## Good practices

## PROG_205CD_EN

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Description of the problem / exercise:

## Poly-Universe and GeoGebra - Changing side numbers in 2D

One of the questions that might first arise is: what if we start increasing the number of sides, for pentagon, hexagon, $\ldots \mathrm{n}$-gon, we start drawing vertex shapes with ratio $1 / 2,1 / 4, \ldots \frac{1}{2^{k}}$ ? At first glance, we get a surprising result. In the case of a hexagon, 1-1 sides of the two largest vertex shapes fit on top of each other. And for a larger number of sides, these two polygons also overlap, as it is seen in the figure below.


Why, in the case of a hexagon, the 1-1 sides of the two largest vertex shapes fit together can be shown by elementary geometric proof.

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But other questions may also arise. Could we calculate the area of the common part of the two polygons? If we were to change the ratio, at what ratio would the two largest vertex shapes have no common part? There is a GeoGebra application for this - you can change the ratio in addition to the number of sides - you can experiment with this and then try to prove it. What if we put the vertex shapes in a different order, i.e. after the $1 / 2$ ratio we would not put $1 / 4$, but say $1 / 8$. Would the above problem still exist?

## https://www.geogebra.org/classic/i3mhcpd7 <br> https://www.geogebra.org/classic/e4tw78hg

- Why this exercise is good: It contains many open questions for further reflection. It develops problem-solving thinking, creativity and analytical skills.
- Which level is recommended: Secondary school, teacher training (mathematics, IT)
- School subject(s): Mathematics, IT

