The Amazing Temples of Chichen Itza

Pyramid of Kulkulkan. (El Castillo). The ruins of Chichén Itzá lie about midway between the towns of Cancún and Mérida on the Yukatan Peninsula

For a thousand years, the slanting rays of the setting sun have played a spectacular shadow game with this great Mayan pyramid. At the appointed hour, the shadow of the Feathered Serpent, Kukulcan slides down the northern stairway...and vanishes.

This is a square-based, stepped pyramid approximately 75 feet tall, constructed by the Mayans ca 1000-1200 AD, directly upon the multiple foundations of previous temples. It was mysteriously abandoned along with the surrounding city of Chichen Itza by 1400 AD. Kukulcan is the Mayan name for the Feathered Serpent God (also known as Quetzalcoatl to the Aztecs).

The axes that run through the northwest and southwest corners of the pyramid are oriented toward the rising point of the sun at the summer solstice and its setting point at the winter solstice. The pyramid is unique among all known pyramids, worldwide, for its central role in a dramatic shadow and light display during the equinoxes.

At the appointed hour, the setting sun casts a shadow of a serpent writhing down the northern steps of the pyramid. The sunlight bathes the western balustrade of the pyramid's main stairway and causes seven isosceles triangles to form, imitating the body of a serpent 37 yards long that creeps downwards until it joins the huge serpent's head carved in stone at the bottom of the stairway.

Each face of the pyramid has a stairway with ninety-one steps, which together with the shared step of the platform at the top, add up to 365, the number of days in a year. These stairways also divide the nine terraces of each side of the pyramid into eighteen segments, representing the eighteen months of the Mayan calendar.


Chichen Itza
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Education Standards Satisfied by This Activity

(See Benchmarks for Science Literacy, Project 2061, AAAS)

1c – The Scientific Enterprise

G6-8 "Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people, in different cultures, at different times.

G9-12 "The early Egyptian, Greek, Chinese, Hindu and Arabic cultures are responsible for many scientific and mathematical ideas and technological innovations.

2a – Patterns and Relationships

G9-12 "Although mathematics began long ago in practical problems, it soon focused on abstractions from the material world, and then on even more abstract relationships among these abstractions.

3A - Technology and Science:

G6-8 "Engineers, architects and others who engage in design and technology use scientific knowledge to solve practical problems. But they usually have to take human values and limitations into account as well.

4B – The Earth

G6-8 "Because the Earth turns daily on an axis that is tilted relative to the plane of earth's yearly orbit around the sun, sunlight falls more intensely on different parts of the Earth during the year. The difference in heating produces the planet's seasons and weather patterns.

11B – Models

G3-5 "Geometric figures, diagrams, and maps can be used to represent objects, events and processes in the real world although such representations can never be exact in every detail.

Problem 1 - The azimuth of the rising sun on the horizon at the Summer Solstice is 64.8 degrees and for the winter solstice is 114.9 degrees. On the satellite photo, draw two lines from the center of the pyramid that follow these azimuth angles. What do you notice about these two axii and the pyramid?

Problem 2 - Suppose you wanted to build a pyramid in Boston, Massachusetts so that the rays of sunlight from the rising sun on your birthday (November 23) (azimuth 117 degrees) shone directly into the center of the pyramid through a window on one of the faces of the pyramid. Sketch how you would align the pyramid to make this happen.

Problem 1 - Answer: See figure below.

The north-east corner of the pyramid is along the sunrise line for the Summer Solstice. The south-east face of the pyramid faces the sunrise on the Winter Solstice.

Problem 2 - Answer: See sketch below.