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Good practices
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Description of the problem / exercise: **Flower variations**

Set used: Circle

By selecting 6 of the circle elements and arranging them in a ring shape, you can create a flower with different conditions.

a) Flower with 1 base colour.

Choose a base colour! Make a flower from 6 circle elements of the chosen basic colour with the same size and colour matching. The large semicircles should be on the outward facing edge of the flower.
How many different flowers can you make with one base colour?
How many different flowers can you make using the other base colours?

b) Flowers with 2 base colours.

Choose two base colours! Using 6 circles of the two base colours you have chosen, make a flower of the same size and colour matching! How many different flowers can you make?
Is it possible to solve the problem by alternating the two base colours?
Can you place a flower by alternating the two base colours and making the outward facing semicircles the same size?

c) Flowers with 3 base colours.

Choose three base colours! Using 6 circle elements, make a flower with same size and colour connection, so that each of the three basic colours you have chosen is included.
Is it possible to make the flower with three base colours so that the outward facing semicircles are of the same size and colour?

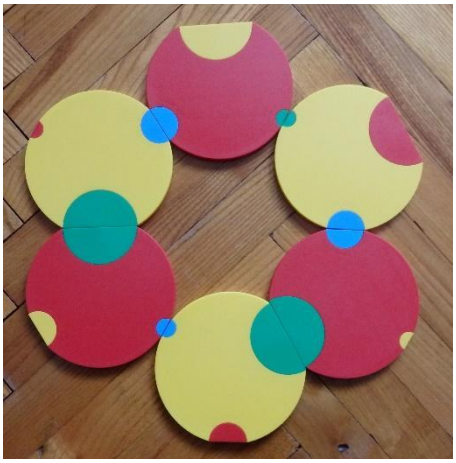
d) Flowers with all the 4 base colours.

Using 6 circle elements make a flower with same size and colour connection so that each base colour is included!
Is it possible to make the flower so that the outward facing semicircles are the same size and/or colour?

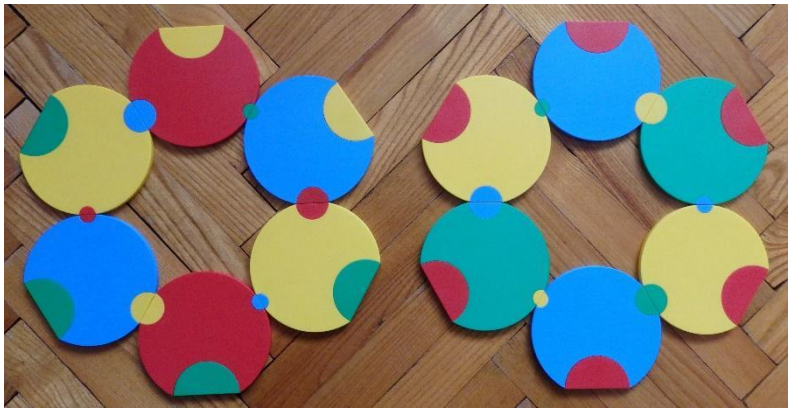
Solutions:

a) For one base colour, by selecting one of the 6 circles and placing it so that the large semicircle faces outwards, the placement of the other circles is evident due to the size and colour matching. With one base colour you can make one flower, so with all 4 base colours you get 4 flowers.

b) If there are two basic colours, the flower can be placed. The easiest way to obtain the solutions is to replace at least one circle in the flower of one base colour with a circle of another colour. The pattern can also be obtained by choosing 3-3 of the two basic colours and alternating them. However, the semicircles do not match exactly. You cannot make a flower by alternating the 2 base colours with the same size semicircles facing outwards.



c) With three base colours, there are several solutions. But if you choose the size and colour of the outward facing semicircle (e.g. large red, we have six such elements), there is only one solution, one such flower can be placed.



d) There are several solutions using all the base colours. If you choose the size and colour of the outward facing semicircle (e. g. large red), it is not possible to make such a flower. Outward facing semicircles can be the same size, but not the same colour.

- *Why this exercise is good: In this exercise, we deal with basic combinatorial cases in a playful way. We put out each case, count the number of cases, the total number of possibilities and the number of possibilities that we cannot put out of the set. Because of the properties of the base elements (4 colours, 3 sizes), we do not get a solution for some conditions. By modifying the condition, we can make the task easier or harder, and even give tasks that cannot be solved.*
- *Which level is recommended: Lower-grades of elementary school (6-10 years)*
- *School subject(s): Biology, environmental studies*