THE SOMA CUBE-3

If you want to know some more...

In the previous activities you have tackled in a manipulative way the classic problem of the SOMA cube: **to form with the 7 pieces of the game a cube of 3 small cubes of edge**. Before doing it, we advised you to study the different possibilities of positioning the pieces, since it was going to help you in the construction process. The question we propose you now is to make this previous study in a more systematic way.

Would it be possible to solve this problem theoretically, with no need of touching the pieces?

For that, we will start by analyzing the result we are trying to get: we will classify the 27 small cubes of the cube 3x3.

It is formed by:

- 1 small cube that occupies the **center of the cube** or hexahedron: **H**
- 6 small cubes that occupy the **center of a face**: **F**
- 8 small cubes that occupy the **vertex**: **V**
- 12 small cubes that occupy the **center of an edge**: **E**

Now we *analyze the initial data*: **What kind of** small cubes (**H, F, V or E**) and **how many** of each kind can occupy each of the 7 pieces of the game, according to the different positions that the cube 3x3x3 can have, considering each piece separately?.

Finally, we just have to look **which combinations** of positions of each of the 7 pieces make exactly that there is only 1 small cube left occupying the center of the cube or hexaedron (H1), 6 small cubes occupying the center

of a face (F6), 8 occupying a vertex (V8) and 12 occupying the center of an edge (F_{12}).

Working out the problem is within your reach, but as it requires a long time, we will just propose you this questions now:

Piece number 2, considered separately, can have in the cube 3x3x3 a position in which 2 of their small cubes occupy each a vertex: Position V_2E_2.

It can also have the position $F_1V_1E_2$.

And also the position F_2E_2.

- Place piece number 2 in the grating cube in each of the indicated positions: V_2E_2, $F_1V_1E_2$, F_2E_2.

- Piece number 2 can have a fourth position in the cube 3x3x3 different from the previous ones. Which one?

- Piece number 5 can have in the cube 3x3x3 the position E_2F_2. Check it!. Which are the three other positions that can have?

- Which are the 2 only different positions that piece number 4 can have?

YOU WILL NEED:
The seven pieces of the SOMA and the grating cube.