Name(s)	Project Number
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Project Title

Exploration of the Ulam Spiral

Abstract

Objectives/Goals

The Ulam Spiral is a way of visually displaying the prime numbers which shows some of the sequence relationships which exist across the whole set of natural numbers. My project focused on whether the patterns observed in the original Ulam Spiral would be seen in variant forms and most especially when the spiral became much larger than when it is typically displayed on a single page.

Methods/Materials

Windows PC loaded with a version of the Python Programming language which has the matplotlib package installed.

Results

My discovery was that patterns seen early within small versions of the Ulam spiral continue to exist even when the Ulam Spiral gets to be very large. Spiral sizes in excess of five million required hours for my computer to produce but could then be sampled to see the patterns continue to exist. These large spirals could then be searched by computer to find the areas of the spiral where the patterns were the longest and most frequently seen.

Conclusions/Discussion

My project showed that Ulam's discovery of the prime number spiral could be extended to a very large set and could possibly be mined to provide pattern areas which might be generalized to predict the existence of large prime numbers.

Summary Statement

My project visually and computationally explores very large Ulam Prime number spirals to examine the consistency of the patterns seen when originally discovered.

Help Received

My prior year's school Scratch Programming instructor, Mr Lee Appelbaum introduced me to programming the Ulam Spiral in Scratch. I wrote and coded the Python programs used for this project but was assisted in the 2 lines of code which actually call the matplotlib scatter routine.