

Good practices

MATH_124A_EN

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Description of the problem / exercise: **Ice cream**

Sets used: Triangle, circle

At the ice cream shop, you can choose from a wide range of ice cream flavours, with different sized cones. The triangle element will make up the cone and the circle element will make up the ice cream.

a) Small cone with 1 scoop of ice cream.

Use only triangles with yellow base colour for the cone. One circle element belongs to one triangle element. Match the triangle and circle elements so that the base colour of the circle and the triangle and also the colours of each shape (large, medium, small) are the same. Put out the ice-creams.

b) Medium cone with 2 or 3 scoops of ice cream.

Use 4 triangles of any base colour for the cone and make a triangle shape. Place 2 or 3 circle elements (ice cream scoops) on each cone. Put out the ice-creams.

c) Large cone with 6 scoops of ice cream.

For the cone use 9 triangles of any base colour and make a triangle shape. On each cone put 6 circle elements of the same colour (ice cream scoop). Put out the ice-cream cones.

d) Giant cone with 15 scoops of ice cream.

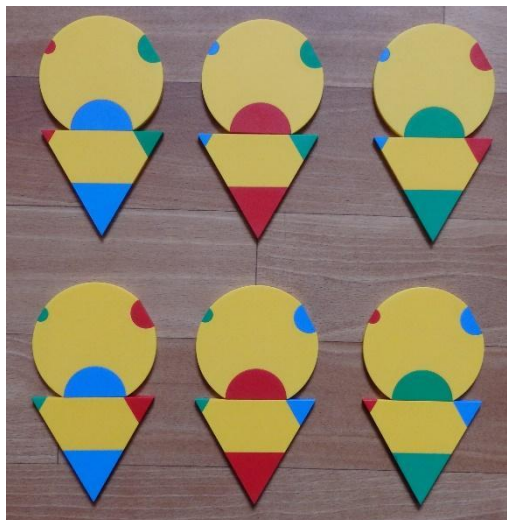
For the giant cone use all the 24 triangle elements. Use them to make a large triangle shape with the bottom missing (25 triangle elements are needed to make a complete cone). Place 15 circle elements on top of the cone. Put out the ice-cream.

Tasks and questions related to the text:

1. How many ice creams can be made in case a)? How many ice creams can be made if the other three base colours can be used, but the base colours of the triangle (cone) and the circle (scoop) are always the same?
2. How many ways can we choose 2 scoops out of the 4 base colours, considering only the base colour of the scoops (circle)? The base colour of the scoops can be the same or different. Place each ice cream according to case b).
3. How many ways can we choose 3 scoops out of the 4 base colours, considering only the base colour of the scoops (circle)? The base colour of the scoops can be the same or different. Place each ice cream according to case b).
4. How many ice creams can be made in case c), i.e. 6 scoops of ice-cream with a large cone?

Solutions:

1. You can make 6 ice creams from the yellow base colour elements. You can also use the other 3 base colours to make a total of 24 ice creams.



2. One possible solution for 2 or 3 scoops of the same base colour in a medium-sized cone.



You can choose 2 of the 4 base colours to make 2 scoops in 4 ways, if the colours of the scoops are the same. If the 2 scoops are different colours, there are 6 possibilities. The pupils put these cases on the table and count them. Alternatively, they can write down the colours (e. g. Red-Red, Red-Blue) and count them. The figure shows all the different 2 scoop ice creams with different base colour scoops.



3. There are 4 ways to choose 3 scoops from the 4 base colours, so that all 3 base colours are different. In the 3 scoops ice cream, 1 colour is always left out. If the colours are the same, we use one of the 4 colours, which also gives 4 cases.



Students can also find cases where the 3 scoops are made of 2 base colours. They can also place these on the table or write down the letters of the colours (e. g. RRB, RRG, RRY) and count the cases, which is $4 \cdot 3 = 12$. In total, you can make 20 three-scoop ice creams.

4. 6 scoops of the same colour can make 4 ice creams.



- *Why this exercise is good: We introduce basic combinatorial concepts in a playful way. We determine the number of combinatorial cases in a problem by placing and counting each case. In the exercise, we deal with cases of selection from a set of given elements. An important condition is that the colour of the scoops is the same or different.*
- *Which level is recommended: Lower-grades of elementary school (6-10 years)*
- *School subject(s): Mathematics*