

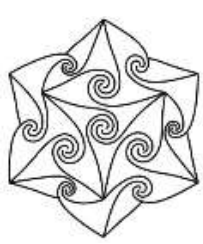
Education Through Origami, My New Origami Book

Krystyna Burczyk, Wojciech Burczyk

burczyk@mail.zetosa.com.pl

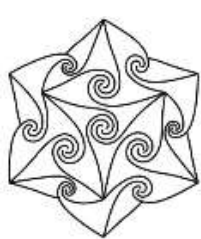
www.origami.edu.pl

Didaktik des Falten,
Freiburg im Breisgau, 2013



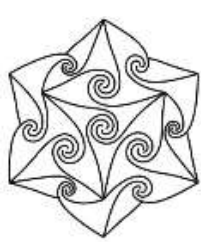
Origin of the book

- **A publisher approach to write a book on origami for teachers**
- **The publisher specializes in collection of math problems for secondary and high school (K7-12) students**



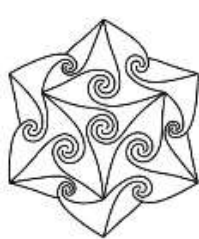
Target group for my book

- Gifted students
- Math teachers (no origami experience expected)
- Origami community (interested in math related models)
- Simple or medium advanced mathematics (below university level)



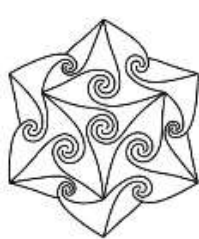
General idea

- Set of problems to be investigated
- Each problem suitable for different levels of education
- Problems may be studied in the classroom, as long term school projects or individually
- Detailed description of the basic problem + open questions suggesting further directions of investigation / possible problem extension



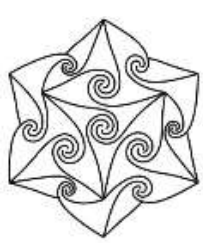
Paper mosaics

- Mosaics are both the title and leading motif
- 20 Problems
 1. Two crossed squares (math without borders)
 2. Flapping mosaic
 3. 3-4-6-8
 4. Poly-tiles
 5. Rhombic tiles
 6. Kite mosaic
 7. Quadrilateral tiles
 8. Hearth tangram
 9. Arrow mosaic

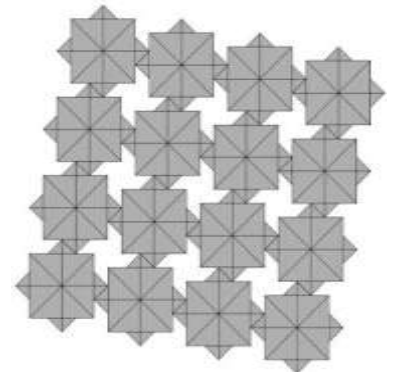
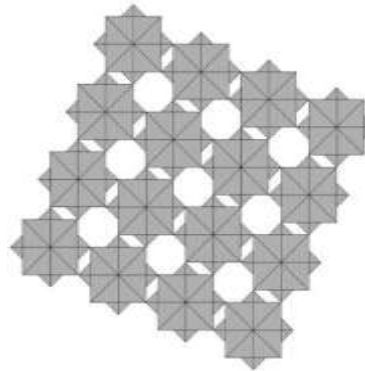
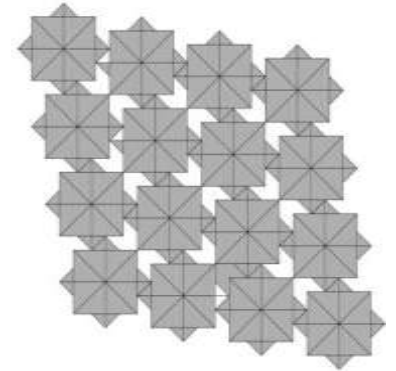
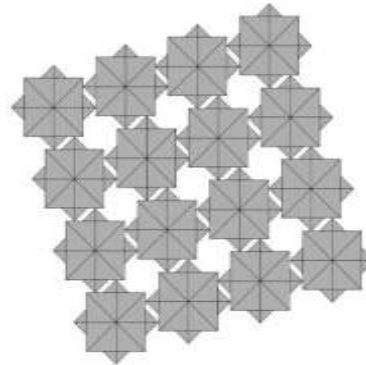
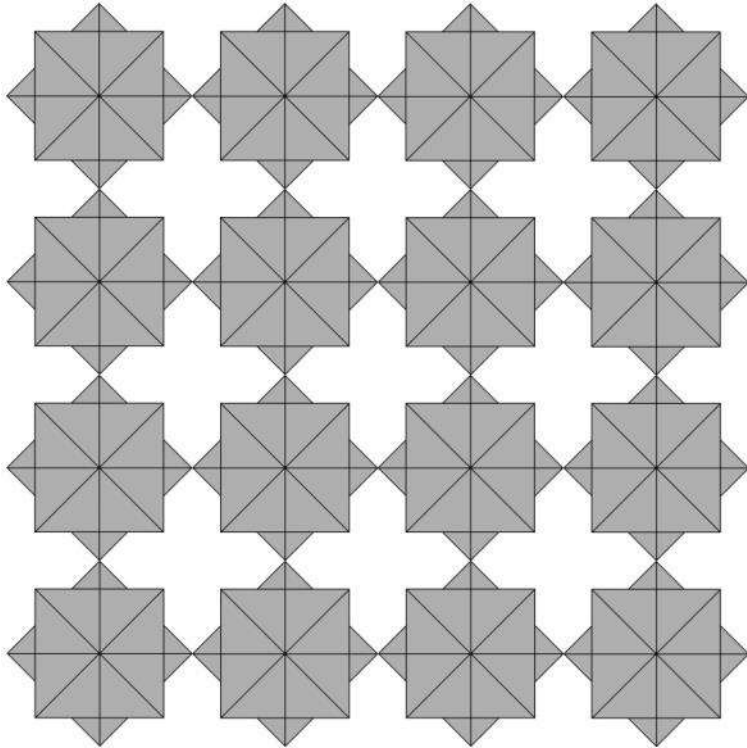


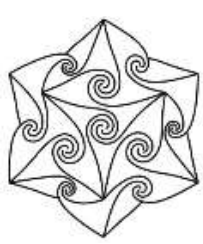
Paper mosaics

10. Square in square
11. Two lines in a square
12. Three scales tile
13. A new position of the point A
14. Trapezium tiles
15. Quadrilateral tiles
16. How many possibilities
17. Parallelogram
18. Section of a square into 9 pieces
19. A star in a square
20. “Wojtek” mosaic

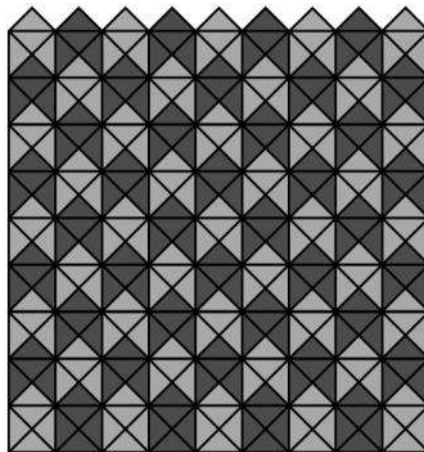
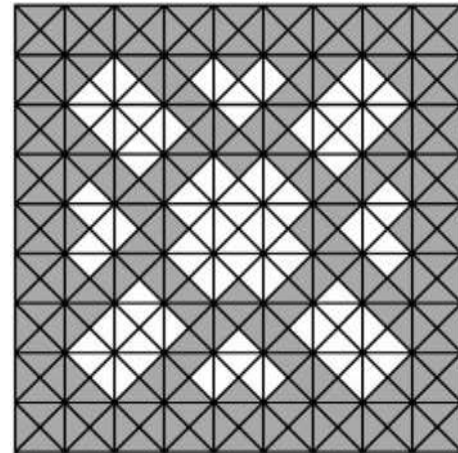
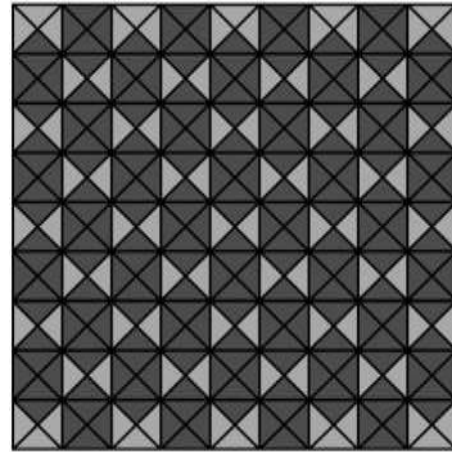
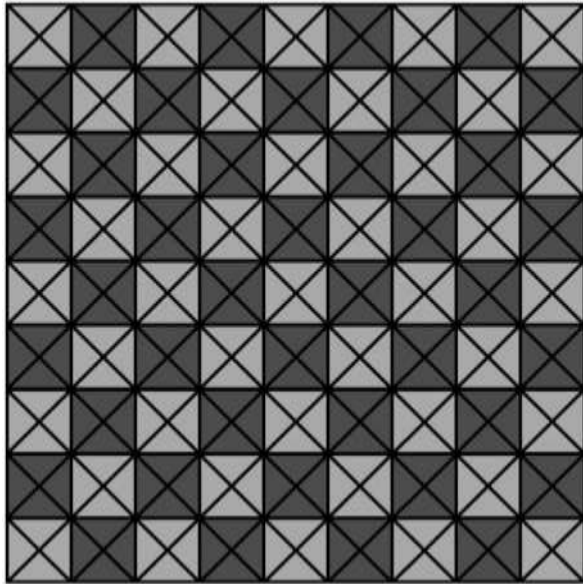


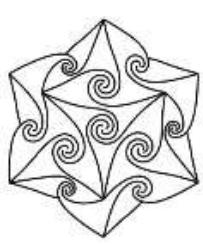
1. Two crossed squares (math without borders)





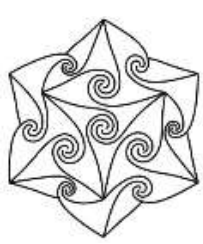
2. Flapping mosaic



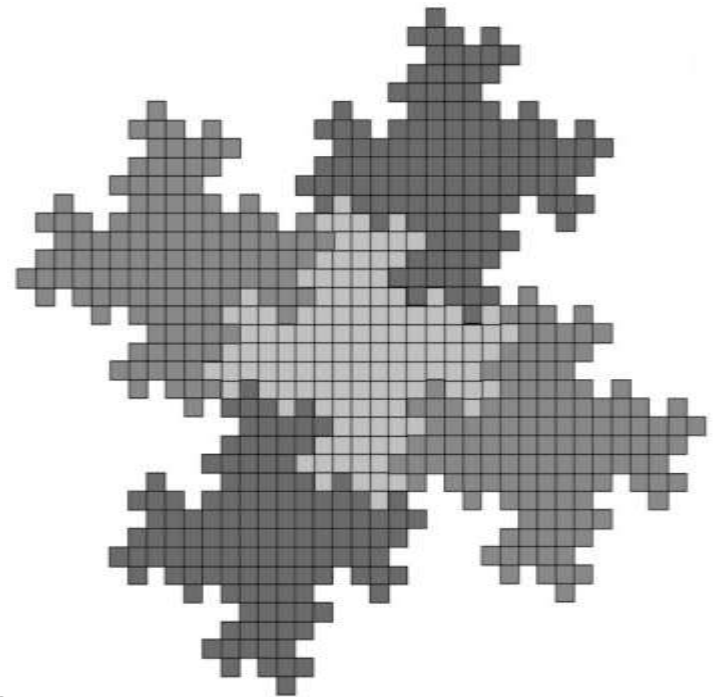
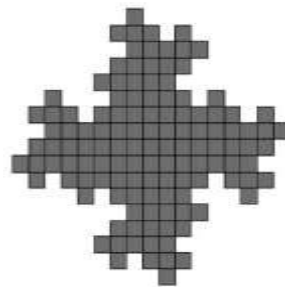
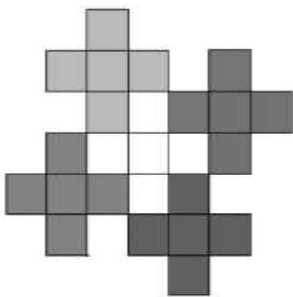
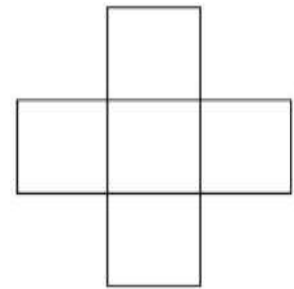


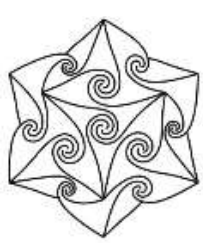
3. Mosaic 3-4-6-8



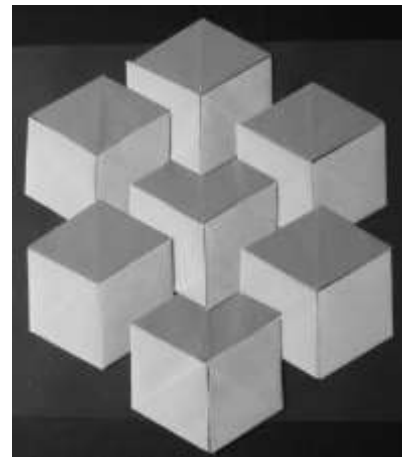
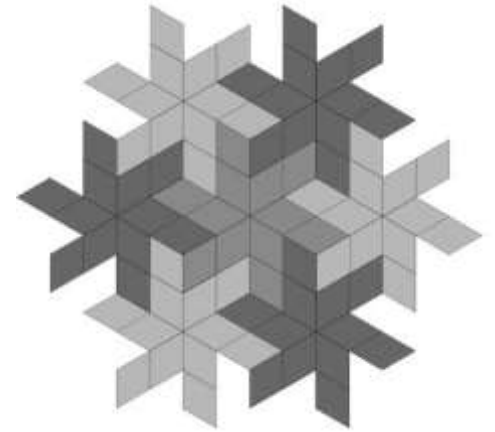


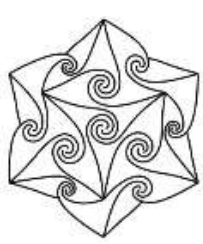
4. Poly-tiles



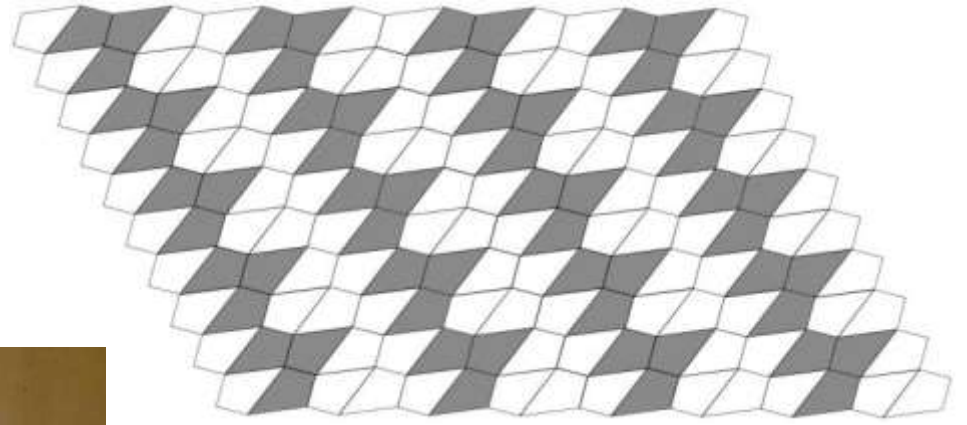


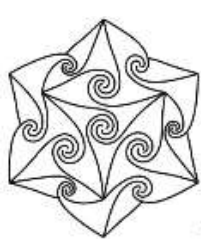
5. Rhombic and kite tiles



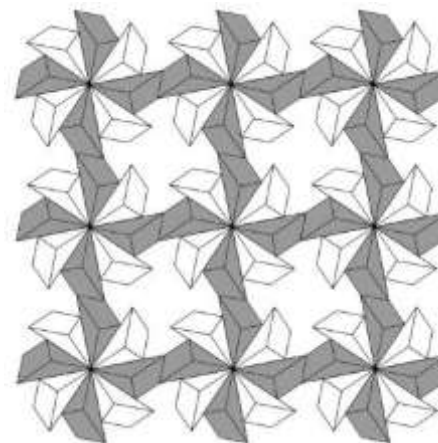
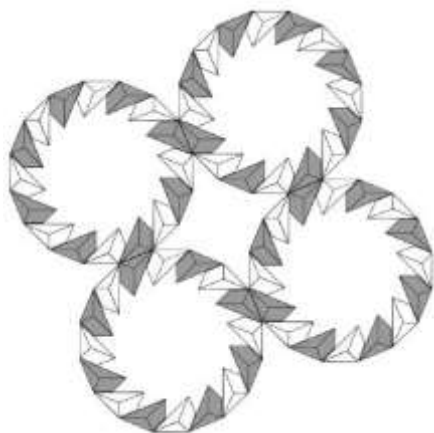
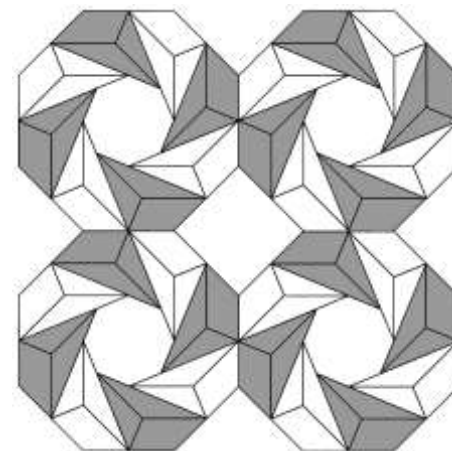
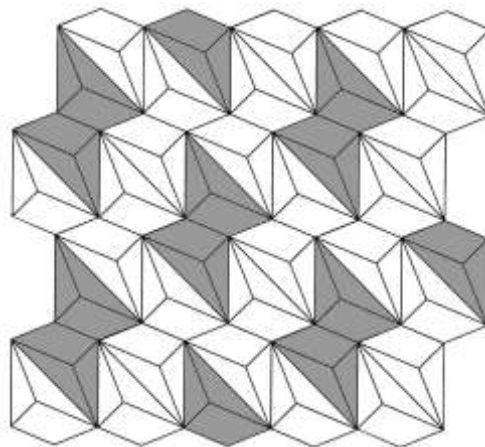
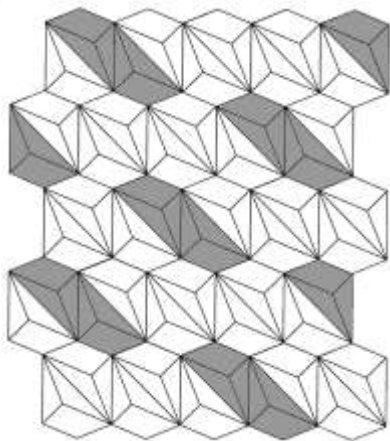


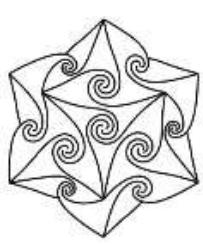
6. Kite mosaic





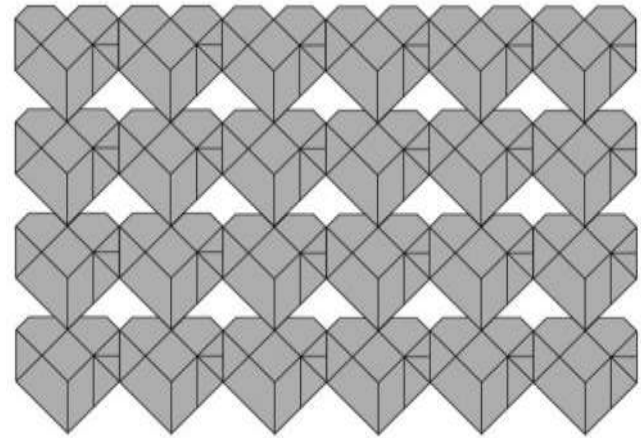
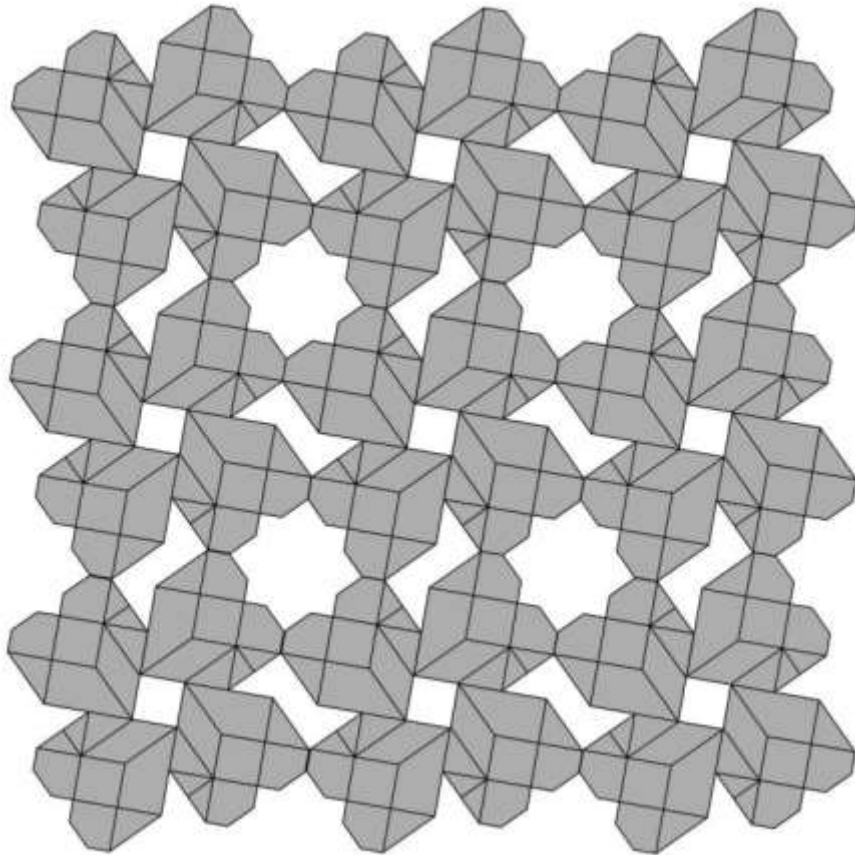
7. Quadrilateral tiles

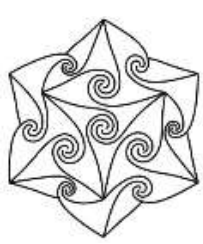




8. Hearth tangram

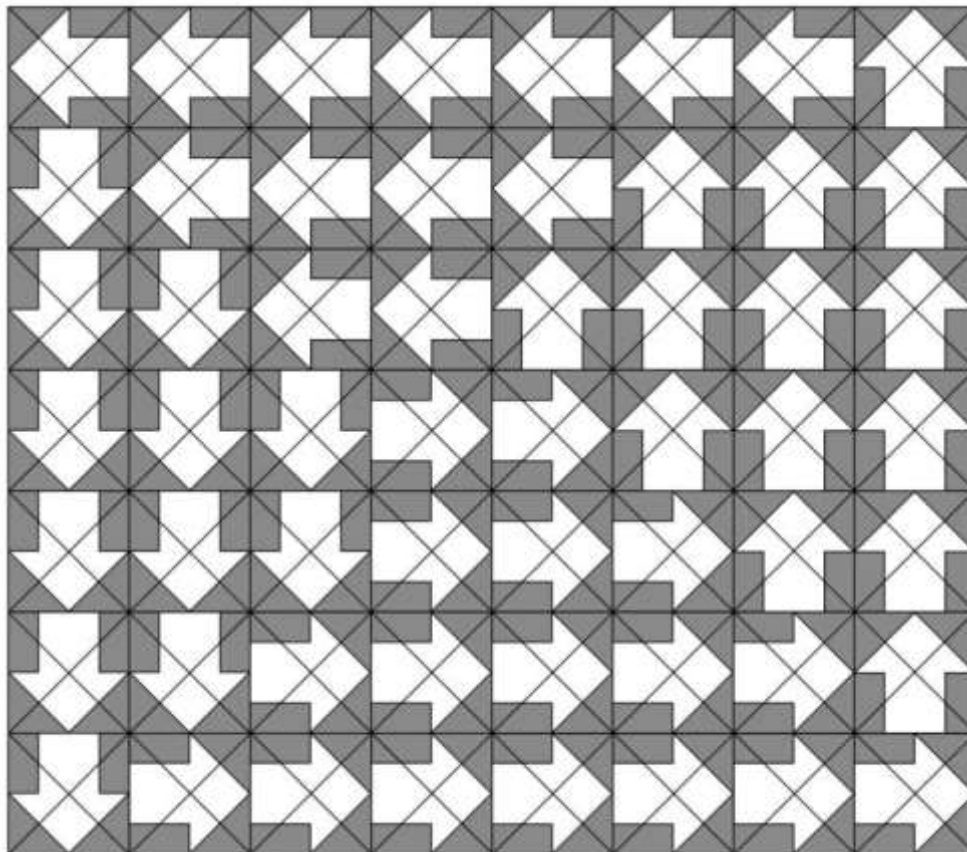
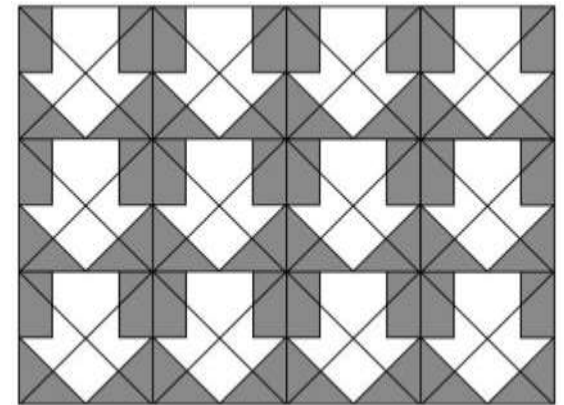
Tiles designed by Francis Ow

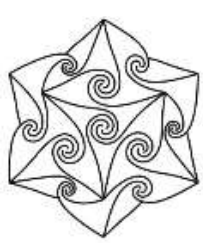




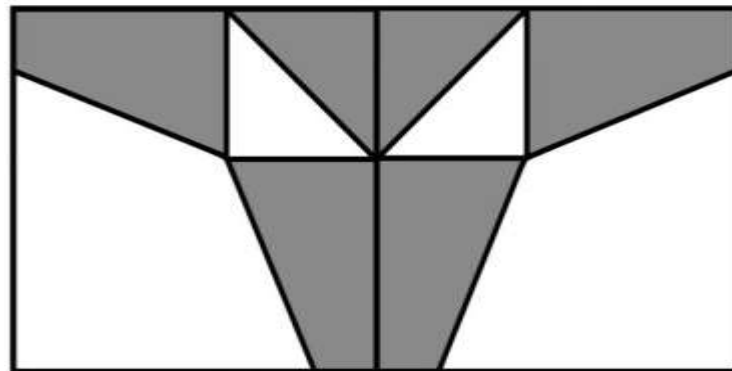
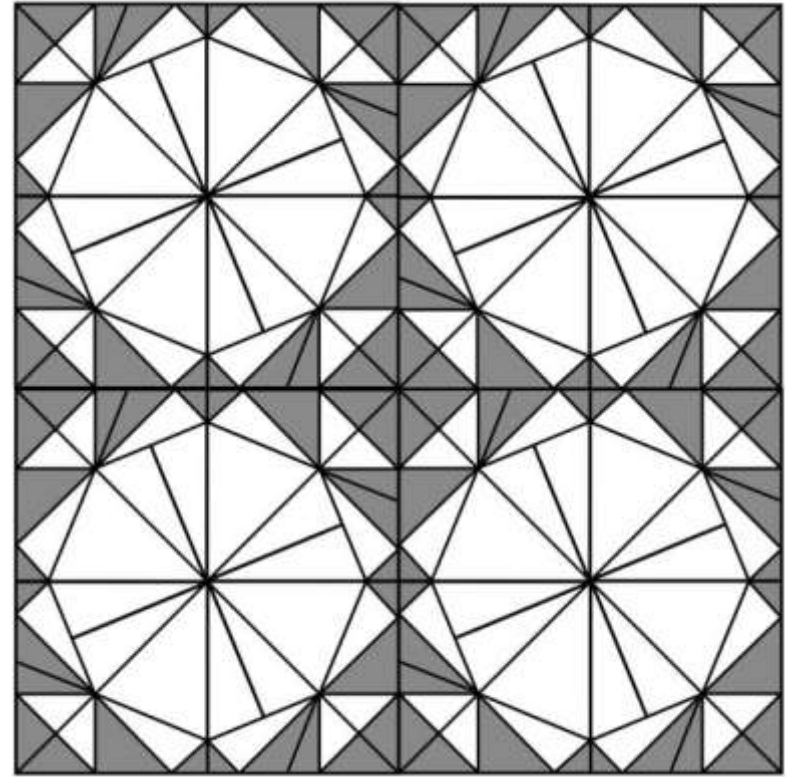
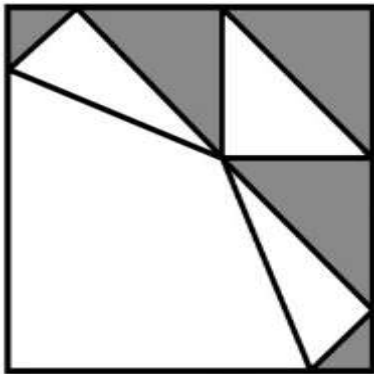
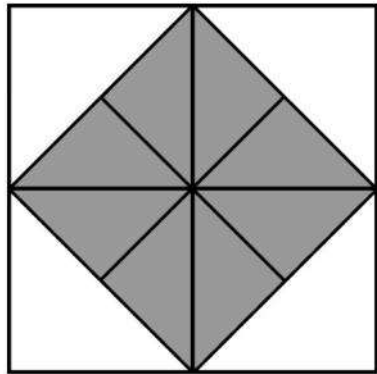
9. Arrow mosaic

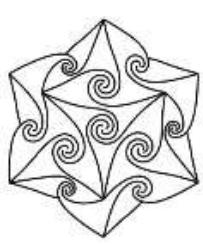
Module designed by Nick Robinson



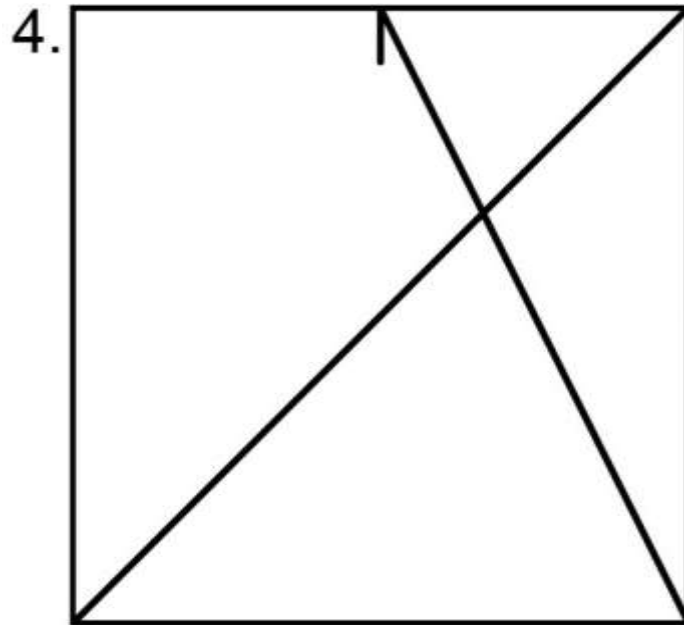


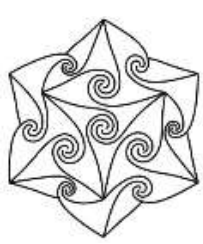
10. Square in square



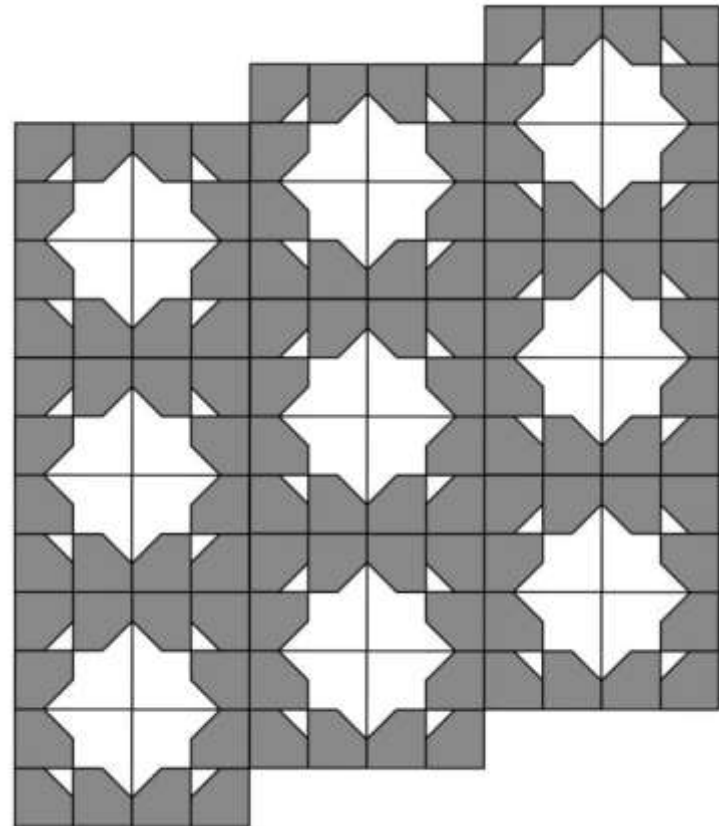
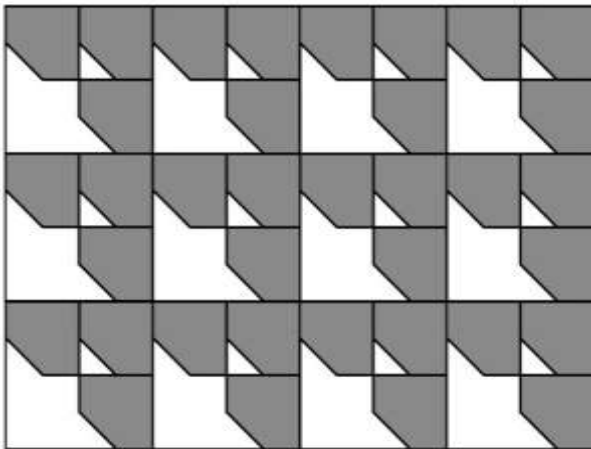
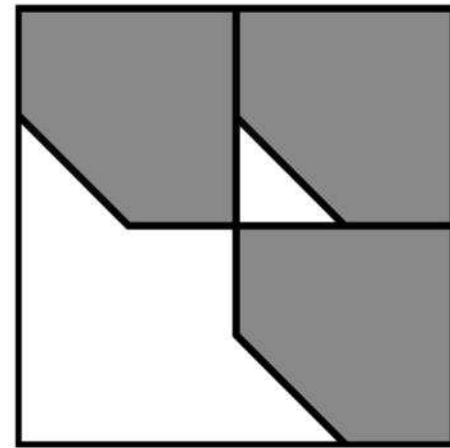


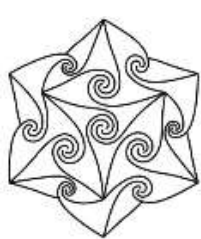
11. Two lines in a square



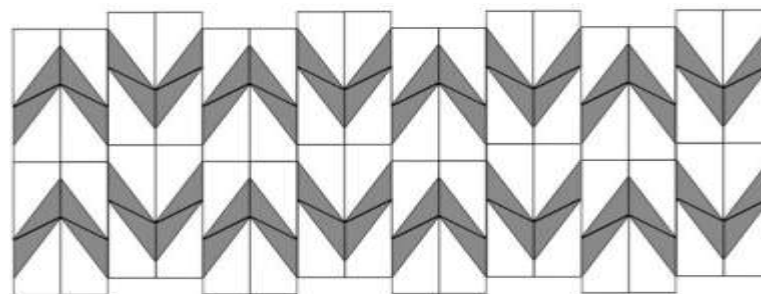
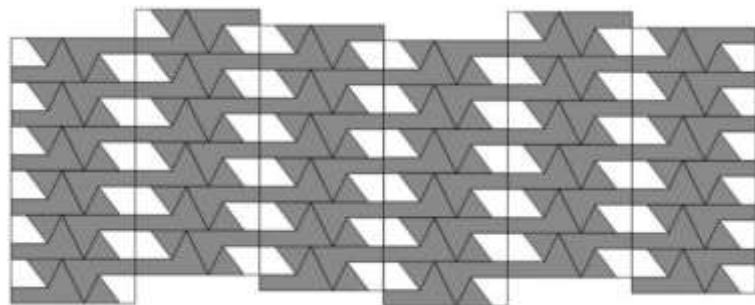
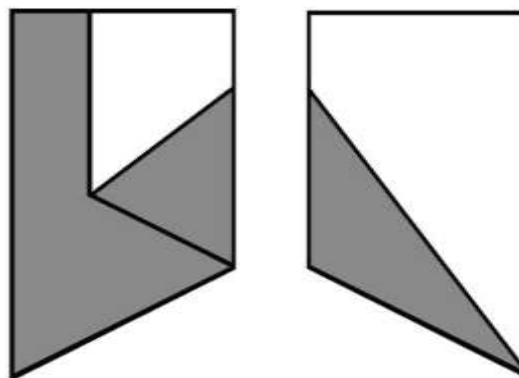
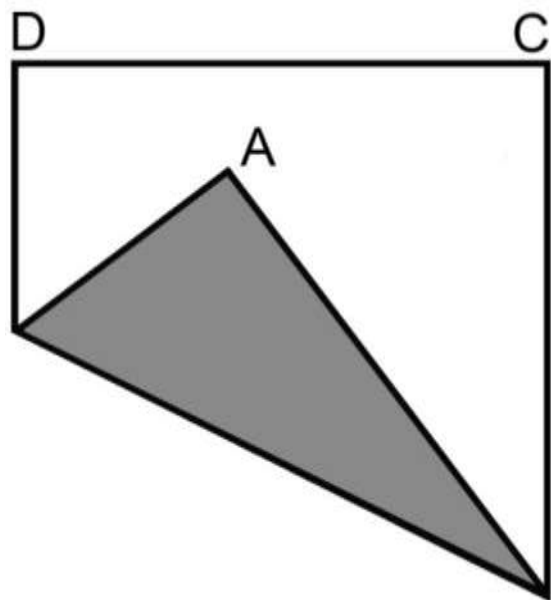


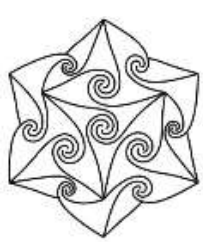
12. Three scales tile



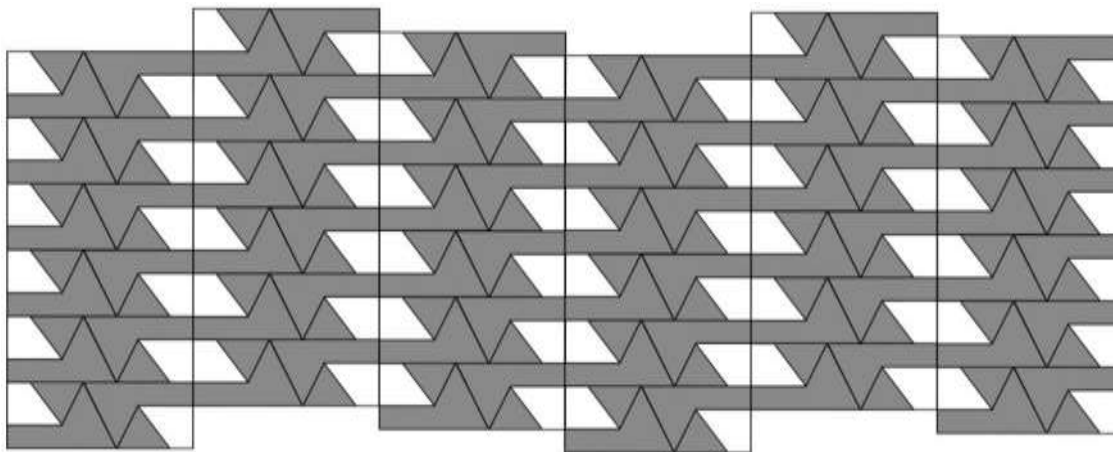
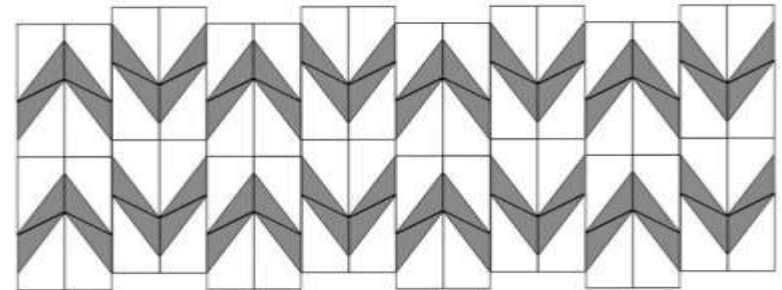
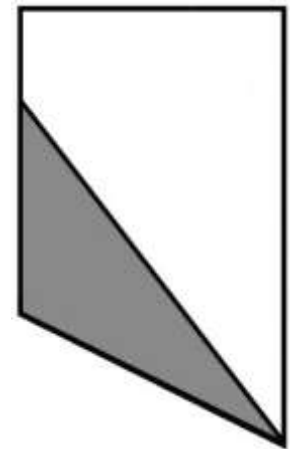
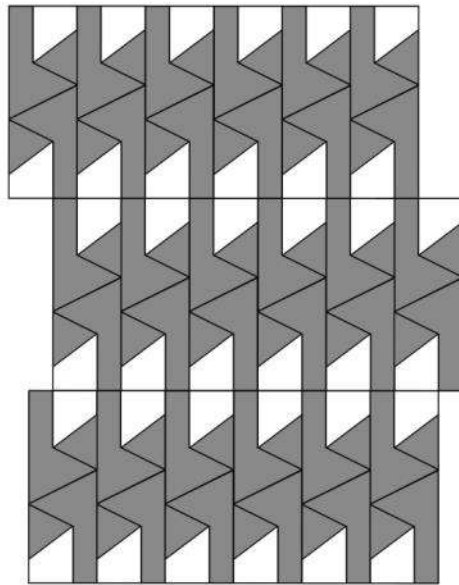
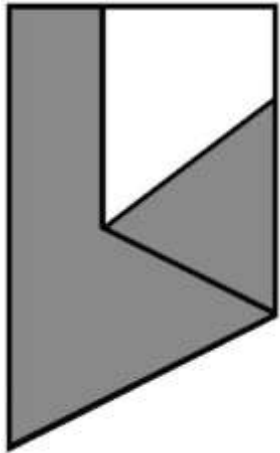


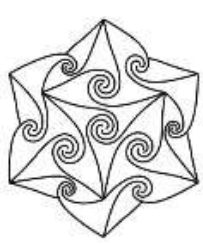
13. A new position of the point A





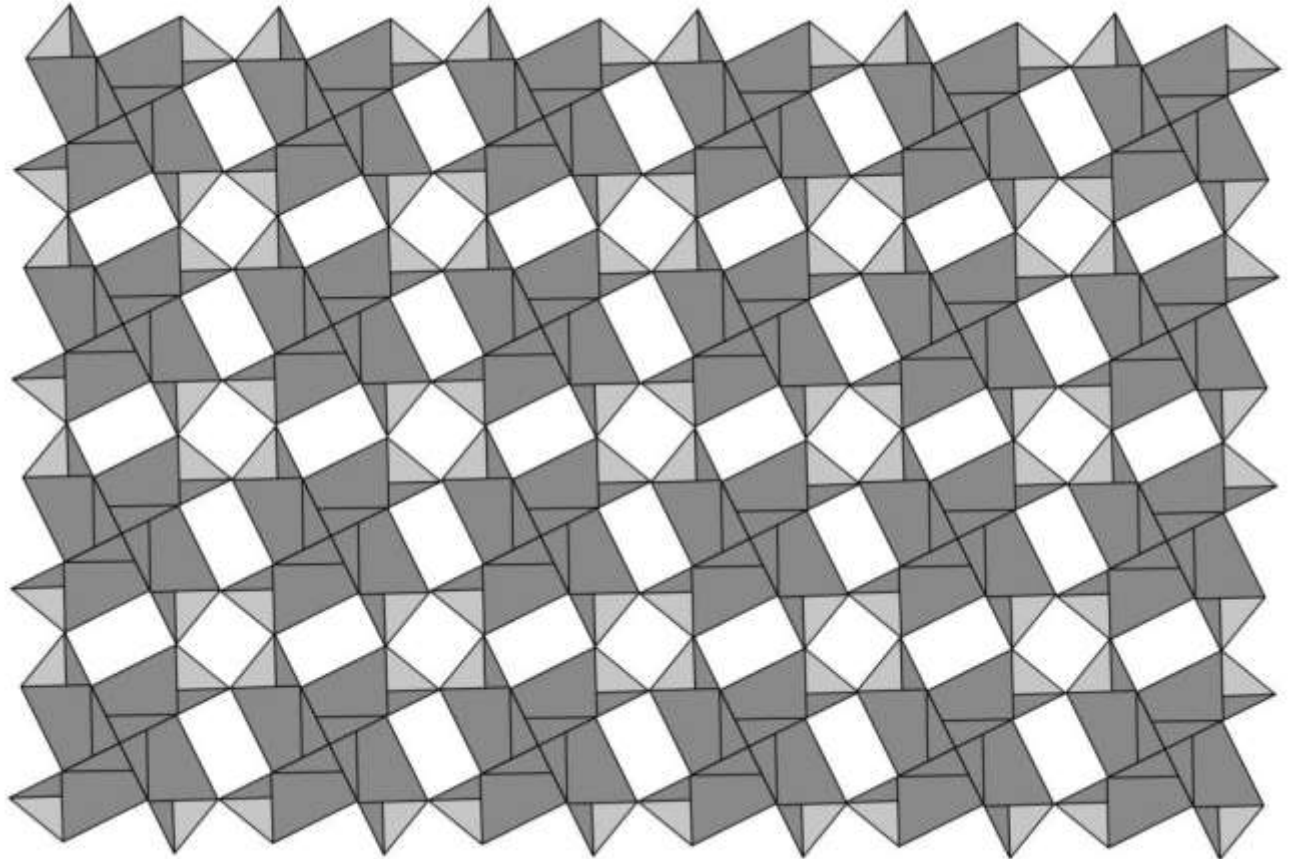
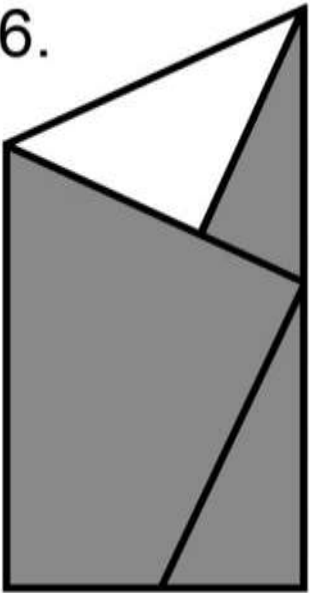
14. Trapezium tiles

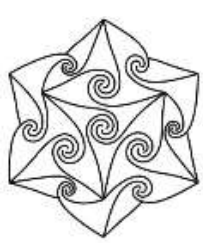




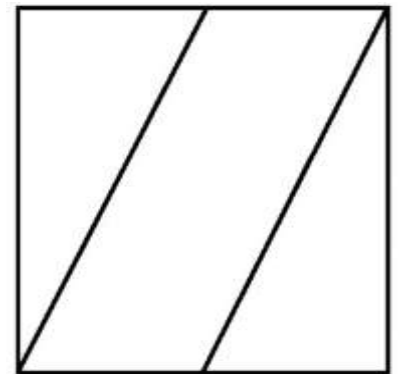
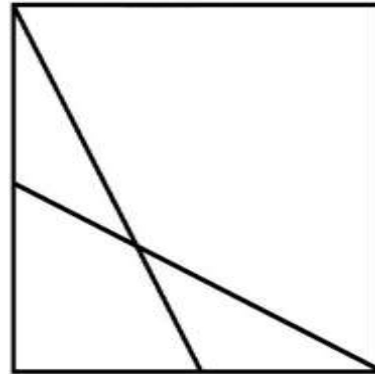
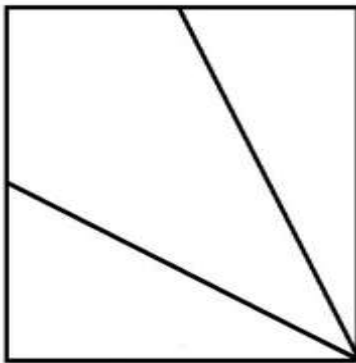
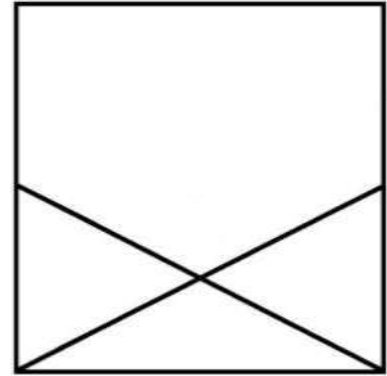
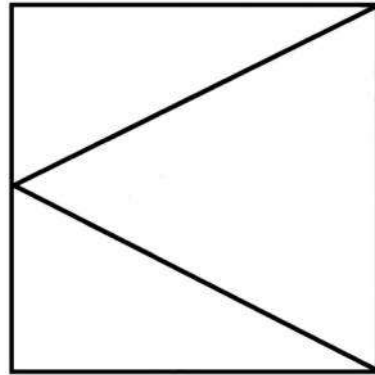
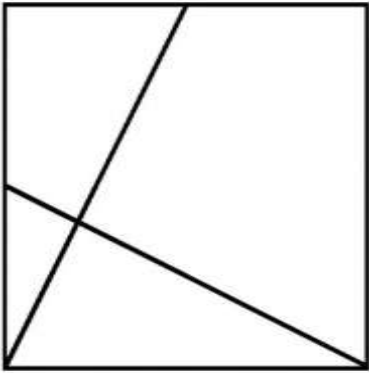
15. Quadrilateral tiles

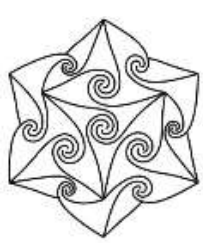
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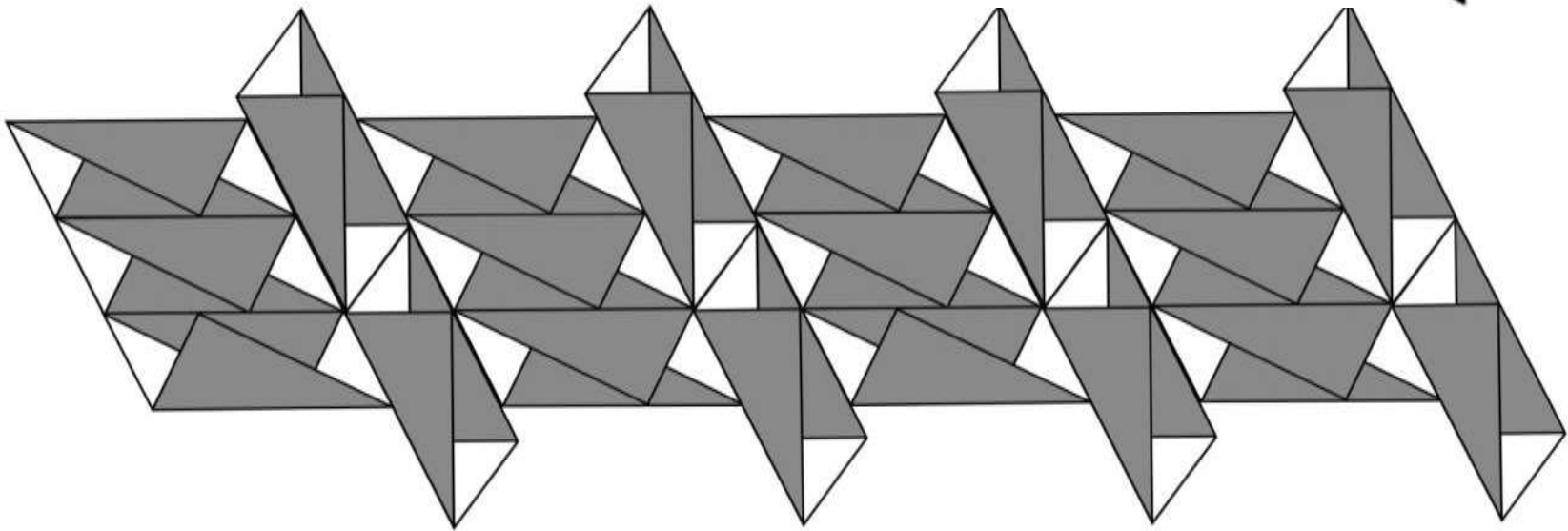
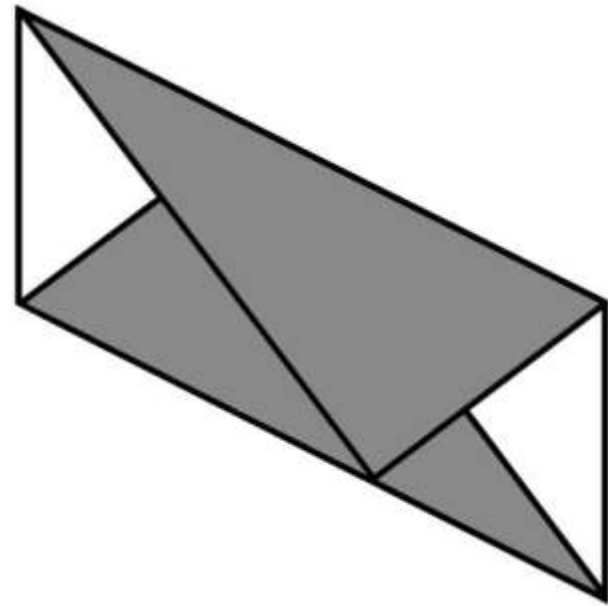


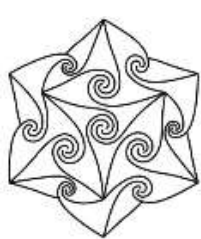
16. How many possibilities



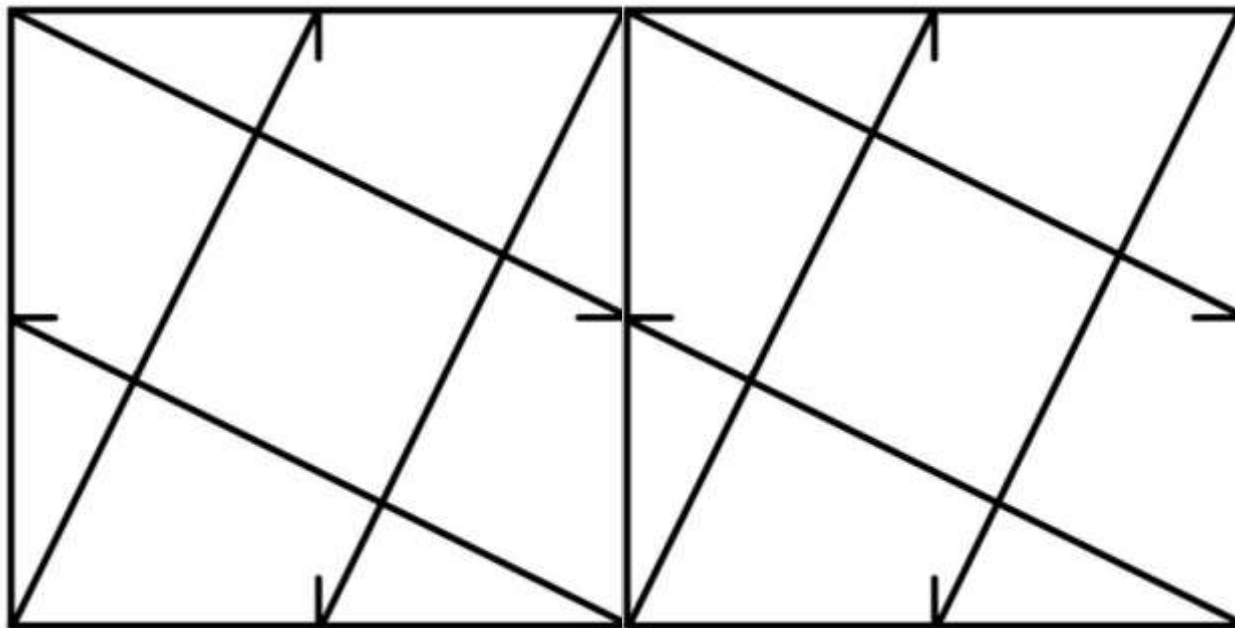


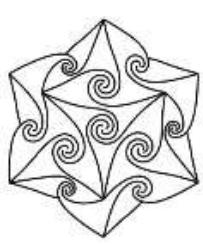
17. Parallelogram



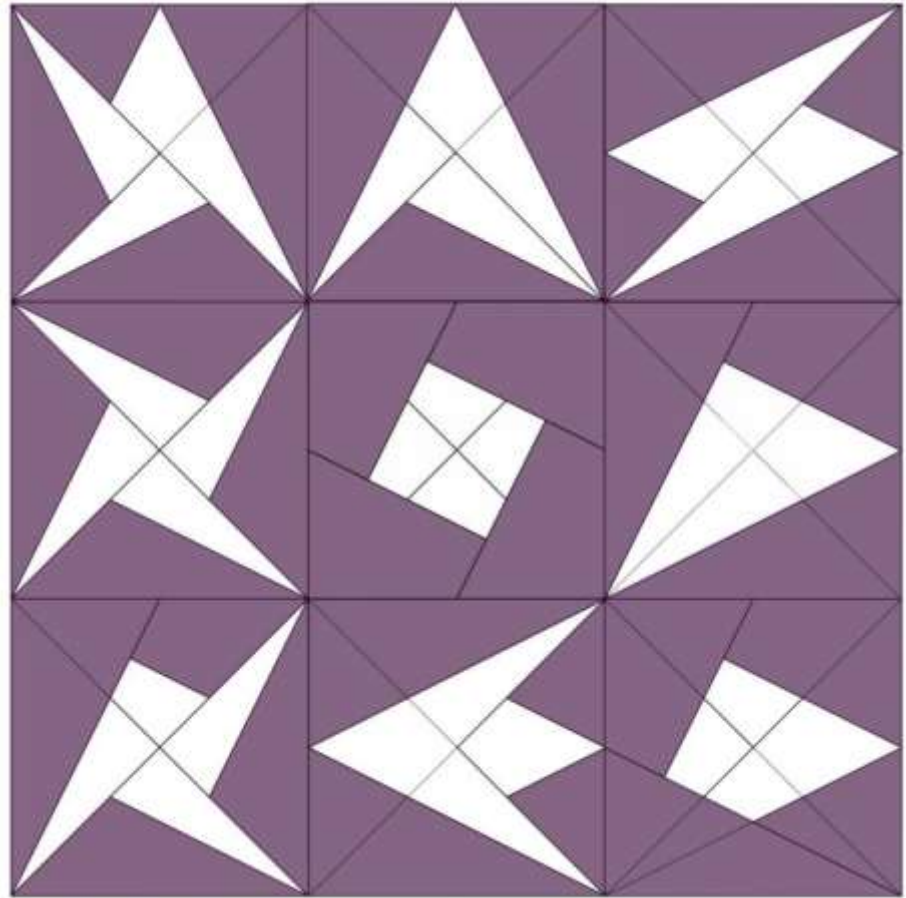
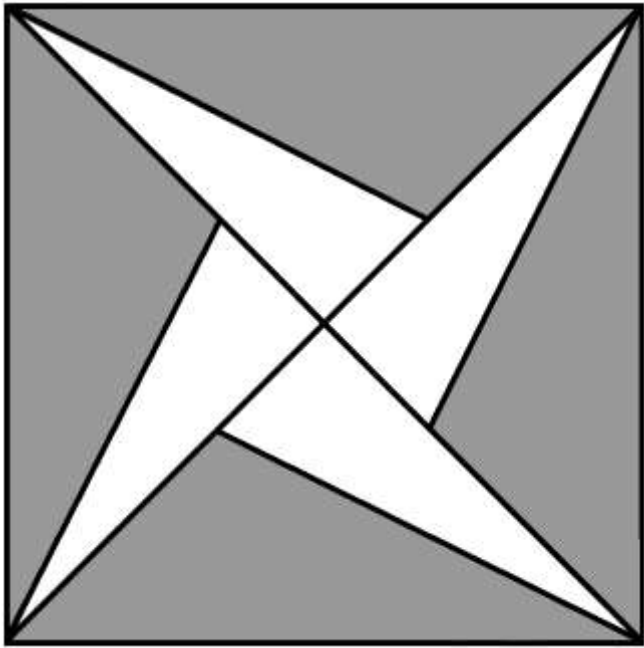


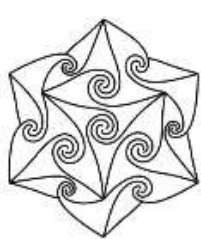
18. Section of a square into 9 pieces





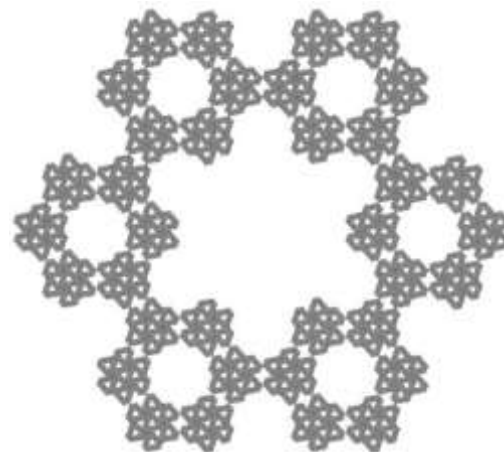
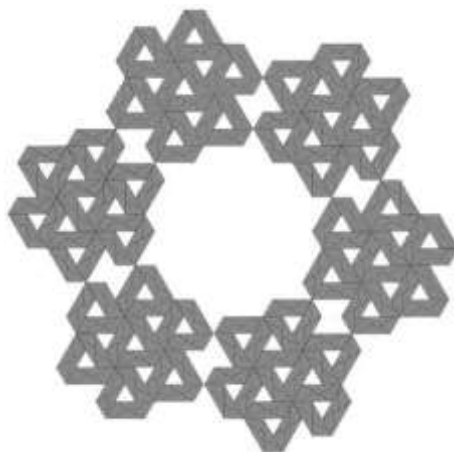
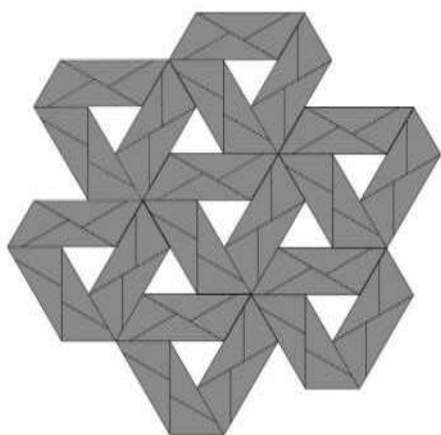
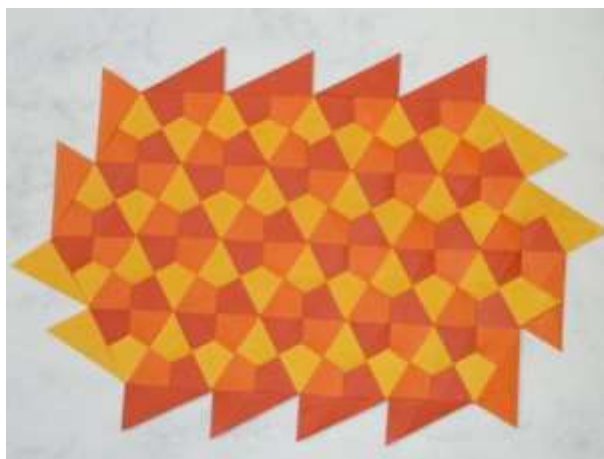
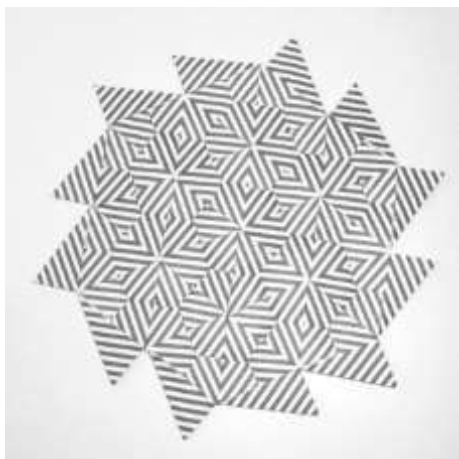
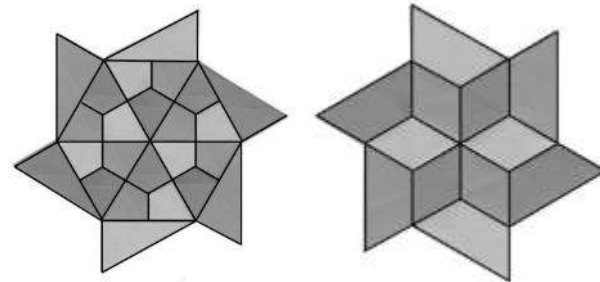
19. A star in a square

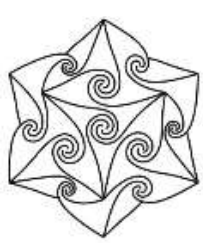




20. “Wojtek” mosaic

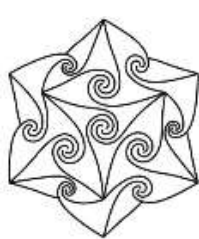
Designed by Bennett Arnstein,
Krystyna Burczyk





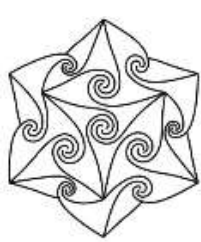
Example

Problem 3: Mosaics 3-4-6-8



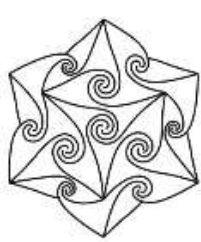
Example problem 3: 3-4-6-8

- Simple origami construction
- Detailed description of the basic problem
- Open questions
- Intentionally, there is no answer for open questions. Exploration may result (depending of the students' abilities) in
 - Hypothesis formulated by a student
 - Examples confirming hypothesis
 - Analytical solution of the problem
 - Mathematical proof of the hypothesis

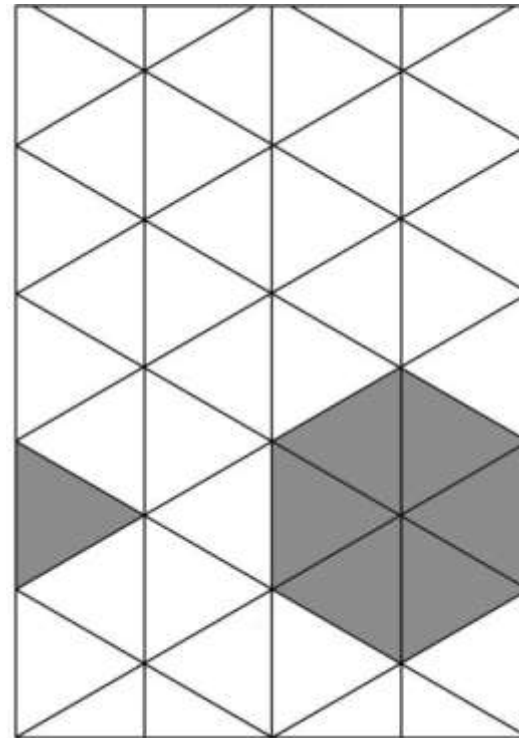
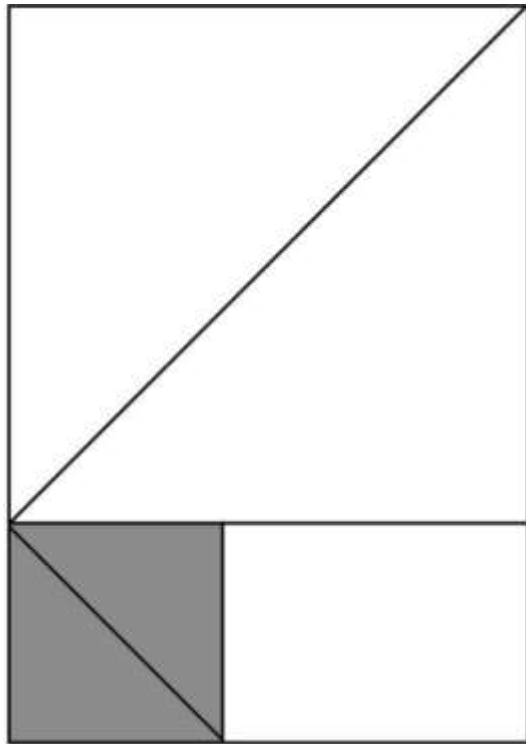


3-4-6-8 - problem

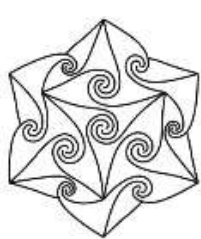
- Fold tiles: equilateral triangles, squares, hexagons, octagons
- Detailed instruction of pre-folding of A4 paper to cut starting sheets of paper
- Detailed instruction (including description using math terms) of folding
- Problem: arrange folded tiles into a tessellation (= packing a plane)
- Patterns of Archimedean tiling provided



3-4-6-8 – open questions

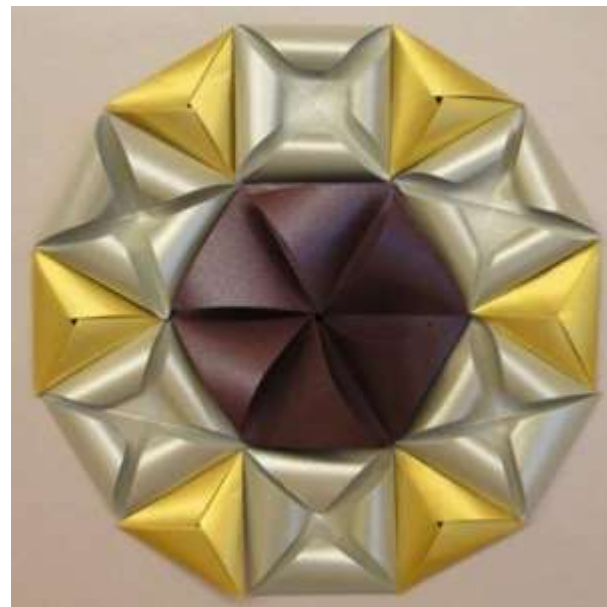
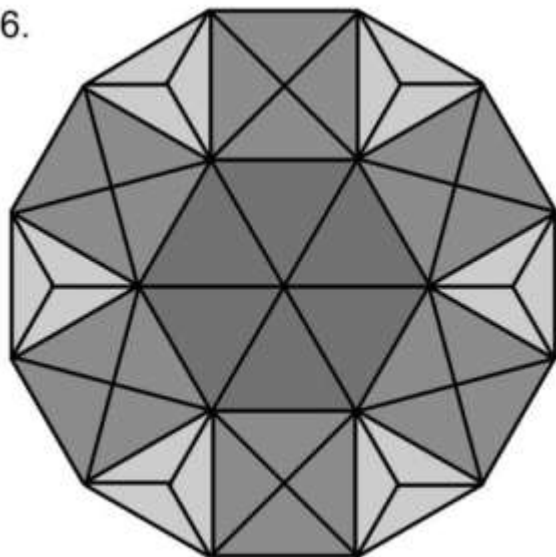


What is side length of the square, triangle and hexagon (A4 is the sheet size)?



3-4-6-8 – open questions

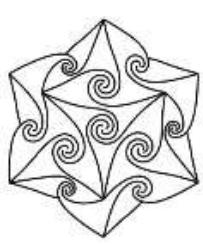
6.



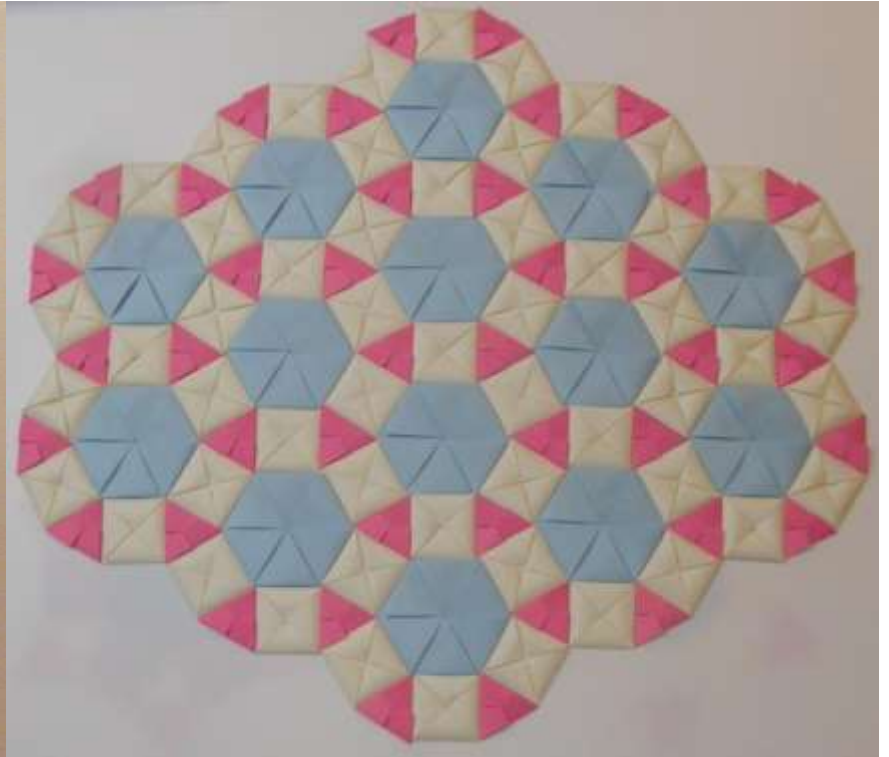
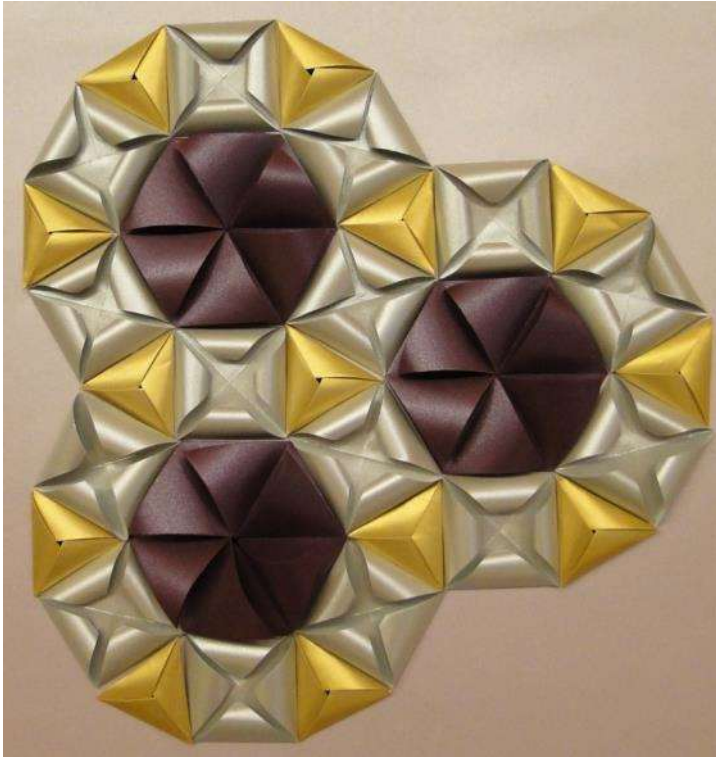
Is this dodecagon regular?

What is size of triangle, square, hexagon and dodecagon tiles?

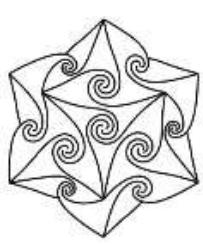
Is it possible to fold a dodecagon tile out of a single sheet of paper?



3-4-6-8 – open questions



How many tiles for these mosaics?



Thank you!

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