

=EQUALS=

A Club of Investigation and Discovery

Mike Round

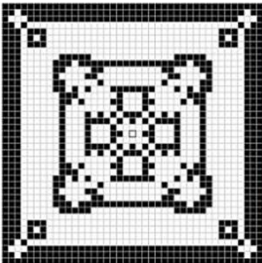
Center for *auto*Socratic Excellence

www.rationalsys.com

AUGUST 2012

An introduction to =EQUALS=, the website, resources, and the spreadsheet. And we'll investigate The Game of Life, the Titanic, and Cool Designs, and see where our "brief look" can take us!

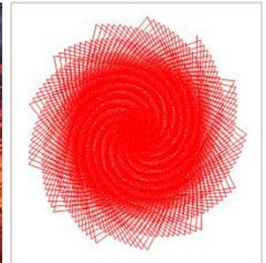
THE GAME OF LIFE



THE TITANIC
Some Thoughts

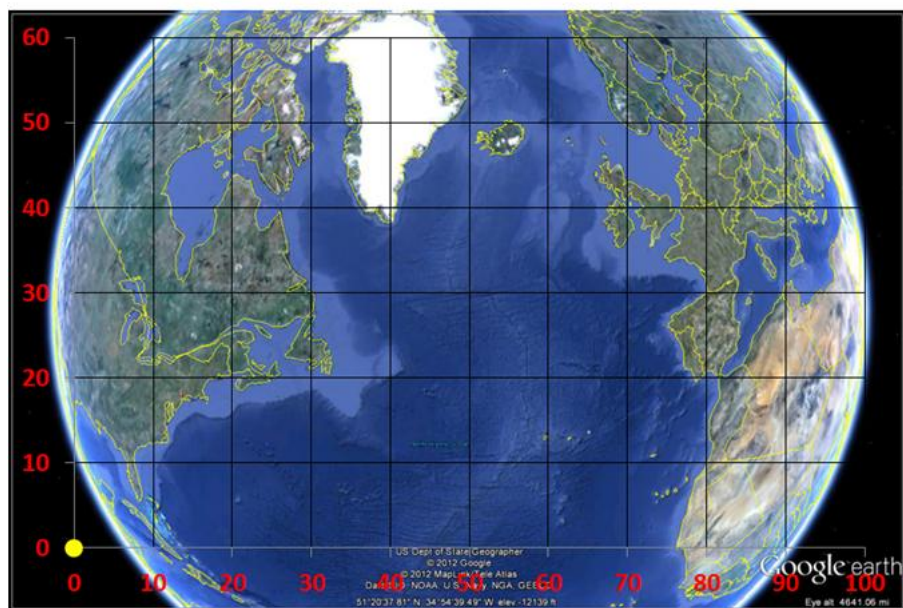
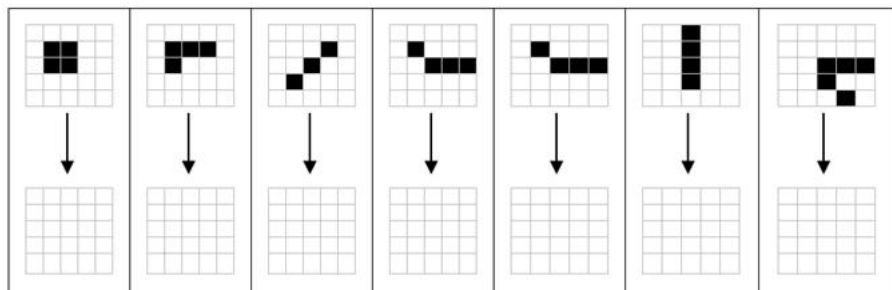


A UNIQUE DESIGN

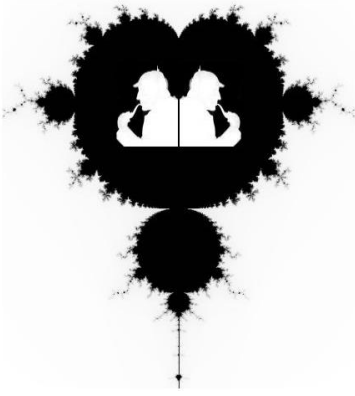


ASSIGNMENTS

- 1 In the "Game of Life", find a neat design and send me the rule and starting pattern;
- 2 Recreate the "Cool Design" graphic, using the video hints on the website;
- 3 Most important, send me something you're working on in class, or see on TV. State capitals. Electron Orbits. Mars. Radiation. A question in math. It doesn't matter what it is, so long as it's of interest to you!



	titanic		iceberg	
	x	y	x	y
start				
finish				



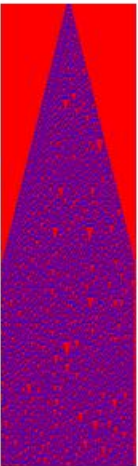
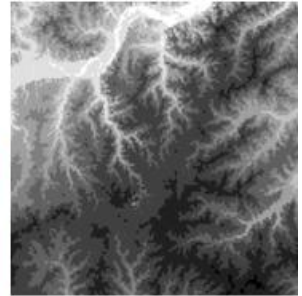
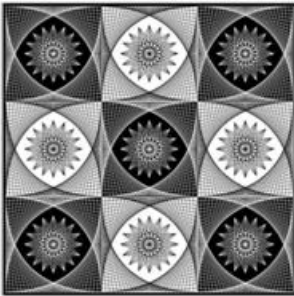
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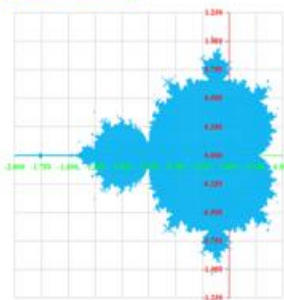
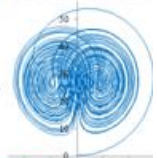
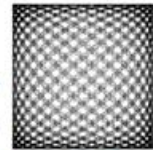
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=EQUALS= is a math, science, programming, and critical thinking club for students, parents, and teachers. The club is for persons of all ages and abilities, and is for those who not only enjoy math/science, but those who don't as well!

The goal of =EQUALS= is to look at fractals, simulation, statistics, chaos and complexity, engineering, math, astronomy, etc., from a new perspective - and actually do the work.

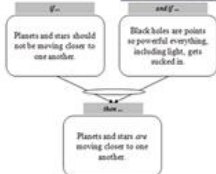
See the site for meeting information, contests, and a year-end "Mandelbrot Celebration!"



Sample Pages / Sample Work

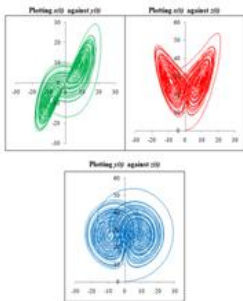
The Joy of Investigation and Discovery in Learning

Already, something doesn't seem right. After all, we're trying to model a Black Hole, which, by definition, implies there is a war in the astronomical tug-of-war: the Black Hole!



This contradiction I'll leave for later, as I want to get started trying to figure out how a black hole might work. Maybe my assumption "the planets are not moving" above is responsible for this contradiction. I'll trace it a bit. As I said, I really want to simply get started. Note to self: as is the case with all contradictions, they must be resolved!

What can I do with this data? It's hard to create a 3-D scatter plot in Excel, but I can plot the coordinates against one another. Let's see what this looks like:



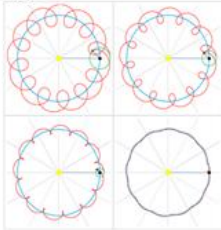
Retrograde Motion

RELATIVE DISTANCES

This model has helped me understand the nature of the full moon, and the difference between sidereal and synodic months. I don't want to lose focus here, as the original question dealt with Easter!

But another thought comes to mind, looking at the looping pattern of the moon's orbit.

Is this really what happens when we look in the sky? Does it look like the moon is going "backwards"? Is this always the case in our model? Let's change the radial distance of the moon's orbit and see what happens:

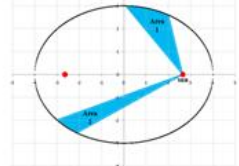


The Pysanky Revolution

UKRAINIAN EASTER EGGS IN A SPREADSHEET



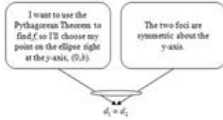
As Laves 1 and 2 look like something I can do something with in Excel, let's start there. Here's an example of these two laws:



I've got an ellipse, with the sun at one of the foci. The planet is revolving around the sun. When it's close to the sun, in a given period of time, it carves out a certain area. Let's call this "Area 1". In that same period of time *elsewhere* about the ellipse, it carves out the same area. Let's call this "Area 2".

Kepler's Second Law, therefore, says in the same amount of time, "Area 1" = "Area 2".

That's the idea. But to get started, I need an ellipse, and all I have is a blank spreadsheet!



Combining these two facts, I can derive the following:

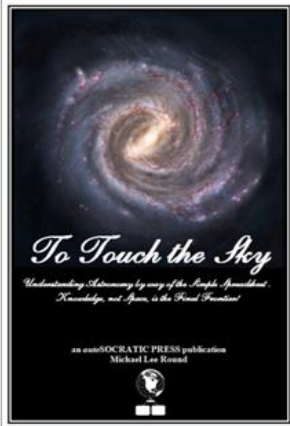
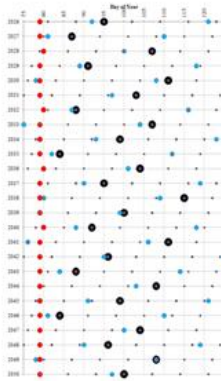
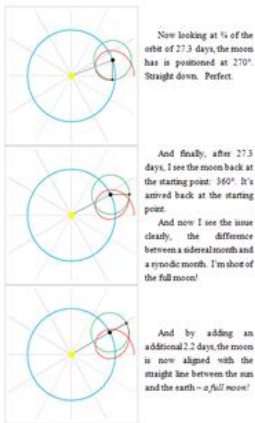
$$d_1 + d_2 = 2a \quad d_1 = d_2$$

$$d_1 + d_1 = 2a$$

$$2d_1 = 2a$$

$$d_1 = a$$

And so that I have my triangle in terms of a and b , I can solve for f using the Pythagorean Theorem:



Some Goals / Advantages

The Joy of Investigation and Discovery in Learning

MULTIPLE ENTRY POINTS	SMALL LEARNING CURVE	SOFTWARE AVAILABILITY
There's an infinite number of things to study. Pick something that looks interesting and get going!	Most software has a steep learning curve. Excel really does not.	Most people have Excel on their computers.

QUICK VALIDATION	SELF-PACED	PROLONGED ANALYSIS
You know immediately if you've done something right - or wrong. Fix it and move on!	As there are 1,000 ways to skin a cat, and so too there are 1,000 ways to solve every problem.	You reach a point of success - or failure - and want to rest. Fine. Save your work. Recall the file. Improve the process.

PROCESS BREAKDOWN	RIGHT AND WRONG	MANY WAYS TO START
The spreadsheet format allows you to breakdown calculations and processes.	To get started doesn't mean it has to be exactly right - but it must be something to get you started!	Often, I see something neat and just want to understand it. Fine. Replicate it. Copy it. The key thing is to get started!

THE REAL WORLD	THE "NEW" MATH	PROBLEM SOLVING
Pascal's Principle. Astronomy. Apportionment. House Payments. Archimedes. The applications are right in front of us - and accessible to all!	Chaos Theory. Fractals. Simulation. Iteration. A "New Kind of Science". Strange Attractors. The "new math" is also right in front of us - and accessible to all!	Most math is within reach of most students. It's how to organize thoughts and data - to truly problem-solve - that is the result of doing the work!

A NEW LOOK AT MATH	INTERDISCIPLINARILY ...	A CAPABLE MIND
Simple logical thinking processes to understand not only math, but the world around us.	And effortlessly integrating this into the world around us - truly in an interdisciplinary format -	With the end-game not only authentic explorations into reality, but the realization we <i>can do it!</i>

Several Methods I Use in Excel ...

cell-formatting	scatter plots	line draw
pivot tables	simulation	animation
programming	formulas	data organization

