

## Good practices MATH\_121A\_EN

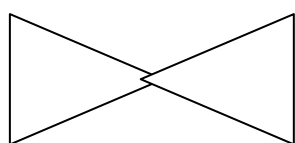
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Description of the problem / exercise: **Bow tie**

Set used: Triangle

Make bow ties out of two triangle elements. The pattern for the bow tie can be seen here:



The bow tie must be made according to the following conditions:

- The base colour of the two triangle elements must always be the same.
- The triangle elements are in contact with each other at their vertices so that the connection is the same size and colour.

Tasks and questions related to the text:

- a) Choose a base colour! Arrange all the bow ties according to the criteria so that the large triangles fit! How many different bow ties can you make?
- b) How many different bow ties can you make using all 4 base colours?
- c) Put out all the bow ties that have medium or small triangles that match! How many of these cases are possible?
- d) How many different bow ties could be made from one triangle set according to the conditions?
- e) You get more possibilities for the layout by using elements with different base colours.
- f) You can make any bow tie you like by modifying or omitting the conditions.

Solutions:

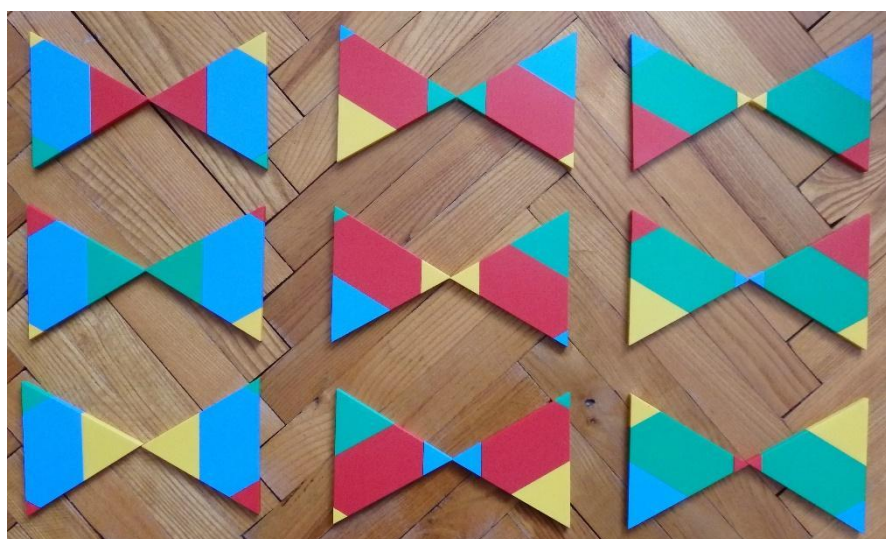
1. After choosing a base colour, you can make from the 6 triangles a bow tie in a total of six ways, so that the large triangles vertices are connected. After placing one triangle of your choice, the other triangle is given clearly, but you can fit it in two different ways.



2. With the elements of the other 3 base colours, there are a further 18 possibilities, making a total of 24 bow ties. Of course, only 12 bow ties can be made from the set at a time.



3. You can also connect the medium and small triangles when making the bow tie. These give you an additional  $2 \times 24$  i.e. 48 possibilities.



4. Of course, you can only make 12 different bow ties from the set at the same time, but the total number of possibilities is  $3 \times 4 \times 6$ , that is 72. You can make 6 shapes with one base colour, 4 colours make 4.6 and the size of the triangle at the contact makes  $3 \times 4 \times 6$ .

- *Why this exercise is good:* In this exercise, we deal with basic combinatorial cases in a playful way.
- *Which level is recommended:* Lower-grades of elementary school (6-10 years)
- *School subject(s):* Mathematics