MATHS NEWSLETTER

LATEST MATHS LECTURES

The [Birmingham Popular Mathematics Lectures](#) are open to all who are interested in the study of Mathematics. They are particularly suitable for those studying Mathematics at A Level and advanced GCSE students. The next lecture is at 7pm 24th March on "Combinatorics in the plane" by Dr Johannes Carmesin.

[Oxford Mathematics Public Lectures](#) enable anyone with an interest in the subject to see the best mathematicians in action and to share their pleasure (and occasional pain). They are aimed at the General Public. There are quick links to past lectures from the 10 most important equations in life to the beauty and art in mathematics.

LATEST MATHS ARTICLES

Frontiers for Young Minds

Frontiers for Young Minds (FYM) believes that the best way to make cutting-edge science discoveries available to younger audiences is to enable young people and scientists to work together to create articles that are both accurate and exciting. Distinguished scientists are invited to write about their cutting-edge discoveries in a language that is accessible for young readers, and it is then up to the kids themselves – with the help of a science mentor – to review the articles before publication.

[This half term's FYM pick](#) looks at disease modelling. This article introduces a popular type of mathematical model of disease spread. It discusses how the results of analysing mathematical models can influence government policies and human behaviour, such as encouraging mask wearing and physical distancing to help slow the spread of a disease.

DISEASE DETECTIVES: USING MATHEMATICS TO FORECAST THE SPREAD OF INFECTIOUS DISEASES

Heather Z. Brooks[1], Unchitta Kanjanasaratool[2], Yacoub H. Kureh[3] and Mason A. Porter[3*]

Maths Degrees Under the Microscope

Reading mathematics at university gives you a great foundation to explore so many career paths. Maths underpins so many fields from medical research, bioengineering and space science to large systems modelling in finance, politics and rolling out vaccines. With so many undergrad maths courses to choose from abroad and in the UK, it can be difficult understand the right course for you. In this section we are going to pull apart one mathematics degree each edition and show you the diversity of maths degrees!

This half term's pick [is Mathematics, Operational Research & Statistics with Professional Placement BSc (Hons) at Cardiff University](#). This 4-year BSc in Mathematics, Operational Research and Statistics combines specialisation in statistics and operational research, with the study of the principles of mathematics, offering a good grounding in general mathematical theory and techniques. Operational research techniques, sometimes called management science, provide quantitative decision-making methods complementary to statistical analysis, such as game theory, dynamic programming, the control of queues and quality control.

The part that caught our eye: this particular version of the degree allows you to spend your third year in paid work as a mathematician and/or statistician at an organisation in the United Kingdom or Europe! This is a great way to set yourself apart and learn crucial transferable skills to jump into any workplace of your choosing. You will have support to apply for a placement, which can be undertaken with a wide range of providers across industry and government including many in the financial services, the pharmaceutical industry and organisations such as the Office for National Statistics. Furthermore, if you complete the professional training period you can be considered for the City and Guilds Senior Licentiateship Award (LCGI).
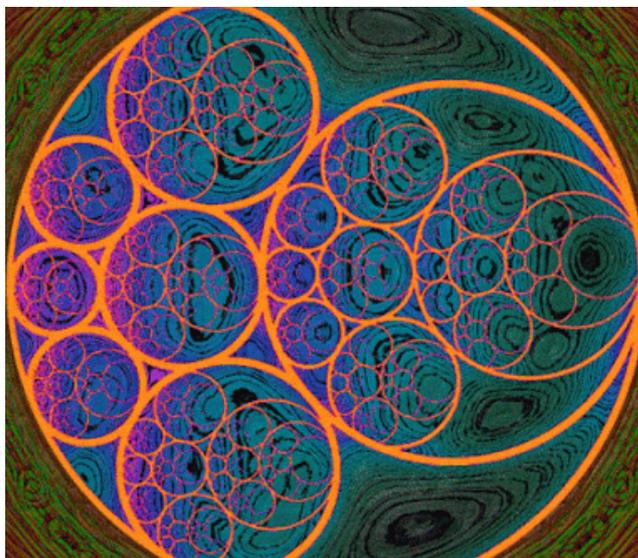
LATEST MATHS COMPETITIONS

In this half-terms newsletter we have three up and coming competitions to announce:- The David Harrison Prize, the Purple Comet! Maths Meet and the Intermediate Maths Challenge. For more information on entry criteria, submission and submission deadlines please contact Mr Oakley cwo@shrewsbury.org.uk

David Harrison Prize 2021

David Harrison Prize 2021. This prize is endowed by Mr. and Mrs. Peter Harrison in memory of their son David, who was Head of Mathematics from 1995 to 1996, and who tragically died in the mountains of Alaska in the Summer holidays of 1996. It is awarded for the best short presentation of a mathematical topic and is open to all pupils in the School, which is given to an audience of Third and Fourth Formers.

This is a great opportunity to talk about an area of mathematics that really interests you, with the aim to present your topic in a clear, interesting and entertaining way. Past winners have included such topics as 'All Artists are Mathematicians' which focused on the works of M.C. Escher and the mathematics of how he transformed the plane in his work 'Print Gallery' and The Mathematics of Love', a study on the likelihood of relationships lasting from looking at the interaction between the couples. Click here for judging guide and some topic ideas to get you started.

Purple Comet! Maths Meet

The Purple Comet! Math Meet is a free, annual, international, online, team, mathematics competition designed for middle and high school students that has been held every year since 2003. Teams from one to six students compete by submitting solutions to a list of mathematics problems. There is a ten-day window during which teams may compete choosing a start time most convenient for them. The problems range in difficulty from fairly easy to extremely challenging. In 2016 over 12,000 students competed in over 3200 teams from 59 countries. This year's competition will be run from April 6-15th.


Intermediate Mathematical challenge (IMC)

Salopians carried out this year's paper in early February and the results are in! one-hundred and thirty pupils from across third, fourth and fifth form competed in this 60-minute, multiple-choice competition aimed at students across the UK, which encourages mathematical reasoning, precision of thought, and fluency in using basic mathematical techniques to solve interesting problems. Congratulations to all who took part and in particular, well done to Hazel M and Mico X for winning joint best in year and Kevin H who was awarded best in school. We look forward to seeing what you all can do in the following Kangaroo competition round on 18th March.

LATEST STUDENT MATHS PROJECTS

Maths Modelling Challenge 2021
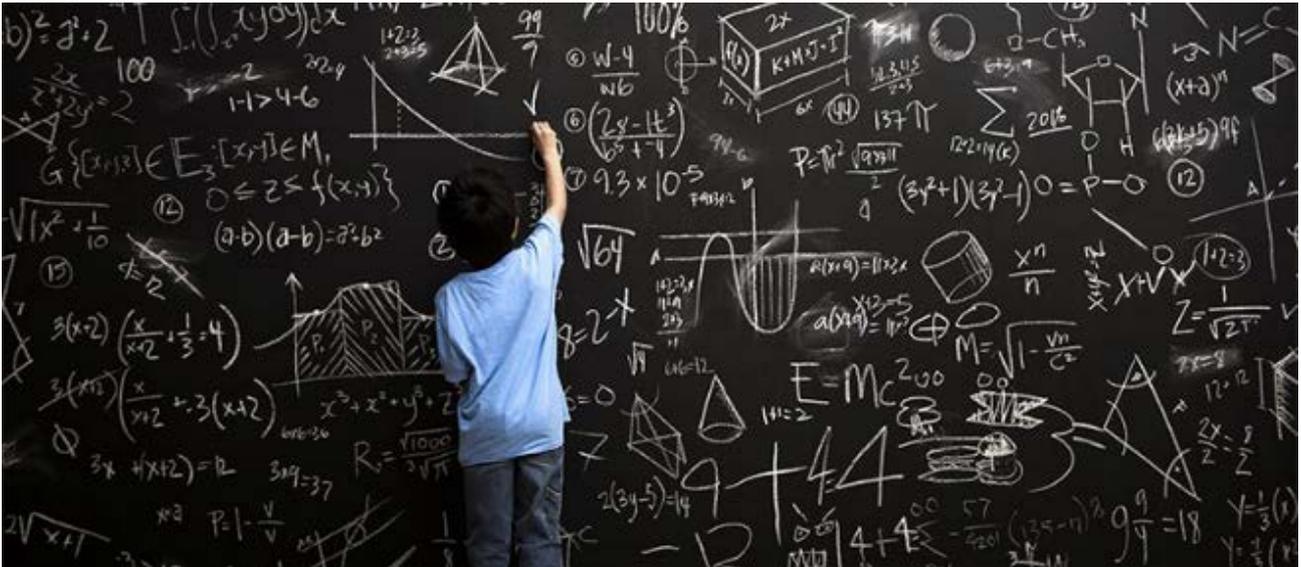
The 4th form have been busy tackling the world's biggest problems with maths from modelling the environmental impact of a selfie to calculating the reduction in carbon emissions by moving to a more plant-based diet. This weeklong challenge saw students getting creative and flexing their maths skills to produce some fascinating and well thought out solutions to some of the most pressing problems of today.

Pupils worked in groups of 3 to break down these complex problems and translate them into equations that they could then solve using real life data that they had researched on the internet. This strategy saw pupils work out the amount of CO_2 emissions that would be saved if Britons reduced their annual meat intake by half.

> Hattie A: *"My set's problem was the excessive amount of meat consumption in the world and what it's doing to our environment. We discovered that the meat consumed globally each year is 364 million tons and the land used for this is 43.23 million km^2. My group thought it would be a good idea to suggest that more people try going pescatarian to reduce the land that you use to rear farm animals so that we can grow trees to try to absorb as much CO_2 as we can."*

Other groups modelling the environmental impact of their online social media activity, calculated the carbon emissions associated with their WhatsApp conversations by converting data usage and storage into power.

> Kate V: *"During the past week, my set was separated into teams to produce a response to several specific questions regarding the environmental cost of a selfie, a pertinent element of today's digital technology use. We researched and calculated and discussed this ever-growing issue passionately to eventually present our Fermi mathematical models to another 4th form set. Having completed this refreshing project, I appreciate its advantages confidently. Not only did we develop teamwork and task designation - both increasingly useful skills in the real word and careers - I believe the paramount aspect of this open-ended problem was introducing and putting into perspective complex, mathematical calculations and research in a relatable way compressible to those who have not encountered it before. To illustrate, we found that the annual carbon dioxide emissions from selfie's to be just under 65 tons, and put this into perspective, calculating that we would need over 4.5 million trees to absorb this disturbing quantity. These are just two of the benefits I have noted in taking maths beyond the classroom through Fermi mathematical models, not to mention the carefully chosen topic concerning climate change which, on behalf of my team, I found very appropriate and inspiring appeal to the intersection between environmental science and mathematics."*

Finally, pupils working on the third challenge determined that we could spread a random acts of kindness around the world in just over a month. Students used exponential growth and logarithms, mathematics used to understand the spread of viruses, to model everyone in the world receiving a random act of kindness.

> Toby J, Otis R, Max W: *"Random act of kindness could be seen as a disease or virus that is spread with every single interaction. We decided to start it on a small scale. We first worked how long it would take for everyone in class to shake each other's hand. We then established that we would need a more efficient way of solving the problem since it would take a long time to reach the larger population. Logarithms are the best way to solve exponential equations, we know that this since each time our answer will increase as the number of people do. We found out that it would take around 33 days for everyone in the world's hand to be shaken. I think that this was surprising since there is 8 billion people in the world. This project was interesting to do as it was a good change and was a different style of work."*

We are all very proud of the effort the 4th form pupils have made with this challenge. This project pushed them to step outside of the traditional maths lesson and use their maths skills to carryout computational thinking. The scenarios that they tackled underpin the ethos that mathematics has applications across the curriculum and beyond the classroom to solve every day, real-world issues. The logistics of remote learning made their achievements even more remarkable. Competition for title of the best model was fierce so many congratulations to:

| | 4MMa1W | 4MMa1J | 4MMa3 | 4MMa5 | 4MMa6 |
	NJW	MDBJ	CWO	IWP	AK
Winners of the presentation (Names)	Luke W Tom K Cici H	Jenny O'B Tom G Brad K	Issy H Suzanna P Todd R-P Ed P	Toby J Otis R Max W	Henry C Charles C Harrison B
Winner/ Commended for effort (Names)	Eva Z Charlie S Janice W Angus X	Archie T Jasper T Charlie S	Toby M Anton M Ed P	Kate K Marcus D Xanthe C	George E

Mindset in Maths

There is a growing body of evidence that students' mindsets play a key role in their math and science achievement. Students who believe that intelligence or math and science ability is simply a fixed trait are at a significant disadvantage compared to students who believe that their abilities can be developed. Moreover, research is showing that these mindsets can play an important role in the relative underachievement of women and minorities in math and science. The first instalment to this segment of our newsletter is a research article that reviews evidence for brain plasticity, the importance of mindset and the ways that mindset messages may be communicated through classroom and grouping practices.
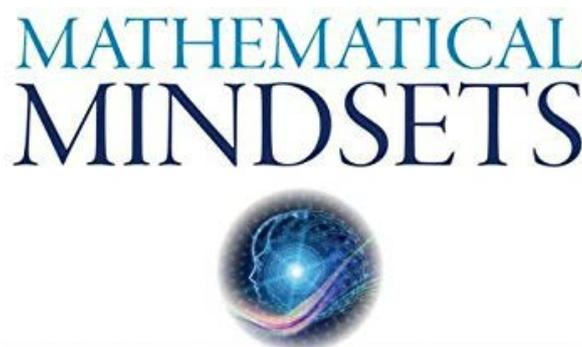
Maths and Art Mashups

Crochet Helping to Visualise the Hyperbolic Planes in Corals
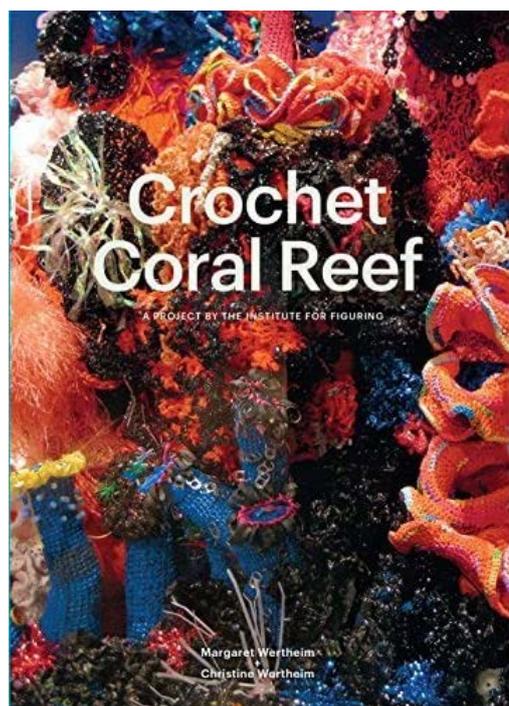
Maths and art are inseparable. It is only very recently that these two professions have diverged into two distinct fields. The great thinkers of our past were considered philosophers, artists and mathematicians all in one. Artists have for thousands of years used mathematical concepts - such as infinity, number and form - in their work. Likewise, the most infamous scientists throughout history have used art to explore and expand their ideas and theories. In this segment, we will showcase some of the best art and maths mashups of today.

For the past 10 years, Dr Margarette Werthiem has been spearheading a project where she uses hyperbolic crochet to make woolly simulations of coral reefs. The Crochet Coral Reefs are an artistic response to the devastation of living reefs due to global warming and have been exhibited at art galleries and science museums around the world, including the Smithsonian.

Check out her TED talk here.

We are keen to see what you can do! Send your Art-maths mashups to kmb@shrewsbury.org.uk and we will showcase them in the next newsletter.