The Trisected Triangle and the Hexagon Within:

Marion Walter's Theorem

Jazmin O. McCorkle

Mathematical Evolutions

Jennifer McCarthy and Andrew Platek

Summer Ventures in Science and Mathematics

The University of North Carolina at Charlotte

Abstract

Armed only with a triangle and a dream, Marion Walter, a professor of mathematics at the University of Oregon, embarked on a quest for mathematical enlightenment. She battled rough angles and contemplated numerous strategies to find answers. In the end, Walter discovered characteristics of a triangle when each of its sides is trisected. Okay, Walter's "quest" was not that exciting or epic, but she did determine the relationship between the area of a trisected triangle and the area of its ever-present central hexagonal region. Walter's findings can best be explained in her theorem: the area of the central hexagonal region determined by the trisection of each side of a triangle and connecting the corresponding point with the opposite points with the opposite vertex is given by 1⁄10 the area of the original triangle ("Marion Walter's Theorem: Triangle and Hexagon areas" 2012). For my research paper, I used Geometer's Sketchpad (GSP) to construct and trisect the sides of a triangle to prove the ratio in Walter's Theorem; the ratio worked! Wanting to challenge the ratio again, I altered Walter's theorem by trisecting not the sides of the triangle but the angles of the triangle. To do this, I used GSP again to construct and trisect the triangles' angles; however, this time I used special case triangles instead of an arbitrary triangle. Unfortunately, Walter's ratio did not hold up, but I was able to discover a new ratio: — .