

An Origami-inspired Adventure in Number Theory and Programming

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keywords: dollar bill rosette, number theory, Python programming

Abstract

This paper describes the dollar bill rosette model, created by Paul Jackson and modified by Martin Kruskal. The folding procedure is significant mathematically in [at least] two ways. It starts off with an iterative procedure that improves an original estimate, that is, decreases the amount of error. The folding procedure works, that is, goes through all the intermediate values, for a known class of numbers: *reptend primes base 2*. I came upon this class using programming in Python and online research. My proof that the numbers that work with the folding procedure are indeed the reptend primes base 2 is included. The talk should have general appeal because of the beauty of the model and what I term number theory in the wild.

Background

The dollar bill rosette is shown in **Figure 1**: Dollar Bill Rosette. Many years ago, Mark Kennedy, master folder and teacher, organized informal folding events to take place while in line for New York City's Shakespeare in the Park. I have forgotten what play I saw, but I did learn the dollar bill rosette.

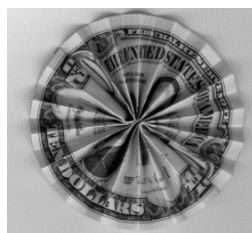


Figure 1: Dollar Bill Rosette.

At some point after learning the model, I showed it to a mathematician colleague at IBM Research and he said that he guessed that the numbers for which the procedure worked were a certain known class of primes. I now explain the folding of the model, which starts with making an estimate; show how the procedure improves the estimate; and then describe how I identified the class of primes using a program written in Python. Lastly, I provide a proof connecting the class definition with the folding procedure.