FROM TEACHERS FOR TEACHERS

TECHNOLOGIES IN STEM EDUCATION

projects involving coding, ICT, big data, AI, VR, network security, etc.

Maja Kalebić, Primary School Vidikovac, Pula, Croatia

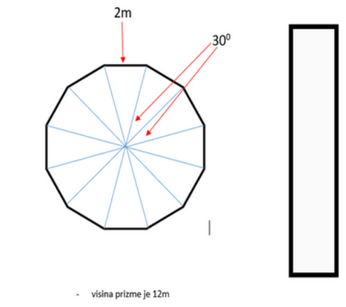
The Hologram

The Hologram project, done by the students of our school, is a teamwork project they worked on in the 7th and 8th grade.
The aim was to build a 3D model of an observatory called "the Tower of Kaštel" located on one of the seven hills of their hometown, Pula.

Kaštel in Pula

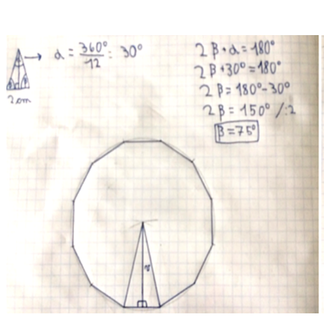
From the upper circular street, one of the perpendicular paths leads to the top of the central hill of the city where a star-shaped castle with four bastions was built in 1630.
Wishing to protect the city and its harbor, because of its great significance in maritime trade in the North Adriatic, the Venetians commissioned the building of Kaštel from the French military architect Antoine de Ville.
This was most probably the site of an earlier fortress dating from the pre-Roman and Roman periods.
The Histrian hill-fort was primarily built for defensive purposes, whereas in the Roman period a small military garrison was stationed here.
Today, Kaštel houses the Historical Museum of Istria.

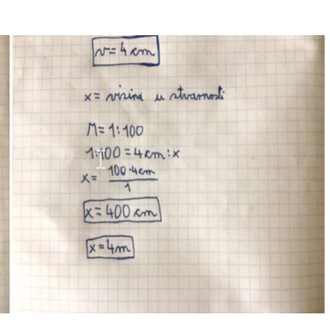
The military Tower at the Kaštel in Pula was the first challenge for my students.
They were divided into teams. It was their first outdoor teamwork activity. They were divided into three teams: Math, Measurement and IT team.
The Measurement team measured the size of the tower and sketched it.
They used measuring tape, a pen and paper.
A team of mathematicians measured the height of the tower using knowledge of the similarity system of triangles.
As the base of the tower is a regular dodecagon, they have constructed one with 2 cm long sides.
They measured the height of the characteristic triangle on paper and afterwards calculated the height of the characteristic triangle of the base in reality.



The Tower of Kaštel fortress

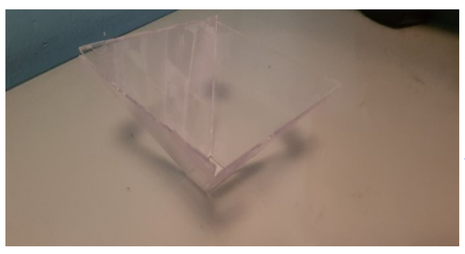
The base of the Tower is a regular dodecagon with a side length of 2 m.
The students could not measure all the dimensions of the building so they used their knowledge of the ratio rule.
The scale is 1:100





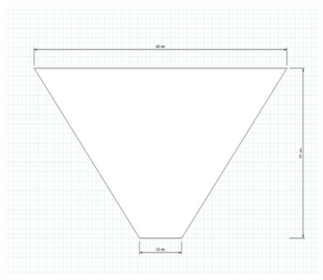
Characteristic triangle of the dodecagon base

The Math team constructed a regular dodecagon with a side of 2 cm.
They measured the height of the characteristic triangle and scaled it to calculate the hight of the characteristic triangle of the base in reality.

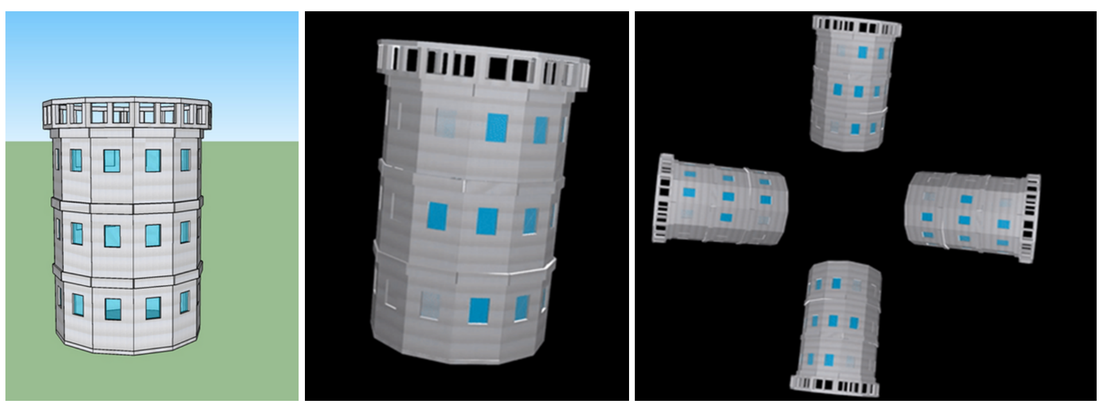


The beginning of hologram making

The next task was for the ICT team to make a 3D hologram of the Tower of Kaštel and find measures for the reflective glass.
In the beginning, students had to experiment and, as usual, their research ended on the web.
The measures that there found were meant for a much smaller screen, so they had to adapt them to their own screen.
Using these measures, the draft was made in a program called LayOut.



The hologram required four identical reflective pieces of glass.
They were placed towards the screen in the substrate at an angle of 45°.
In that way, a realistic image of the animation that is on the screen was obtained



Tower 3D model

As the Math team had done the calculations of the tower dimensions,
IT team made a 3D model according to them.
The coding program they used was SketchUp.
The animation was adapted to the holographic projection by software Premiere Pro 2018.

Everything was ready for the presentation:
the students, the hologram and the 3D model.

Luka, Marko, Lea, Sara and Lucija