



How to Develop Our Spatial Skills Using Origami Models?

Wie verbessern wir unser räumliches Denken durch die Anwendung von Origami Modellen?

Kształcenie wyobraźni przestrzennej z wykorzystaniem modeli origami

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Mathematics Teacher Association

Galician Group of Origami

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How to Develop Our Spatial Skills Using Origami Models?

We would like to present the interesting examples of geometric and algebraic problems which we can illustrate and understand better with origami models.

Wir präsentieren interessante geometrische und algebraische Problem, welche wir mit Origami besser darstellen und verstehen können.



Terminology notes

1. We make geometric constructions and we use mathematical terms when we fold.
2. We will use mathematical language to describe folding process as I normally do in the classroom.
3. When we say "square" we know that it is abbreviation for "a sheet of paper (or a part of it) which has square shape".



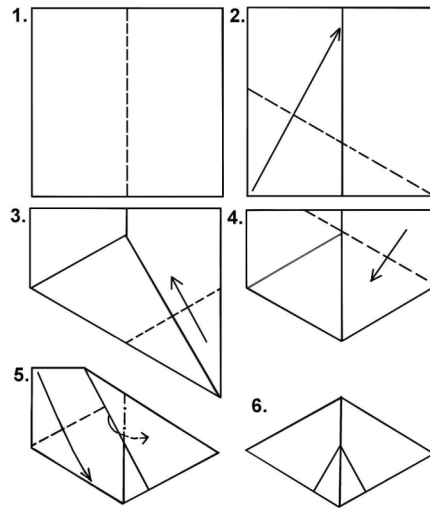
Examples of mathematical problems and how they could be expressed and solved with origami



Rhombic tiles and cubes

Make 3 rhombus tiles.

Try to join them into composition.

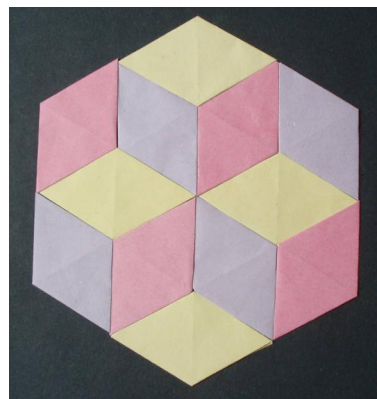


Spatial objects and their planar projections

Linking a drawing (planar projection) with a spatial form.

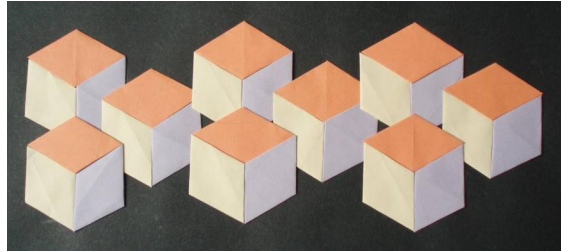
Example.

Rhombic tiles as a projection of a spatial form made of cubes.

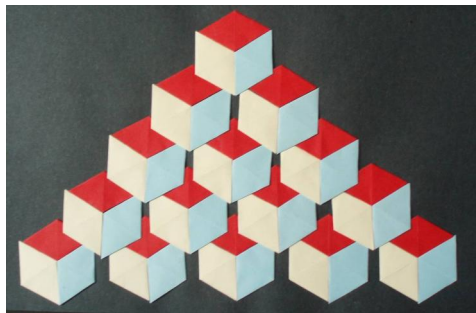
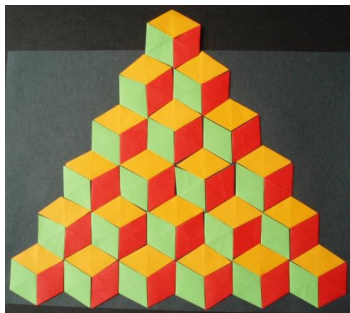




Rhombic tiles and cubes

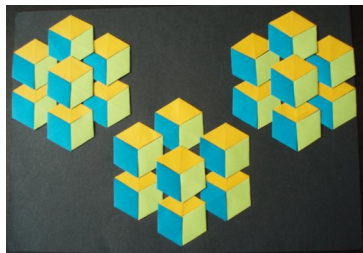
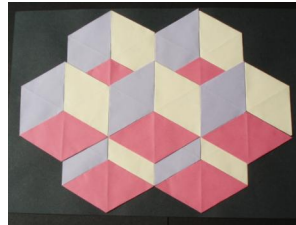
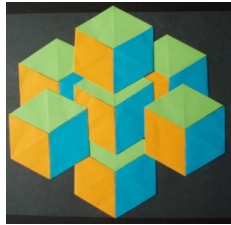


Rhombic tiles and cubes

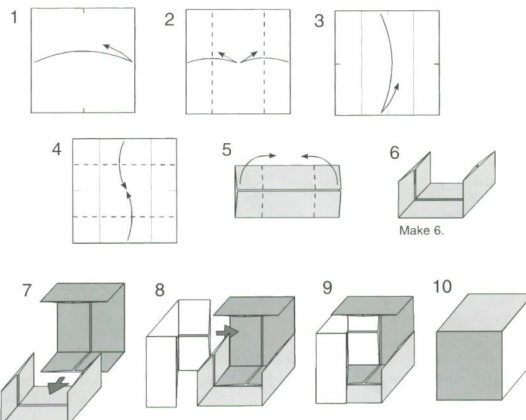




Rhombic tiles and cubes



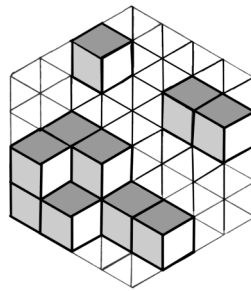
Cube (creator Paul Jackson)





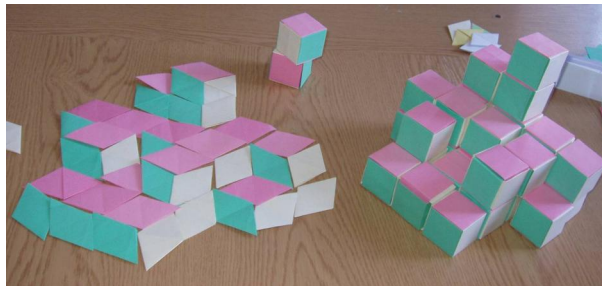
Rhombic tiles and cubes

Build a spatial composition of cubes that reflects the composition made of tiles.



Rhombic tiles and cubes

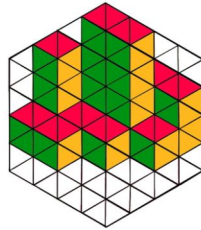
How many cubes is used to build such composition ?





Rhombic tiles and cubes

How many cubes is used to build such composition ?



$$2+5+9+4=20$$

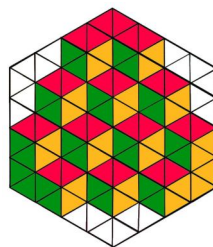
At least.

Can you use more cubes for this composition ?



Rhombic tiles and cubes

How many cubes for this composition ?



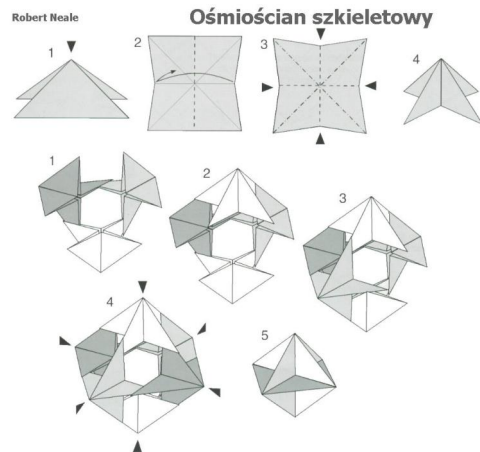
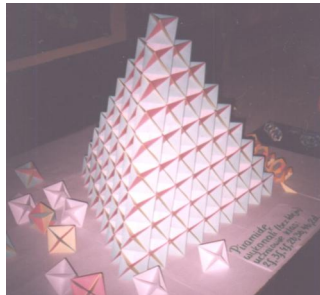
$$3+6+10+13=32$$

At least. In this case you can use more ...



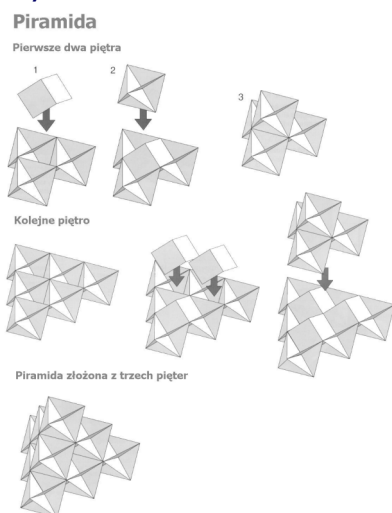
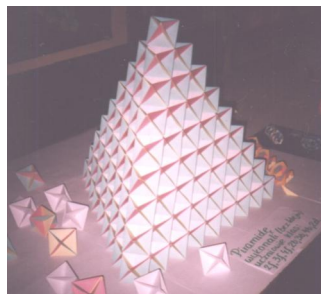
A pyramid made of colored skeleton octahedra (creator David Mitchell)

1. Make skeleton octahedra and joining units.



A pyramid made of colored skeleton octahedra (creator David Mitchell)

2. Composing a pyramid.





What features of origami determine its unique function in mathematic education ?



Easy model enhances success

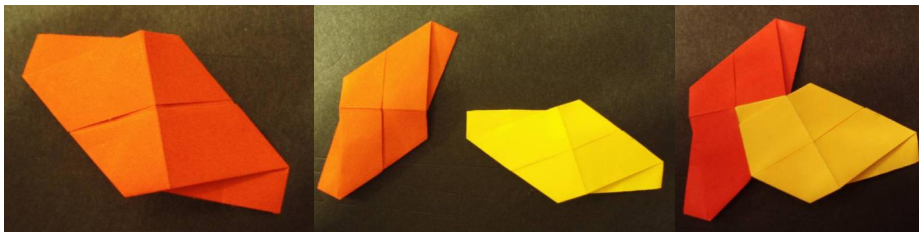
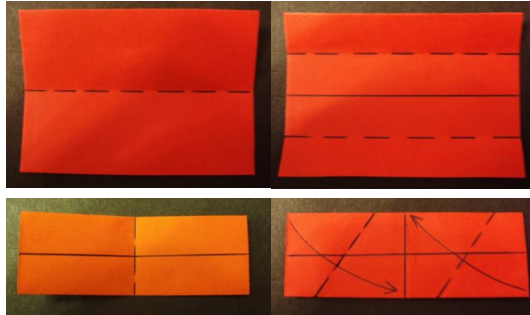
When a model is easy to fold student finish it during the lesson and he/she can bring it home.

Example. Platonic dodecahedron (creator Silvana Mamino).





Easy model enhances success



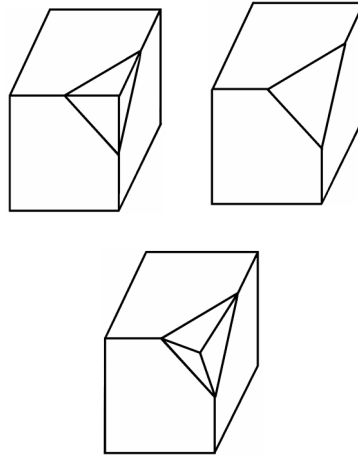
Easy model enhances success





Exploring the properties of the polyhedra

1. Drawing on the surface of the cube.
2. Truncated forms of a cube.
3. Transformations of a polyhedron.
4. A polyhedron in a polyhedron.
5. Sections and divisions of a cube.



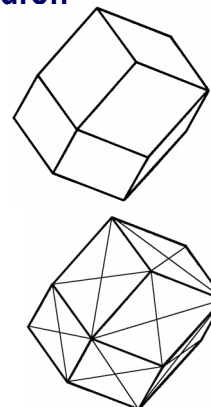
Example - Rhombic dodecahedron

We can try solve “find a shape in a shape” problems.

It develop the manipulation with the model in the space, finding its components and describing relations.

We can find inside a rhombic dodecahedron:

- Cube
- Octahedron
- Tetrahedron



Find it!
Do You see it?



Creativity

Modular origami supports creativity by composition of interesting spatial forms build of small modules.

Example 1.

Models made of traditional Chinese module by students of high school in Bochnia (I Liceum Ogólnokształcące w Bochni).



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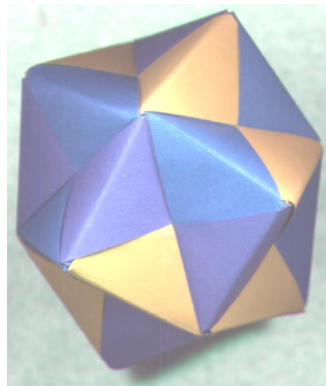
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Creativity

Example 2.

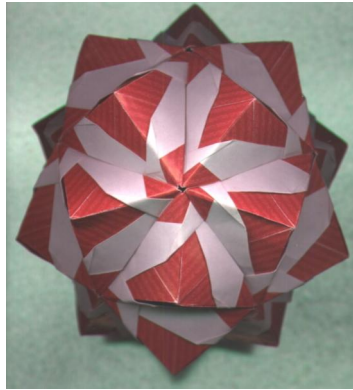
Models made of Sonobe modules.





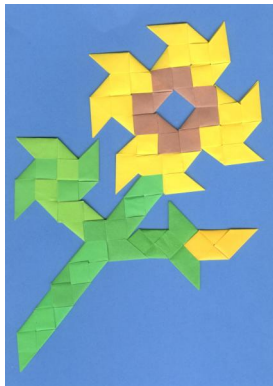
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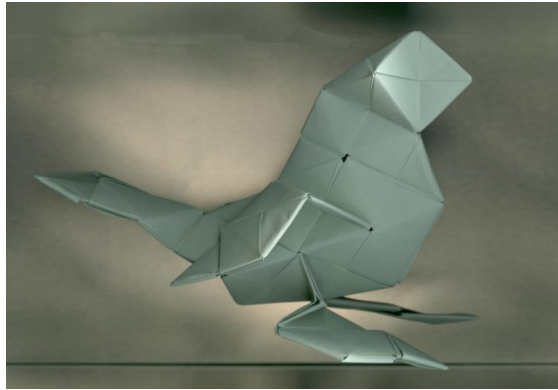




Creativity

Example 2.

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Thank You!