Math Homework Help

Mathematicians have solved one of the basic questions about the dodecahedron
A trio of mathematicians have solved the "straight path" question on the dodecahedron, writes Quanta Magazine. They proved that there are an infinite number of such paths. The study was published in Experimental Mathematics and warmly received by the scientific community.

Mathematicians have solved one of the basic questions about the twelve-sided polyhedron
Scientists for over two thousand years have been studying the features of the five Platonic bodies (regular polyhedrons - ed.) - the tetrahedron, hexahedron, octahedron, icosahedron and dodecahedron - but still do not know much about them.

Mathematicians have long been interested in the question: is there a direct path from a vertex of a regular polyhedron by which it can return to the starting point without passing any of the other vertices?

For hexahedron, tetrahedron, octahedron and icosahedron consisting of squares or equilateral triangles the answer is unambiguous - there is no such path. Any straight path starting at one of the vertices of these figures will lead to another vertex or will wiggle forever.

But there was no information about the possibility of a straight path through the dodecahedron, which consists of 12 pentagons - a gap in the world's knowledge. Three mathematicians recently closed it.

The research began back in 2016, when Atreya of the University of Washington and Olicino of Brooklyn College began playing with a set of flat shapes, folding them into regular polyhedrons. While "assembling" the Platonic bodies, Olichino realized that the accumulated material on planar geometry could be useful in understanding straight lines on the dodecahedron.

"We were literally assembling these things from disparate pieces. Simple curiosity coincided with the possibility of new research," says Jaydev Atreya.

Jaydev Atreya's double pentagon tattoo
Using early knowledge, Jaydev Atreya, David Olichino, and Patrick Hooper proved that there are infinitely many straight paths on the dodecahedron. Finding the solution required the use of modern technology and computer algorithms.

Together with Hooper at City College in New York, the researchers figured out how to classify all the straight paths that leave one corner and arrive at the same corner, bypassing the other corners. The mathematicians divided them into 31 families.