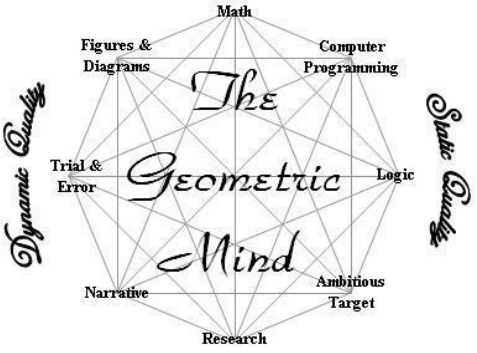
THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

21

PROBLEMS 1-21

Geometric Mind Books 1-7



Published by:
*auto*SOCRATIC PRESS
www.rationalsys.com

The Puzzle

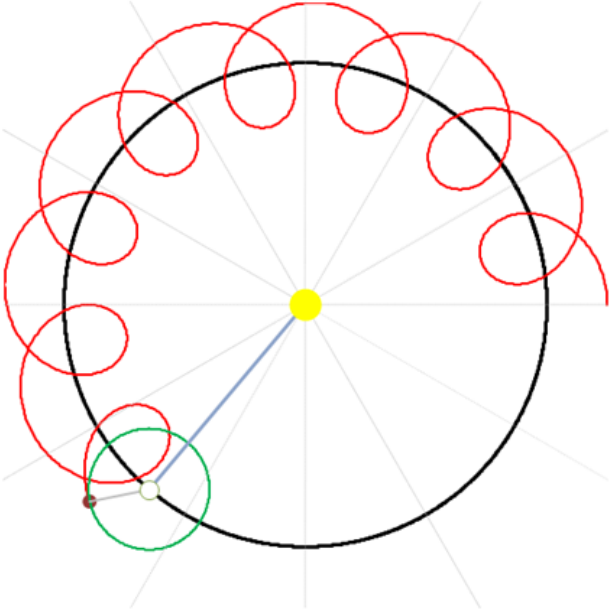
The First 7 Books Will Be Finished by September 30.

The Puzzle Will Be Complete …

THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

From an Apple to the Planets

Newton, Gravity, and Planetary Motion



PROBLEM 1

	Average Distance of Earth from Sun (miles)	Average Distance of Moon from Earth (miles)	
Actual	93,000,000	240,000	
Model	200	50	incorrect scale
Model	200		correct scale

0	.	5		

Check Key 1

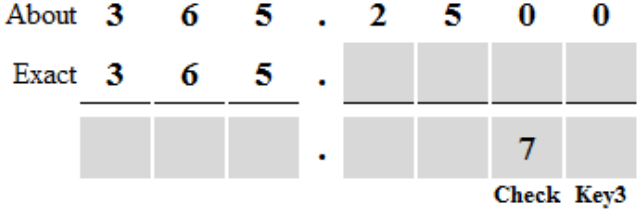
PROBLEM 2

	Sidereal Month	Synodic Month
Actual	27.3	29.5
Theoretical	45.0	

		.	3
	Key 2		Check

PROBLEM 3

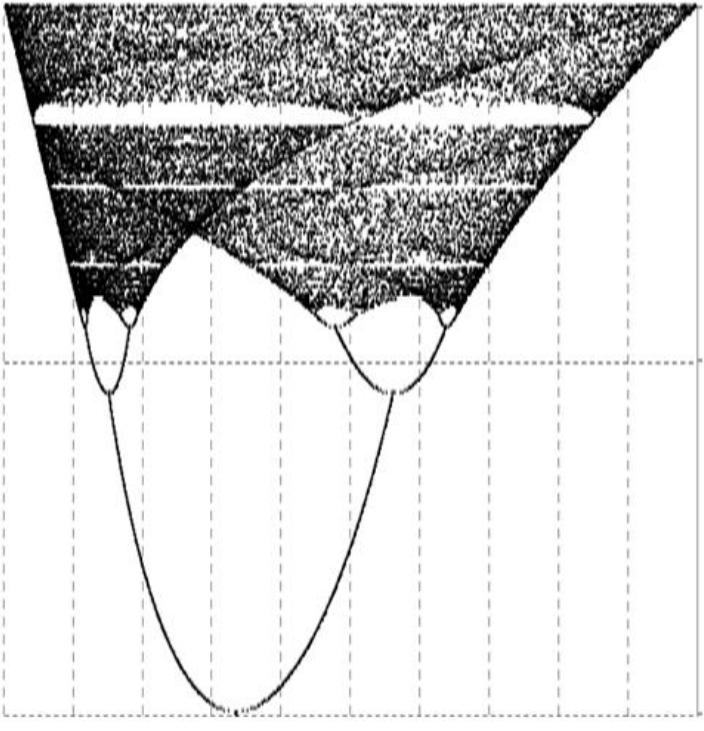
The model assumed the earth goes around the sun every 365.25 days. That's not exactly right. Actually, it's 365 days, 5 hours, 49 minutes, and 12 seconds. What's the difference? (Hint – convert the fractional part to seconds).



THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

The Logistic Map

Bifurcations, Basins of Attractions, and a Lot More



PROBLEM 1

x_7 = 0.76624 and r = 3.1. Find x_9

0	.	7				

Check Key 1

PROBLEM 2

What is the value of r between 3.70 and 3.80 that oscillates between five ending points (assume $x_0 = 0.5$)?

. 7

Check Key 2

10

PROBLEM 3

What is the maximum value of

$$f(x) = x(1-x)$$

$$x \in [0,1]$$

0	.		5

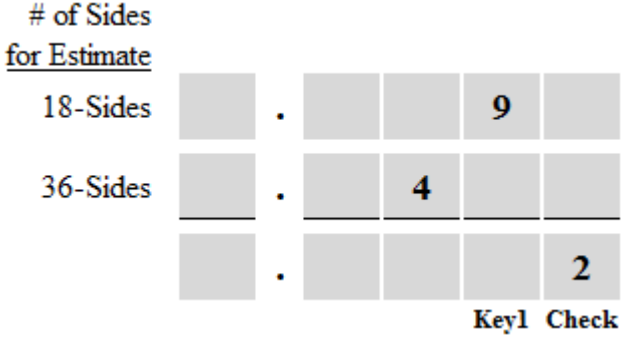
Key 3 Check

THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

ARCHIMEDES
and the
Method of Exhaustion

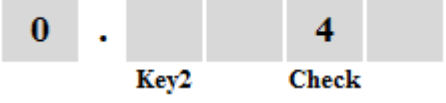
PROBLEM 1

When 18-sided polygons are used, we get an estimate of π. When 36-sided polygons are used, we get a better estimate of π. *How much better?*



PROBLEM 2

If we're using 30-sided polygons to find an estimate of π, what is the sin(relevant angle)?



PROBLEM 3

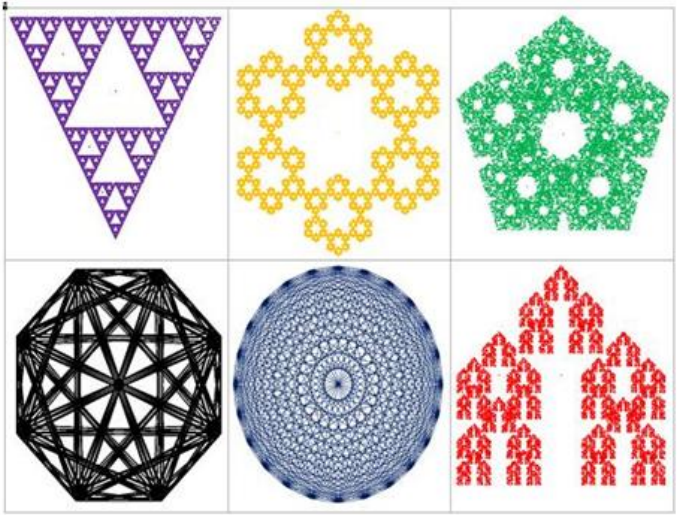
What is the least sided-polygon needed to estimate $\pi \approx 3.14159$?

		9
Key3		Check

THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

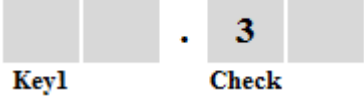
The Chaos Game

From Chaos Comes Order of the Most Peculiar Kind!



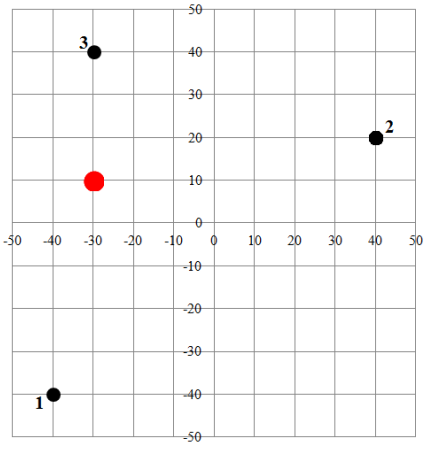
PROBLEM 1

The Tortoise has a 40 mile head start. It now plods along at 3 mph, while the Hare bounces along at 12 mph. At what mile-marker do the two meet?



PROBLEM 2

My current position is the red dot. I've randomly chosen to move towards Point #2. What is the half-way point?

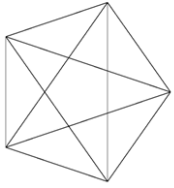


(, 1)

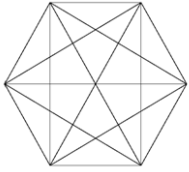
Check Key2

PROBLEM 3

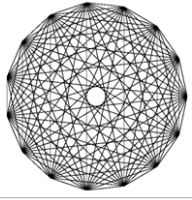
With 5 Points
There are 4+3+2+1 Routes



With 6 Points
There are 5+4+3+2+1 Routes



15 Points
There are _____ Routes



		5

Key3 Check

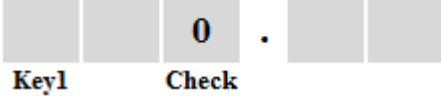
THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

Home Sweet Home

A Short Story on Mortgage Payments and Interest Rates

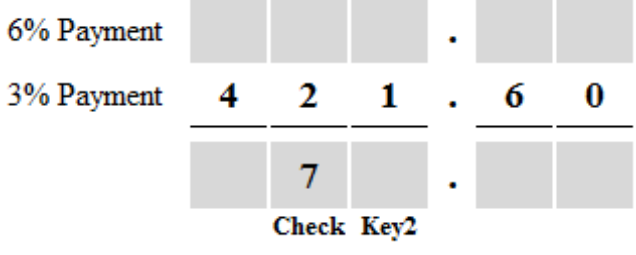
PROBLEM 1

I borrowed some money with the condition I would pay it back in 4 monthly installments of $150. Fortunately, there was no interest rate. How much did I borrow?



PROBLEM 2

Interest rates rose from 3% to 6% in the example earlier in the booklet. How much did the monthly payment rise?



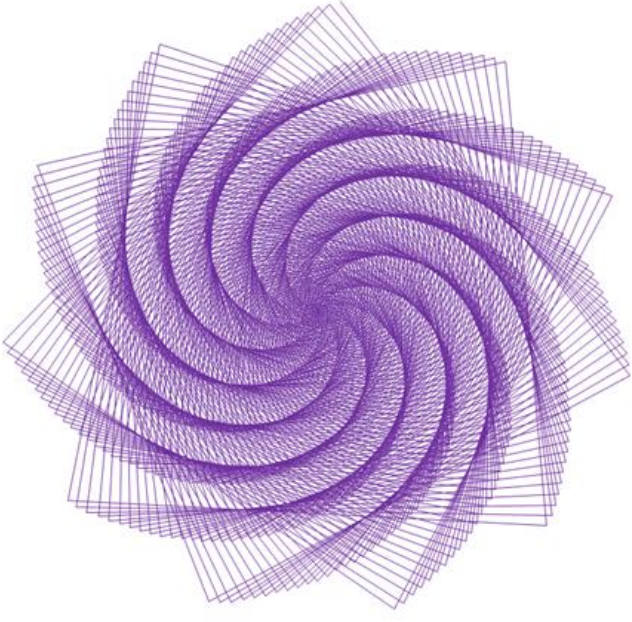
PROBLEM 3

My home payment at 3% for 30 years was $421.60 for a $100,000 loan. I realize I can really afford to pay $500. How much can I borrow, still at 3%?

THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

The Spiral

Beauty - From Cartesian to Polar Coordinates



PROBLEM 1

$$\cos(44°) = \frac{x}{3}$$

2 . Check Key1

PROBLEM 2

Number	Degree	x	y
0	0		
1	0		
2	40		
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			?

	1	.		
	Check		Key2	

PROBLEM 3

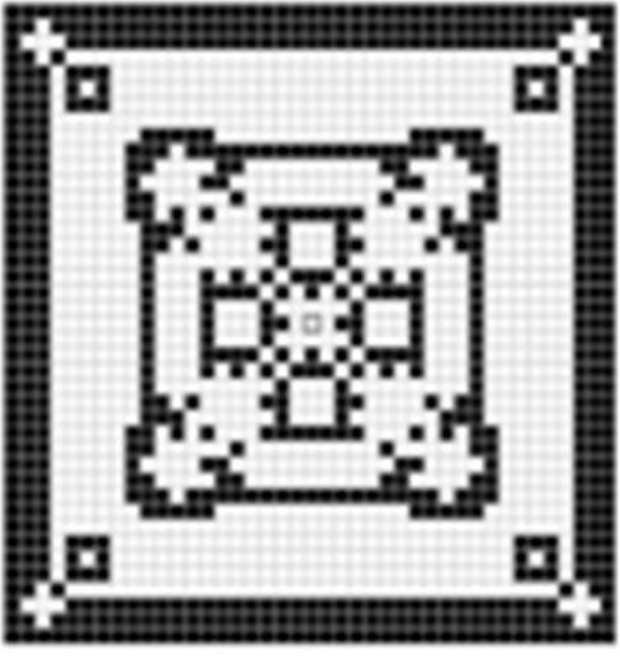
$$(r,\ 53.1°) = (3,4)$$

	.		0
Key 3			Check

THE GEOMETRIC MIND SERIES
an *auto*SOCRATIC QUICK-START publication

The Game of Life

An Introduction to John Conway's "Game of Life"



PROBLEM 1

PROBLEM 2

PROBLEM 3