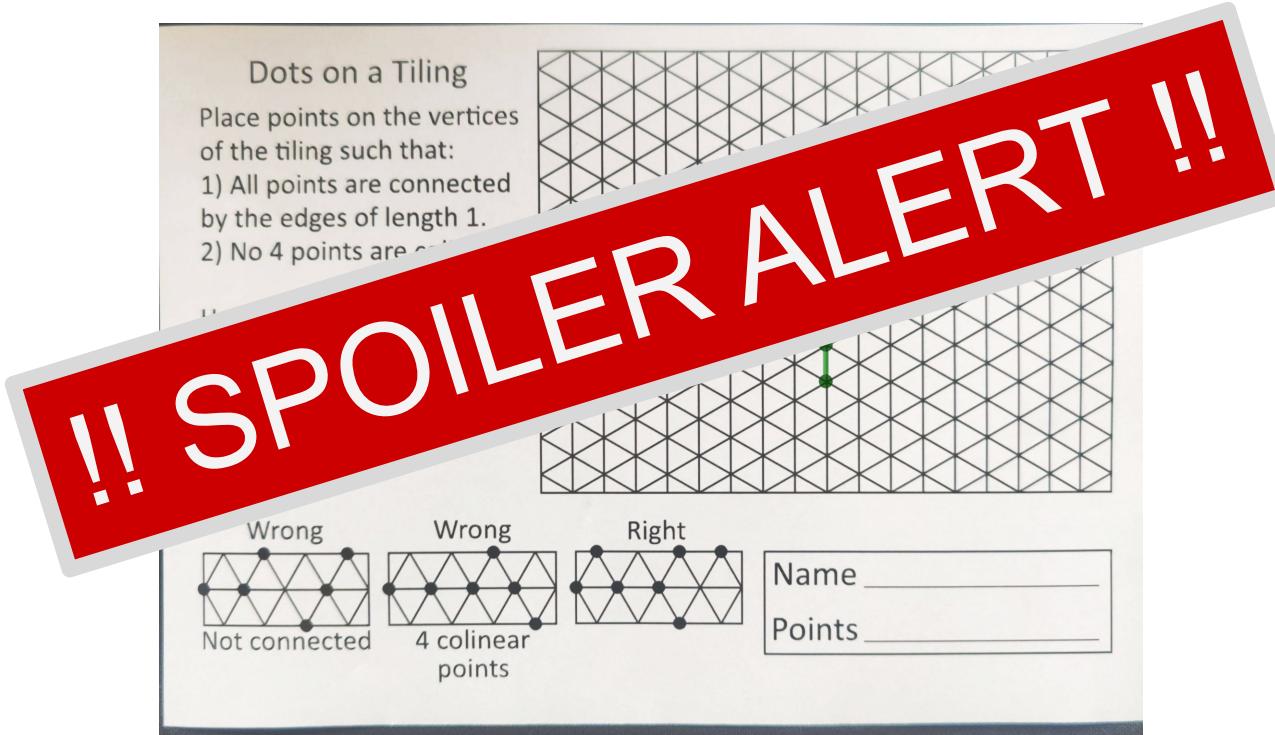
Don't connect four

Hexagon: Largest solutions for $k \leq 3$

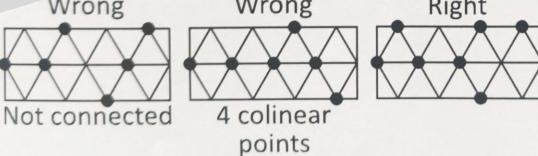
Dots on a Tiling
Place points on the vertices of the tiling such that:

- 1) All points are connected by the edges of length 1.
- 2) No 4 points are collinear.

!! SPOILER ALERT !!



Wrong Wrong Right

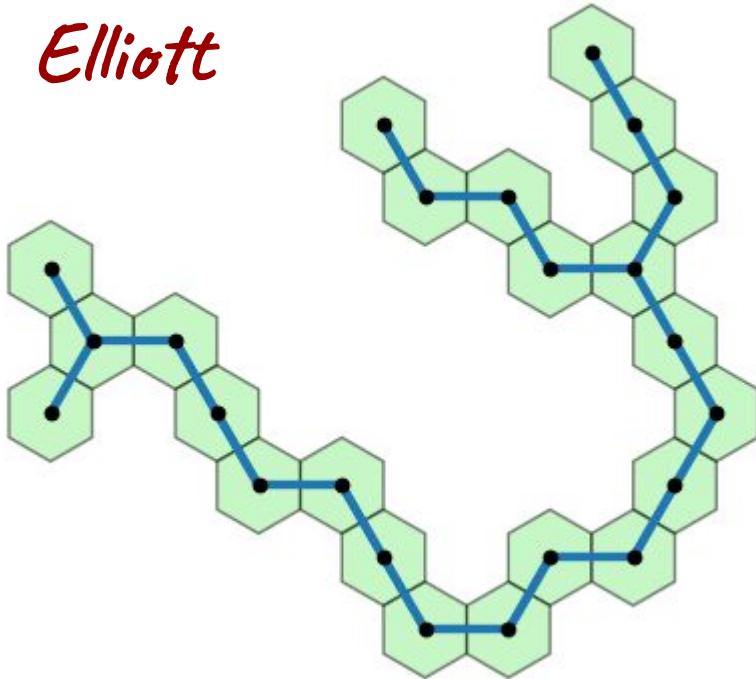


Not connected 4 colinear points

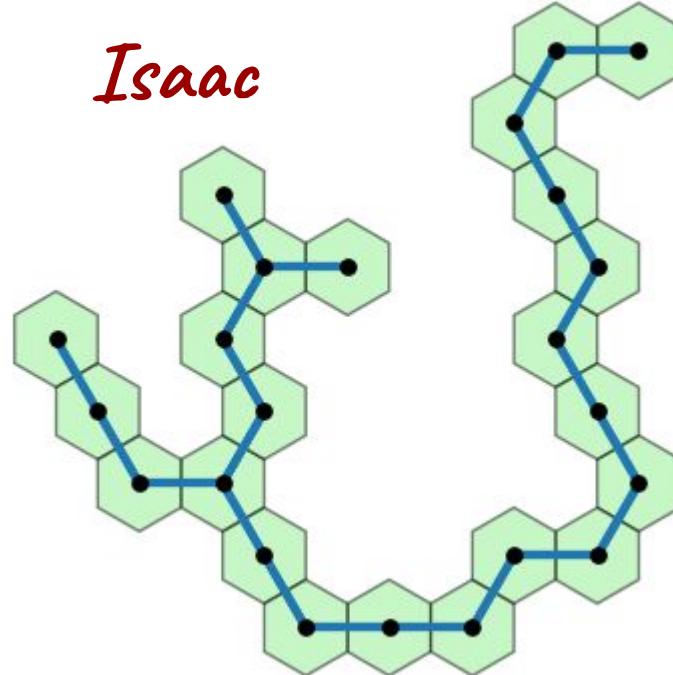
Name _____
Points _____

Hexagon: Largest solutions for $k \leq 3$

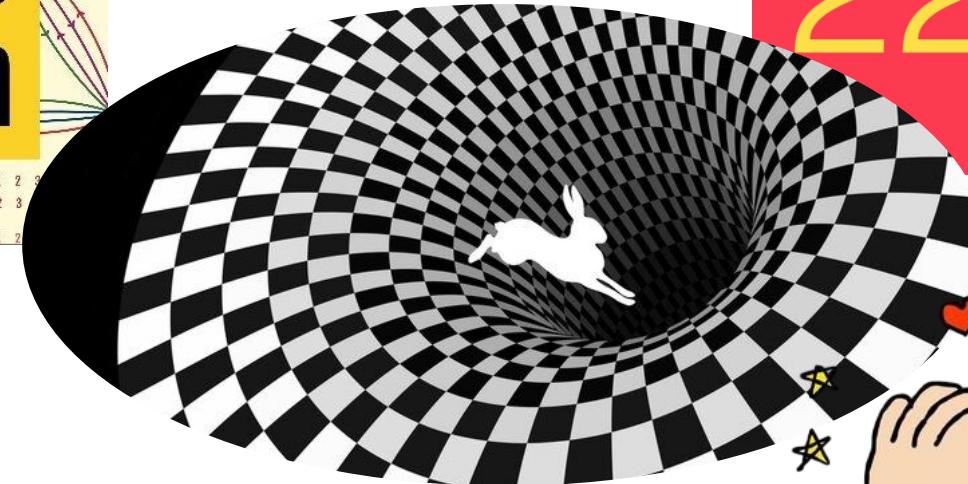
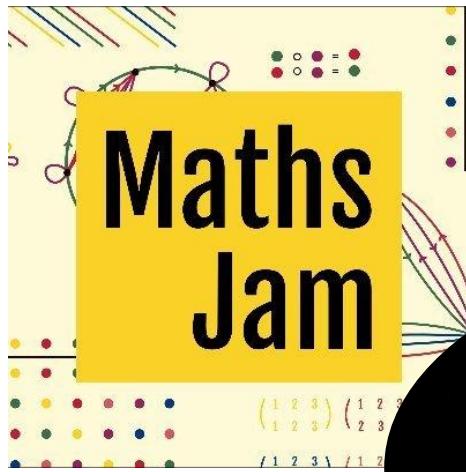
Elliott



Isaac



23



0 1 3 6 2 7
OEIS
13 20
23 12
10 22 11 21

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