Finding the gradient of a poem

“Oulipo poetry” involves crafting poetry in a manner so that it follows a mathematical rule or restraint. The Oulipo movement was co-founded by François Le Lionnais who was a chemical engineer with an interest in maths. Lionnais had a crazy life and there isn’t really time for it here, but he dipped his toes into all kinds of fields and was captured by the Gestapo at one point for being part of the French resistance- or maybe they just didn't like his poetry... Anyway the Oulipo movement popularised in France (1960) was made up of a mixture of mathematicians and poets who sought to prove that restraints do not stifle creativity, but stimulate it. I found this movement interesting as it attempts to bridge that artificial divide between artistic and STEM fields. Moreover Oulipo has had very little attention in the English language (largely being French movement), so as the only person in the world taking A level Maths AND English Literature, I took it upon myself to write some horrible original poems inspired by the ideas of the Oulipo movement, in order to explore the challenges and problems faced when trying to combine the disciplines of maths and poetry.

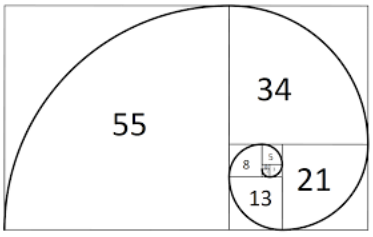
Fibonacci poem:

Many Oulipo poems follow mathematical sequences, for example there's a link at the bottom to a rewrite of Edgar Allan Poe's “The Raven”- one of my favourite poems by the way I love the Simpsons version- following the digits of Pi (although I doubt this work was completed with the Oulipo movement in mind). Alternatively linked below is a collection of genuine Oulipo poems that follow the digits of Pi to organise their stanzas. This is really complicated though so I thought as my first sequence poem I'd try doing a basic Fibonacci poem. The Fibonacci sequence famously has each subsequent term be the sum of the previous 2 terms (1, 1 , 2, 3 ,5….) and can be defined by this equation:

$$F_n = F_{n-1} + F_{n-2}$$

$$n > 1$$

If we applied this to a poem, we could have each term in the sequence be a line, and the value be the number of syllables. I wanted all the poems to be maths-related in a desperate attempt to keep this essay vaguely relevant to the topic, so for this first short poem I decided to write about trigonometry. It's pretty short as continuing it would mean I ran out of space faster than an exponential graph hits its asymptote, but I think it's a nice little proof of concept:

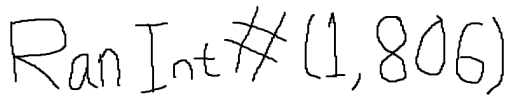


“Sine”
Sighs
Students
It’s boring.
We’d rather go dance
Or play sports or even romance
But, I interject: trig is good for any project
Ask architects, and engineers, seismologists, astronomers, and future careers

I thought I'd like to reflect a bit about each poem at the bottom. I think this was a decent start but it's a bit simplistic and the flow is a bit off by the end, but I'm proud of the sibilance emphasising that sigh of boredom and literally forcing the reader to make that sound. Without getting too “englishy” on you and sending you straight to sleep, I think it's quite poetic as the poem quote literally expands, mirroring how trigonometry might widen future possibilities.

Random poem:

A common Oulipo poem is an “n+7” poem where each noun must be followed by the 7th noun after it in the dictionary. Inspired by this I thought I'd try and produce something similar but instead use a simple random sample to select my words. The oxford school dictionary has exactly 806 pages of words; we can use this as a sampling frame to select 14 random words to add to our poem (1 per line) making the world's first surprise sonnet! (it's random so it's a surprise). For simplicity's sake, let's use the 3rd word on each selected page as unfortunately the number of words per page varies. We can generate 14 random numbers between 1 and 806 using the CASIO fx-C650 calculator like so (ignoring repeats)



Here's the results

104	carpenter	207	distraction	27	announcement	601	rush
518	plumbing	728	tie	139	compel	770	venom
721	thankful	798	wonderment	286	furnishings		
282	friction	545	proverb	157	cornflower		

And the theme of this poem….drum roll… famous maths figures/people

Newton was not a carpenter
Nor did he knew tonnes about plumbing
But be thankful it's not fiction
That he let us understand friction

After some distraction, Einstein jumped into action
He wore a suit and tie
In wonderment, he discovered relativity- what a guy
Like a proverb of wisdom transcending through the sky!

Announcement: “eureka!”, Archimedes (the bees knees) cried
But what could compel him to yell?
It was not ikea furnishings, but him confirming his
buoyancy breakthrough, a cornflower in the field of knowledge

These heroes had a rush of insite
The venom of passion, to transform the world in ways, we can only imagine.

I found this particularly challenging to write. I'm very happy with the first stanzas, particularly the word play- I felt like Shakespeare coming up with that- however I bet even the best Oulipo poet would have struggled to work in “cornflower” :(In some ways this poem feels more like a demonstration of using randomness rather than a meaningful work of literature. I'd love to see what someone more talented could come up with. If I was to do it again I'd maybe focus on randomness itself as the theme, which might make the ideas and the product slightly more cohesive.

Mathews algorithm:

One key development in Oulipo poetry was “Mathews algorithm” which involves defining at least 2 sets of heterogeneous(different) elements and putting them in a table only to rearrange them to find new exciting combinations. If you have no idea what I just said don't worry, there's an entire website dedicated to mathews algorithm (linked below), but it does appear to be translated from french and difficult to follow at times.
The gist is that you arrange the words you like in a table, and the “algorithm” which consists of shifting the rows left and right produces new combinations. For example, I'll use the tool created by Mark Wolf on the website. Sorry this font is smaller than Kevin Hart's pinky I really struggled to lay this out,

Text 1

1. the moon
2. a river
3. the wind
4. shadows

Text 2

1. whispers softly
2. dances ominously
3. sings soothingly
4. dissolves into dusk

Text 3

1. in endless loops
2. with quiet grace
3. with a sense of pride
4. in defiance

Text 4

1. in the forest
2. on the mountaintops
3. through the snow
4. under the moonlight

In which direction do you want to shift the elements? right
Transform

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2. dances ominously
3. with a sense of pride
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In which direction do you want to shift the elements? right
Transform

You can see how the initial layout in image 1 is shifted to create some interesting combinations in image 2 eg “the moon dances ominously with a sense of pride under the moonlight”- which contains an interesting paradox.
The way this works is the elements are arranged in columns like so

1	a_1	b_1	c_1	d_1
2	a_2	b_2	c_2	d_2
3	a_3	b_3	c_3	d_3
4	a_4	b_4	c_4	d_4

And then shifted n-1 places to the left (or right). In other words dont shift set 1 as 1-1=0, shift set 2 one place as 2-1=1 ect.. To this

1	a_1	b_1	c_1	d_1
2	b_2	c_2	d_2	a_2
3	c_3	d_3	a_3	b_3
4	d_4	a_4	b_4	c_4

(Images from website link at end)

To be honest I don't think this is super amazing or anything I just thought I should bring it up as when researching Oulipo poetry this was a big deal apparently.¯_(ツ)_/¯ I think the idea is to repeat this process a lot more times to spark inspiration.

Graph poem and chaos!

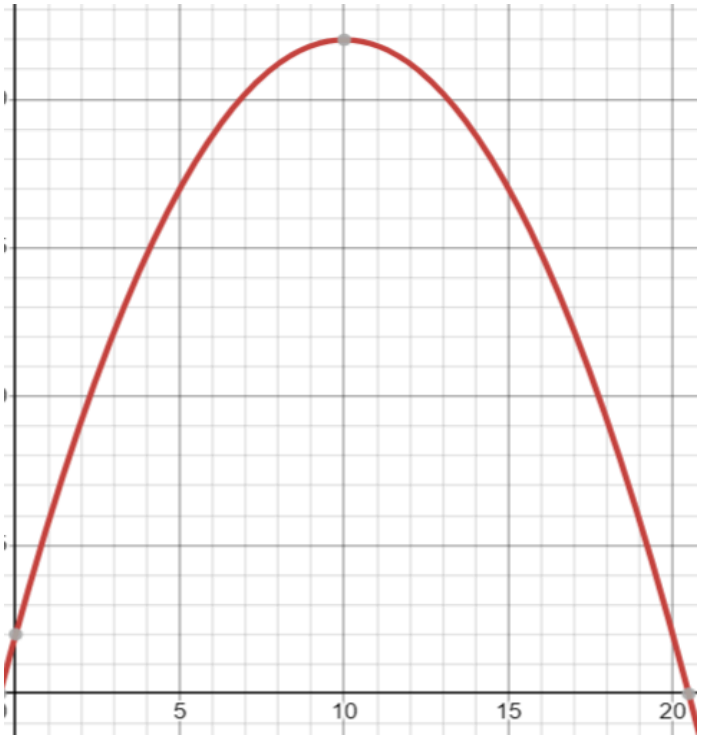
If you are a fan of Christopher Nolan's films you know that any great magician ends with a spectacular prestige to wow the audience- i’m not doing magic and I preferred Inception personally but here's my finale!

My favourite part of maths has always been finding the gradient of a line, because I think it's so funny that basically half of GCSE and A Level involves finding the slope of a graph which just sounds ridiculous. One key part of this ever endless pile of gradients to find is finding the turning points of polynomial functions, which sparked an idea as poetry also famously has turning points (known as Voltas for sonnets, i'm not writing a sonnet I just like the term). So I began to think of ways to combine these two properties to write a poem following a function

on a graph, that has a turning point at the turning point on the graph- oh and let's make the X values be the lines and the Y values be the number of syllables i'm allowed to use just to add a constraint and make the poem look like our function as it goes up and down.

The first problem I encountered was that many more interesting polynomials such as cubics tended to be too "extreme" to the point that by line 8 i'd be on like 50 syllables, so I decided to go with a quadratic. Problem two was finding a quadratic that wasn't equally extreme and also had 2 positive roots with one being 0- meaning that my constraint of the syllables and lines wouldn't go negative which I thought was cheating.
Here's the function I landed on:

$$f(x) = -\frac{1}{5}x^2 + 4x + 2$$



This function was perfect in terms of the maximum point keeping the syllable count reasonable, while remaining positive for the range I need (1-20 for 20 lines).

To find out where my turning point should be, let's use some primary school level differentiation!! (seriously maths wise this might be the least impressive essay ever submitted)

$$f'(x) = -\frac{2}{5}x + 4$$

$$-\frac{2}{5}x + 4 = 0$$

$$-2x = -20$$

$$x = 10$$

Wowee the stationary point is at X=10 so my poetic turning point should happen at line 10

Here's a table of values for the graph showing how I got my syllable number (Y) per line (X), Y is rounded obviously

x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
≈y	2	6	10	12	15	17	19	20	21	22	22	22	21	20	19	17	15	12	10	6	2

Ok this is kinda similar to the first poem I did so let's spice it up by randomising the Rhyme scheme!!- but with CHAOS

When I first heard about chaos theory I assumed it would be some mystical rule governing Kanye West's tweets but thankfully it's far less polarising. I watched a video by Veritasium and from what I understand a part of chaos theory is a “logic map” which is an equation that when iterated devolves into pure chaos but with periods of oscillation which are more predictable. Fun fact that you probably already know- this was used as early random number generators for computers.
Here's my Logic map, I experimented with a few similar values of “r” this was the best I thought

$$x_{n+1} = r x_n (1 - x_n)$$

$$r = 3.95$$

Here's my values, you may be wondering how I plan to convert this to a rhyme scheme, I figured i'll do 4 different rhyme sounds and assign each to a different range from 1-0

line	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	0.99	0.04	0.183	0.59	0.95	0.17	0.56	0.97	0.10	0.35	0.90	0.32	0.87	0.46	0.98	0.08	0.28	0.80	0.64	0.90	0.33
	D	A	A	C	D	A	C	D	A	B	D	B	D	B	D	A	A	D	C	D	B

$0 \leq x < 0.25$ Rhyme A

$0.25 \leq x < 0.5$ Rhyme B

$0.5 \leq x < 0.75$ Rhyme C

$0.75 \leq x \leq 1$ Rhyme D

Here's my rhyme sounds if your interested
ERS = D
TION = A
ICE= C
APHS = B

Final poem topic- maths and nature, I watched a really cool video on “the golden ratio” by Be Smart (linked at bottom) which inspired this. Look out for the turning point!

Numbers:
Guide life's interaction
And with patterns full of satisfaction
Everyone so intricate, every so precise

The hexagons used by bees, and also the spirals of some birds
Romanesco broccoli, snowflakes and ferns with fractal abstraction
White daisies, blue lilies, pink starfish with radial symmetry will suffice
But also logarithms behind solar systems, snails shells and hurricane thunders

Also DNA, majestic genetics determined by probability and attraction
However even decay is shaped by logic, defined by areas where beauty lacks
More eerier, take bacteria exponentially growing till we are outnumbered
Or famine-fueling potato blights and cruel fungi that make entire crops collapse

The levy flight patterns that unscrupulous sharks use as apex predator hunters
Poisons evolved to maximise their lethal dose fifty to kill dogs and giraffes
The voronoi zones that dictate territory for terrifying tigers
And rules of collective motion helping locust resource extraction

From deadly viruses to healing drugs like ceftriaxone
From explosive tropical storms in the summers
Maths guides the world if malicious or nice
In a maze of colours

Thats maths

I'm really pleased that It kind of captures the shape of the parabola and there's a turning point on line 10 as you can see (both graphically and poetically). This was the hardest poem to write and I think it's ok given the constraints, but the metre seems off at points and some lines feel too long. The Rhyme scheme certainly feels chaotic I'll give it that, but if I did another I'd probably change the ranges of each rhyme to make one sound have a bigger proportion of the lines to assist the flow a bit more, or just have only 3 different rhymes.

Conclusion

So what was the point of all that? You might argue this was the most useless exercise ever and I do agree, but I think there's a value in examining the challenges that occur when applying these totally opposite subjects to each other, for example how randomising words and rhymes makes it very difficult to shape a flow/narrative or how constraining the syllable count forces more creative word uses. It was an interesting thought experiment. Moreover I learnt a lot about a seemingly underground poetry movement in the process. I think more than anything writing this lets me appreciate my love for literature and maths in a new way. People always talk about "left brain" thinking for maths and science vs "right brain" thinking for arts and literature, I think writing this poem I became temporarily "middle brain" in a way very few people ever have tried to be.
Thanks for reading :)

"The Raven" but Pi http://www.cadaeic.net/naraven.htm

Actual Oulipo Pi poems
https://wordswithoutborders.org/read/article/2013-12/from-41-irrational-sonnets/

Mathews algorithm https://markwolff.name/wp/research/mathewss-algorithm/
-images from this site

Golden ratio video https://youtu.be/1Jj-sJ78O6M?si=DgMpMTKykVeiMl9_

Chaos theory video https://youtu.be/fDek6cYijxI?si=aLUPPqIy2UUOg5_1

Oulipo poetry wiki page - I did my research here don't judge me-
https://en.m.wikipedia.org/wiki/Oulipo

Image of fibonacci sequence from
https://www.mjmatc.com/positional-integration/2017/8/27/fibonacci-spirals-and-human-movement

Image of graph created using https://www.desmos.com/