

Critical thinking toolkit Runner up in SEDA awards

The critical thinking toolkit was runner up in this years SEDA Educational Development Initiative of the Year Awards. Follow the link to see the workshop Hilary and I put on a couple of weeks ago. Well done Hilary. twitter.com/h_wason/status/1094285657151819779.

Ct toolkit

Coding, rivalry, seashells, golden triangles and rampant rabbits.

Today we're going to tie the concepts of; coding, renaissance rivalry, punch-ups, golden shapes and reproducing rabbits all together - because maths wouldn't be the same without it.



Photo by Pixabay on Pexels.com

Now a long time ago (I was 9) my dad tutored me to prepare me for my exams at 11. Everything was a challenge, but that if you understood the rules, you could follow those rules. Non-verbal reasoning appealed to me. Maths made sense even if I didn't understand it yet.

Maths underpins all science- physics, chemistry and biology- (in that order) and that underpins all life. Yes it is massive but then, have you seen the universe lately?

So, this week I am going to teach myself **R**. If you already know what R is, you are already 100% more knowledgeable than I was when I said I'd learn it. But in all things, sometimes it's wise to be ignorant, pretend we know nothing and start small.

For those of you who don't know what the heck I'm taking about, it's a **coding** package of nightmares for the fainthearted. I have had to get out 'R for dummies' from the library to help me translate the 'coding speak' that is so common to the up and coming tech-savvy generation. I have also gotten an app called datacamp <https://www.datacamp.com/courses-> if you're interested. The millennial

generation have so many tools that we never had, and well done them for bothering to facilitate their own learning.



It's challenging non-verbal reasoning- but thank goodness for the app. Photo by Pixabay on Pexels.com

Where am I going with this? In the R learning package they utilise something called the golden rule : 5:3:2 as if it were assumed I knew about this fundamental piece of knowledge. Its something called the **Fibonacci sequence** which I had heard about. A bit. Spirals in shells and stuff.

First let's put this all in context and I'll tell you what I know.

Firstly, Fibonacci was Pisano- from Pisa- about 500 years ago and Fibonacci was a nickname. Pisani were/are mortal enemies of the Fiorentini- who say,

"Better a death in the house than a Pisano on your doorstep".

To say that people from Florence (some say the cradle of the renaissance) really didn't like people from Pisa was an understatement. short video about Fibonacci.

So, here's the sequence:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89.....

Can you see a pattern? If you can't see a pattern. Don't worry.

The 1st and 2nd numbers add up to the 3rd. The 3rd and 2nd up to the 4th, the 3rd and 4th up to the 5th and so on.

Why? Just is?

No. Everything has a 'Why?'

Think of yourself as a little robot who has an infinite pile of bricks to make into a wall. the little robot collects the bricks to build a wall (like WALL.E) and has a *really, really* short term memory, so you can only remember **the last thing** you did and the **time before that**.

So you count the last number of bricks you used in the wall and the number of bricks you used the time before that. That is the number of bricks you will now use. Easy.

It is all based around the **relative numbers** of your bricks: Ultimate and penultimate.

So you assemble your wall.....



Photo by Alexander Kovalyov on Pexels.com

Then you begin again, assessing how many bricks you **just used** and the time before that. Each time the number of bricks will increase by a certain value and that value is a Fibonacci number. Its logical. Its a self perpetuating cycle.

The numbers of bricks used each time relative to each other are a certain size/volume/shape and this brick building thing is perpetual.

It is these 2 facts;

1. relative size of whatever you've just produced to what went immediately before
2. the perpetuity of it all

that creates repeating patterns in plants and flowers when their structures are first developing at a microscopic level.

Most plants have: petals, leaves, pips, centres etc that add up using this principle of Fibonacci, which is why they have such lovely swirls (check out the maths of the swirl below).



“He loves me, loves me not.” Photo by Suzy Hazelwood on Pexels.com

So now for what may seem like a weird bit.

If you divide one of those Fibonacci numbers with the number before i.e 55/34- you will always get **THE SAME NUMBER!!!!!! 1.6183**- this is not magic but simply that you are always increasing your brick number by the ultimate and penultimate number bricks, so the ratio is always the same. However, it is called a **Golden ratio**-

So, Fibonacci explained it in terms of rabbits. 1 rabbit boinks 1 rabbit to make 2 rabbits. How many rabbits there would be in a field if they never died? If they mated once a month, they had one male and one female offspring each month, and all their offspring mated with each other- you'd get these numbers.



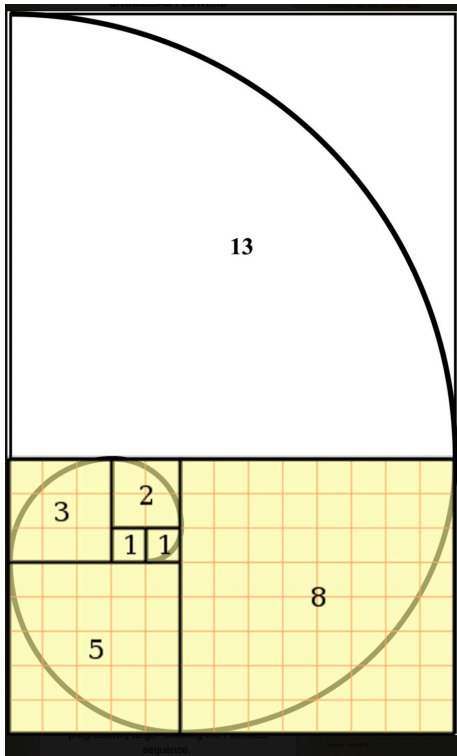
Fibonacci time..... Photo by Ulriika Joutseno on Pexels.com

The Golden ratio is known as many names, PHI(named after the Greek Phidias who built the parthenon) but I'll stick with 'The Golden Ratio (8:5, 89:55 or decimally 1.6183)', named perhaps because things built this way as such are so aesthetically pleasing. It has been used relentlessly in art, architecture and anatomy i.e length of face:width of face; length of body: distance to navel) and was a concept that was kicking around since before Fibonacci.

This magical ratio is found in the pyramids at Giza, the acropolis in Greece and the Parthenon- Great website examining golden rules in famous buildings. Let's face it those ancients were enlightened- (then came the dark ages, which is why the renaissance is called the rebirth).

I'm just going to explain the shell curve thing today- as this is visualised most easily.

You know you like the curve- but why? Well, because it is mathematically sound.



Recognise the numbers yet? Also, look at what the numbers in the boxes represent and where the curved line intersects.

Homework.....The next time you're bored, in a meeting or a class,(you know the ones when maths is more appealing than listening)- try drawing this curve out. Alternatively, watch this video- it is just lovely spirals and doodling in class,

Now, most renaissance art had golden rules somewhere within them, and scenic layouts follow the shell idea of aesthetic perfection . This has been applied to recent photography and deconstructed quite beautifully.



NOTLR
@NOTLR



Replying to @hughesroland

Identical to the Cistine chapel roof

Applying renaissance principles to a punch up

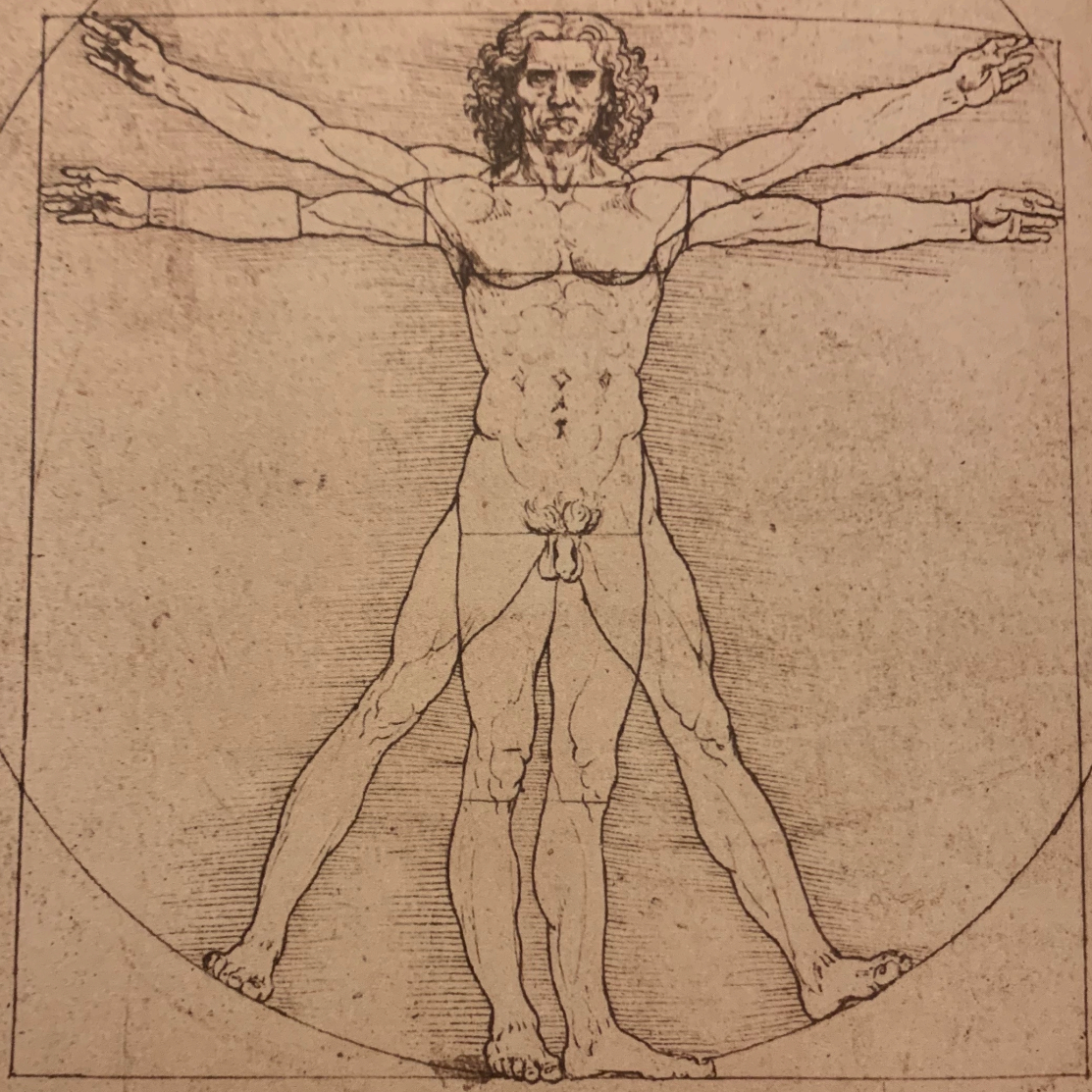
Manchester brawl- spot the Fibonacci sequence and the nod to Michelangelo's creation of man

So, using these rules you can also construct an aesthetically pleasing golden rectangle (I.e: 8x 13). You can cut the golden rectangle into 2 triangles - and they too come out golden.

You can also make a 'golden' pentagram and a pentagon using these dimensions- essentially they're all mathematically sound, and very, very pleasing to the eye- this time it's to do with the angles they use- but we won't go into that here.

At this point historically, obviously I'm paraphrasing, but with Leonardo 'Fibonacci', Leonardo Da Vinci, Michelangelo, these objects are everywhere. Da Vinci called it the ~Divine proportions and can be found marked out in 'Vitruvian man'. More modern artists have also adopted this- the artist Mondrian being the most obvious. Essentially, look for it and you'll see it.

Handwritten text in a cursive script, likely a preface or introduction, located at the top of the page above the main illustration.



Handwritten text in a cursive script, likely a continuation of the preface or introduction, located below the main illustration.

Handwritten text in a cursive script, likely a continuation of the preface or introduction, located at the bottom of the page.

Vitruvian man espouses perfect golden ratios.

Leonardo Da Vinci, who died 500 years ago this year was an exponent of all things artistic and scientific. Art and science were not exclusive and once you begin to see science and art from that point of view, the more any of what I am talking about with respect to beauty in science starts to make sense, even 9 year olds.

**Your task is to find something
you'd normally not look at twice**



Link: This is literally so cool.

As temperatures plummet all over the planet, lots of posts are popping up about the cold weather. My absolute favourite has to be National Geographic's bubble freezing slowly (see below).

I see the frost, it's just crystals of water after all- but there's a lot to be said about that from an aesthetic point of view- leaving the house in the morning when it's dark and frosty. The gloomy grey colour of the pavement has disappeared and the twinkling frost has coated everything.

Moisture in air has turned to ice as temperatures plummet and anything with water in it freezes. Damp washing in Chicago freezes.

Link: Nippy video from the Guardian.

Water appears to steam despite freezing temperatures. The river in the video from The Guardian is 'steaming' because the water is much, much warmer than the air. That tells you how cold the air is.

I wanted to paint a frosty flower, capture how beautiful frost can look on plants. Problem is, water in the leaves freezes, expands and bursts the little vessels (like your pipes), so me capturing twinkly frost on some leaf or other is quite tricky, as it's probably wilted, or grown black and died.

So I chose the cabbages to draw Cabbageart. Not quite a rose.



I planted them last summer when it seemed a really good idea at the time then I forgot about them. It's February and I have 2 massive , caterpillar-eaten, gone -to-seed cabbages.

I think they're magnificent. Those darkest green, thick leaves. Veins so tough that a little overnight frost doesn't touch them.

Given their lack of care, the fact that they haven't been decimated by the wildlife, broken by foxes during their nighttime shenanigans and are still standing despite numerous frosty mornings, makes me take my hat off to these magnificent brassicas.

It was draw that or the garden bin- which has also improved with the frost.