Mathematics in Architecture

Teacher: Daniela Diaconu

"Gheorghe Cartianu" Technical High School, Romania

The connection between Mathematics and architecture has persisted since old times. Although at the beginning architecture was not a form of art (because ancient people wanted just a simple shelter), later it developed due to the need of building something pleasant for the eye.

People's imagination and dare have turned architecture from a job into the most complex form of art.

The great architect **Le Corbussier** said that "*architecture is an art, an emotional phenomenon out of the building matters and beyond them.*"

The most important building problems can be solved through Geometry. All buildings present volumetric mixtures of geometric shapes. The mathematical **proportions** lie at the root of the architecture quality.

Ancient and Medieval builders used the geometrical shapes to draw the plans of the building on the ground, whereas the mathematical calculations were used to measure the component parts of the buildings.

Euclidean geometry has a fundamental role in architecture. Along the time, the pyramid is present in impressive constructions.

Initially the pyramids appeared in the Precolumbian civilizations (Mayan or Aztec) and they had terraces for sacrifices, being built with stairs. This highlights the architectural representation of a new religious conviction.

The Pyramid of the Sun in Teotihuacan (an old Aztec town in Mexico) was built in such a way as the Easter part could be oriented exactly towards the sunrise and the sun rays could come down directly on the top of the pyramid at 12 pm on May 19 and July 25.

https://cersipamantromanesc.wordpress.com/2010/03/28/misterele-piramidei-soarelui-din-mexic/

The Egiptian pyramids impress us even today as they have survived through their perfection along the time.

When it was built, the **Lion Pyramid Kheops** was the highest construction in the world.

The Egyptian architects, who were priests as well, built the pyramid so as thearea of the isosceles triangle that makes the side face could be equal to the area of the square whose side is the height of the pyramid

It was the highest construction in the world for more than 43 centuries. Initially, it measured 147m in height, the side face was 227m and it has 2,521,000 m^3 of stone. It is built under the angle 54° and 54 min. The biggest error between the side lengths is under 0.1%.

It seems that the Egyptians perfected the structure of the pyramid and had large knowledge of Mathematics and Astronomy. Blending science and religion, they considered that the two-dimensional and three-dimensional geometrical shapes influence the energetic field around them. That is why the pyramid has this effect – because of its shape.

Even today the pyramid is viewed as one of the strongest architectural constructions. Modern architects analyze it from different perspectives so as to get spectacular and efficient structures.

The Great Pyramid from the Louvre Museum in Paris is an impressive construction, made of metal and glass, surrounded by other 3 smaller pyramids in the inner courtyard of the Louvre Palace. I.M.Pei is the architect who drew the remarkable and innovative structure of the pyramid. It measures 21m in height. The building has 673 glass panels: 603 are diamond-shaped and 70 are triangular-shaped. The bottom measures around $35m^2$.

We present you some other imagines containing contemporary constructions worldwide, having a pyramid as bottom.

Walter Pyramid	**'Ryazan Kremlin' Historic and Architectural Complex**

https://en.wikipedia.org/wiki/Walter_Pyramid |

https://www.rbth.com/travel/327249-russian-incredible-ryazan-kremlin |

Bolz Music Academy in Wisconsin

https://www.idealdecor.ro/wp-content/uploads/2015/09/153519dd-79c4-46b4-8c3c-1baa6d80ab16-olbrich-botanical-gardens-Custom.jpg