CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J1205

Project Title
Pi of Pieces Unlimited: A Continuation

Abstract

Objectives/Goals
There are three objectives in this project. The first is to derive an upperbound recursive equation for Pi using regular polygons circumscribed about a circle to approximate its circumference. The second goal is to show the equivalence of François Viete's and my Last year's lowerbound expression for Pi. And the last objective is to derive an Algebraic Polynomial of which one root is Pi itself. I have also found other roots of this polynomial which I call The Pi Associates.

Methods/Materials
I used regular circumscribed polygons about circle of radius 1 for deriving an upperbound expression for Pi. I used the perimeter of each polygon to approximate the circumference of the circle and from there of Pi. Starting from a square an 8-sided regular polygon is constructed, doubling the number of sides. This procedure can be repeated endlessly doubling the sides of the polygon with every step. The polygon with a larger number of sides closely approximates the circle. The side of the 2n-sided polygon can be determined from the side of the n-sided polygon. This produces a recursive relationship for the side of the 2n-sided polygon in terms of the side of the n-sided polygon. (For the Algebraic Polynomial and the equivalence between Viete's and my expression for Pi I used my results from last year.)

Results
I was able to derive a recursive equation for Pi using regular polygons circumscribed about a circle of radius 1. I have shown that Viete's expression for 2/Pi is equivalent to my last year's expression for Pi. Using my last year's expression for Pi from the lower bound I can derive an Algebraic Polynomial, of which one root is Pi itself and the others I call the "Pi Associates".

Conclusions/Discussion
I was able to derive a recursive equation for Pi using regular polygons circumscribed about a circle, although I did go through quite a bit of trial and error, finding faster and better ways of deriving it. I also was able to show that François Viete's expression for Pi is equivalent to my last year's lower bound expression for Pi. And Lastly, I have introduced the Pi Associates, numbers whose properties I have yet to discover. What kinds of numbers are the Pi Associates? Are they also transcendental numbers? I would like to investigate further on these questions.

Summary Statement
I must prove my last year's expression for Pi is equivalent to Viete's expression for 2/Pi, Pi can be obtained from an Algebraic Polynomial, and to derive an expression for Pi using regular polygons circumscribed about a circle of radius 1.

Help Received
My father has been by me through many sleepless nights, helping me with the tedious cutting and pasting that is involved with the making of a board, and making sure I am equipped with supplies I need. My Biology teacher has been supportive of me, and put deadlines for different elements in the project.