



Communications

Maths Jam: playing with maths in pubs, an international movement

The AustMS *Gazette* has been publishing the popular Puzzle Corner for a number of years. Here's how to take it to the next level: get together and solve puzzles in a group of maths enthusiasts!

Upstairs in a London pub in early 2008, Matt Parker¹ gathered around him a group of like-minded self-confessed maths enthusiasts to share puzzles, games, problems or anything else they thought was cool or interesting. Maths Jam was born. Taking place on the second to last Tuesday of the month, this idea has spread to pubs all over the world. As a stand-up comedian and travelling mathematician, Matt is often not in London on Maths Jam night and his ambition is to have a local Maths Jam meeting wherever he finds himself.

The second regular Maths Jam gathering was started by Katie Steckles² in Manchester in November 2010. At a recent meeting, when the group was done comparing the maths jokes on their t-shirts, Michael showed a card trick. Three volunteers each cut a deck and then take the top three cards. Just from specifying who has the highest, middle and lowest card and which cards are black, the magician can identify all three cards. Magic tricks are a favourite of Maths Jams and if they're driven by maths, rather than sleight of hand, then everyone can join in.

Later, Ed described this puzzle: a car is 90 feet away from a brick wall travelling towards the wall at 90 feet/second, and its speed is changing so that the speed in ft/s is always equal to the distance away from the wall — when it is 80 ft from the wall, it will be travelling at 80 ft/s and so on. How long does it take before the car is 1 ft from the wall? It's quite a nice question, and the answer is almost what you'd expect it to be. A couple of people managed to get it by calculation before the night was over!

Hearing about a second meeting location, Peter Rowlett³ was moved to set up a Nottingham Maths Jam in December 2010. A group of people working locally as engineers, physicists and computer programmers met in a 13th century inn. They

¹Matt is an ex-pat Australian based in London. He is a standup maths comedian, and is currently touring his show with comedian Timandra Harkness, 'Your Days are Numbered: The Mathematics of Death', which appeared at the Adelaide Fringe Festival and at the International Comedy Festival in Melbourne. For more information, see YourDaysAreNumbered.co.uk.

²Katie is a mathematician who currently lives in Manchester and is working in the area of public engagement, in particular with mathematics and related subjects. She has recently completed a PhD in Topology and is continuing her research in that area.

³Peter works in mathematics education at university level and is about to finish a stint working for the Maths, Stats and OR Network in the UK. Outside of work, Peter blogs about mathematics via aperiodical.com and is one half of the transatlantic Math/Maths Podcast.

celebrated their first birthday last December with origami and cake. Emma showed the group how to make an origami penguin and Jon walked everyone through folding a dragon — with flapping wings! Sharon brought cake and made a modular origami Christmas tree for the table. The Maths Jam favourite of modular origami is epitomised by the ‘post-it note dodecahedron’ popularised by Colin Wright and James Grime (both mathematicians in the UK). Slotted together from 30 specially folded post-it notes there’s a bit of a knack but once you’ve got started you’ll have dodecahedrons *everywhere*.



Puzzle: prisoners buried in sand

Many logic puzzles involve prisoners and/or hats in improbable scenarios and the diagram above shows a classic that the Nottingham group heard about from the Manchester group. Four prisoners are buried in sand as pictured, so they cannot see their own hat or the hat of the people behind them. No one can see through or around the wall. The prisoners are told that two of them are wearing black hats and two are wearing white. If any of them can name their own hat colour correctly then they will all go free; if any names their hat colour incorrectly they will all be killed. One prisoner⁴ correctly names the colour of their hat. Which one?

Having three regular meeting locations, Maths Jam reached a tipping point and rapidly spread to many more cities about a year ago. Up in Newcastle (UK) a group of mathematics undergraduates from Durham get together with PhD students from Newcastle for a Maths Jam organised by Christian Perfect (a mathematics PhD student from the University of Newcastle). A recent meeting saw John leading a group at one end of the table through the probability calculations to answer a puzzle: can you make two new dice numbered with positive integers that, when rolled in pairs, have the same probability distribution for the sum as normal dice? The solution is a pair of dice called Sicherman dice, and a delight to discover. Meanwhile, at the other end of the table, Christian was teaching Peter a card game called Mad Abel⁵, invented by Smári McCarthy.

In Mad Abel, each player is dealt seven cards from a standard deck and two are placed face up in the centre of the table. Players must sum cards in the following way: card values are added modulo 13 (with ace being 1 and jack, queen and king being 11, 12 and 13 respectively); suits are added modulo 4, with the order being hearts (taking the value 0), spades (1), diamonds (2) and clubs (3). Gameplay is

⁴Other ‘prisoner’ questions have been asked in the AustMS *Gazette* Puzzle Corners 3 (34(3)) and 12 (36(2)).

⁵www.pagat.com/docs/madabel.pdf

to sum the two cards on the table in this way to make the target. For example, five of spades + queen of clubs = three of hearts. Each player must make the target (value and suit) using a combination of cards from their deck. Discarding a set of cards equal to the target onto the pile in the centre, the topmost two cards form the next player's target. If a player cannot play, they take two new cards from the deck. The winner is the first player to lose all their cards. Try it. It takes a few rounds to get your head around the arithmetic but it's a fun game with some interesting features (such as the king of hearts being an identity element).

It's problematic to put a total number of Maths Jam meetings in print because new Maths Jams are being set up every month but at the time of writing Maths Jam takes place on the second to last Tuesday of the month at 7 pm local time in 25 cities in five countries on three continents. Maths Jammers keep in touch via Twitter, so on Maths Jam night you can see the Twitter account @MathsJam⁶ and the hashtag #MathsJam⁷ buzzing away with photos and puzzles to try, and a steady transfer of ideas takes place between cities, countries and time zones.

Now Maths Jam has gained a foothold in Australia, with meetings in Melbourne since January 2012. Organised by Katrina Szetey⁸, with reminders usually sent via Twitter, the meetings are now located at The Bull and Bear, 347 Flinders Lane. So far, Melbourne has had four regular attendees and a few intermittent ones; with a bit more organisation and the creation of a mailing list it hopes to grow. In the March Maths Jam, Andrew suggested looking at the following question: Imagine a long line of people, one behind the other. A benevolent donor is going to walk along the line, starting from the first, asking each person in turn, 'What's your birthday? Have you heard your birthday spoken aloud yet?' The first person who can honestly answer yes is granted a million dollars. You are about to join the line, and you can insert yourself anywhere. What is the optimal position to maximize your chance of winning, given that you know none of the birthdays? In April, the group played noughts and crosses on a four-dimensional grid represented in two-dimensional space (i.e. on paper), worked out the probabilities associated with rolling the non-transitive dice from [MathsGear.co.uk](http://mathsgear.co.uk) (see photo) and tried a game of Mad Abel. So far, attendees of the Melbourne Maths Jams have ranged from undergraduate mathematics students, to teachers, to academics — with one thing in common: a love of mathematics.

Maths Jam works well because it's decentralised. Meetings are free and easy to arrange, and the originators are happy for anyone to take up the mantra and start a Maths Jam in their city. The format is flexible enough that a Maths Jam meeting can mean different things in different cities, with each group finding a level of maths and balance of activities to suit. Maths Jam is also connected, so travellers can always find their local meeting and have a good time. Matt's ambition to have

⁶<http://twitter.com/mathsjam>

⁷<http://twitter.com/search/%23mathsjam>

⁸Katrina is an undergraduate student majoring in mathematics and astrophysics at Monash University in Melbourne and is also a French-horn player with a Masters in music performance.



Calculating probabilities for non-transitive dice at the Melbourne Maths Jam

a Maths Jam nearby wherever he goes hasn't been realised quite yet⁹, but we've come a long way towards that goal.

For more information about Maths Jam, or to enquire about starting a meeting where you live, visit www.mathsjam.com. If you happen to find yourself in Melbourne on the second last Tuesday of the month, come along to the Melbourne Maths Jam!

Peter Rowlett (Maths, Stats and OR Network, University of Birmingham, @peterrowlett)

Katie Steckles (Freelance Maths speaker, Manchester, @stecks)

Birgit Loch (Mathematics, Swinburne University of Technology, @loch_b)

Katrina Szetey (Undergraduate Student, Monash University, @hornmaths)

Andrew Kelly (Princes Hill Secondary College, @bewdyrooster)

Email: melbourne@mathsjam.com

⁹He just missed out on the Melbourne Maths Jam when in town to perform at the Melbourne International Comedy Festival, but at least was able to catch up with locals over an impromptu Maths Jam after his show, where he gave Katrina a set of non-transitive dice.