



CoIAUMS Space

NEWSLETTER OF THE AUMS

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Contact details

AUMS email
mathsatadelaide@gmail.com
AUMS website
aums.org.au
AUMS Facebook page
facebook.com/UofAMathsSociety
AUMS Instagram
[@adelaideunimaths](https://www.instagram.com/adelaideunimaths)

Have an idea for an article or want to contribute? Contact the editor at colaums.space@gmail.com

Need a membership?

See us at our next event to sign up or use the link below!

<https://aumsmemberships.getqpay.com/>

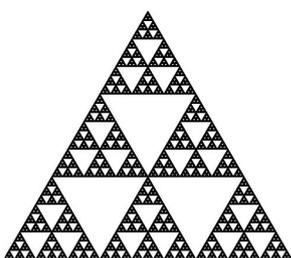


Figure 1.0, Sierpinski Triangle

Introduction

Hello and welcome back to the second edition of CoIAUMS for 2022! We hope you had a fantastic first 6 weeks back to uni and a relaxing holiday, but if they were anything like mine it was a good excuse to catch up on work and sleep. We have less events on the horizon for this term, but the ones we do have are guaranteed to be a blast! Our first event is our annual pub-crawl on Friday Week 8. Shirts are going on sale in the second week back, so make sure you get them quick because the pub-crawl will push you to your 'limit'. Another exciting event is our Women in Maths Day panel on Thursday week 9, held in the IW conference room on level 7. More information about the panellists and a link to register will be available on our social media. In week 10 we also have some student talks, there will be more details released about this closer to the time so make sure you stay tuned on social media for updates. In this issue there is an article on fractals, focusing on the Sierpinski triangle, with code that you can use to create your own fractals. The second article will celebrate women in maths by looking at some of the most exciting female mathematicians of the last century. Thanks everyone for our amazing first term, I look forward to seeing you all soon and good luck with your studies!

- *Nicholas Aplin, CoIAUMS Editor*

Fractals and Sierpinski's Triangle

While some of you may already know what fractals are, I'll do a quick refresher. A fractal is a curve or geometric shape that has a forever repeating pattern. No matter how far you zoom in, you will always see the same thing (see Fig 1.0). Fractals have a variety of applications, including medicine, where they're used for diagnosing cancer. Another use is in image compression and resolution to make highly efficient data storage for 3D models. To show how a fractal can be made we will use the shape in Fig 1.0 as an example, this is known as Sierpinski's Triangle and there are a few ways to make it. The first is by removing triangles, the process is as follows:



Figure 1.1, Sierpinski Triangle process

1. Start with an equilateral triangle
2. Subdivide it into four smaller congruent triangles and remove the central triangle
3. Repeat step 2 infinitely to get the Sierpinski triangle

Using this process, it will progress as seen in Fig 1.1. The other way that it can happen is through a chaos game and the way this works is as follows:

1. Take three points in a plane that form an equilateral triangle
2. Randomly select any point on that plane
3. Randomly select any of the vertex points
4. Move half the distance from your current position to the selected vertex
5. Plot the current position
6. Repeat from step 3

To see how this looks in practice see Fig 1.2 and if you want have a go for yourself, I have written a python script that can be downloaded here [here](#)) that you can have a play with and see the triangle form. You will require the Turtle and Random packages, so ensure they are installed.

- Nicholas Aplin, CoLAUMS Editor

Puzzle

Try and find the letter or number that belongs where the question mark is.

	16	4	
T	D	C	G
P	M	K	H
	3	?	

Women In Maths

On Thursday the 12th of May, we will be celebrating International Women in Maths Day with the Women in STEM society. We celebrate the past, present and future achievements of women in maths on this day because it is the birthday of Dr. Maryam Mirzakhani, the only female winner of the Fields Medal. The Fields Medal is the highest honour in mathematics, often described as the mathematical equivalent of a Nobel prize; however, it is only awarded every 4 years and only to mathematicians aged 40 or younger.

Female mathematicians have made significant and vast contributions to mathematics across the world, and I want to share just a few of them with you!

Dr. Maryam Mirzakhani was not only the first woman to win the Fields Medal, but also the first Iranian. She was born on the 12th of May, 1977, in Iran, for whom she won two gold medals at the International Mathematical Olympiad.



Dr. Maryam Mirzakhani Dr. Mirzakhani studied her Bachelor of Mathematics in Tehran before moving to the USA to earn her doctorate, remaining in the country as a professor upon completion of her studies. She was considered a leader in the fields of hyperbolic geometry, topology and dynamics.



Julia Robinson

Julia Robinson was the first woman to serve as President of the American Mathematical Society and was a recipient of a MacArthur Fellowship. Her work was instrumental in the discovery of the solution to Hilbert's 10th problem, a question looking at determining whether an equation has an integer solution. While she wasn't the one to prove that there is no general algorithm, Julia did show that a "Goldilocks" equation was required, sparking a different perspective of thinking to that eventually



Gladys West

Gladys West was an American Mathematician who earned both a bachelor's and master's degree in mathematics. During her time at the Virginia U.S. Naval Proving Ground, she was renowned among employees for her ability to solve complex mathematical problems by hand.⁵ Gladys moved on to programming computers, designing an award-winning pro-

gram to determine the movements of Pluto in relation to Neptune.

Gladys' later work involved using satellites to monitor ocean conditions and was the first project to demonstrate the successful use of satellites to measure ocean data. This work laid the foundations for our current GPS technology.

As you can see, the contributions women have made to the field of mathematics are far reaching and incredible. Please come along to our Women in Maths Day panel to hear about our current incredible mathematicians and an insightful discussion into some of the remaining barriers that women face in our field of mathematics. - *Katie Atkins, AUMS President*