



THE UNIVERSITY OF THE THIRD AGE

Mathematics and Statistics



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A few words of introduction

In this newsletter Mike Ellicock, Chief Executive of National Numeracy, informs us of the UK's first National Numeracy Day to be held on Wednesday 16 May 2018. Gordon Burgin introduces his puzzles website, Roger Luther reviews a mathematics book, Doug Harryman shares a puzzle, and Tom Roper, President of the Mathematical Association, continues with further insights in to Taxi-cab geometry.

Do investigate the National Numeracy Day website and think about doing something special about this with your group in May, letting us know how it went.

The mathematics organisations gather together for BCME9 at the University of Warwick from 3 to 6 April 2018 (www.bcme.org.uk)

Don't forget to send in problems and solutions for the problem sheets devised by Andrew Holt (draaholtco@yahoo.com)

Newsletter articles, puzzles and book reviews are most welcome (max 250 words)

Correction: The British Society for the History of Mathematics website is www.bshh.ac.uk

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Mike Ellicock, Chief Executive National Numeracy writes:

The UK's first ever National Numeracy Day is fast approaching. Taking place on 16th May 2018, the Day is an annual celebration of the importance of numbers in everyday life and will bring together individuals, employers, educators and influencers to improve numeracy.

National Numeracy Day is run by the UK charity National Numeracy (www.nationalnumeracy.org.uk) and has been created with Founding Supporter KPMG, with additional support from an impressive and growing list of organisations.

From getting the best supermarket deals to managing family finances, or understanding salaries to getting a promotion at work - we all use numbers every day. Despite this, 1 in 2 working-age people in the UK have numeracy levels that we would associate with primary school children – but it is never too late to improve.

If you haven't already done so, head across to the National Numeracy Day website (www.numeracyday.com) and sign up to receive information and updates as the campaign progresses. There are lots of ways you can get involved in National Numeracy Day, from checking you have the Essentials of Numeracy using our online assessment tool (www.nnchallenge.org.uk), to finding out your 'Number Personality' – the website has a range of fun and free resources to help improve number skills across the UK.

Together, we can ensure that more people benefit from knowing how to use numbers well

We're all numbers people!

Articles (up to 250 words) welcome for future editions.

A member's puzzles website

U3A member Gordon Burgin in the Norwich area has published several maths puzzle books and maintains an on-line puzzle website

(www.gordonburgin.com)

He writes "Anyone who enjoys the challenge of numeric and logic puzzles may find the website interesting. These mathematical puzzles are designed to give your brain some mental exercise and range from entertainingly easy to devilish difficult – there's something for everyone."

Book review by Roger Luther

"I'd thoroughly recommend 'The Maths Behind.....' by Colin Beveridge, pub Cassell. A very readable, and excellently illustrated, look at about 50 applications of maths in the real world today, from Bitcoin to Elections to Queues. Whilst I would have liked slightly more mathematical detail, it gives a spur to further research, in preparation for a U3A maths afternoon. Well worth browsing."

Doug Harryman of U3A Roding Valley shares the following puzzle with us.

A Vicar and his Verger (both brilliant mathematicians) are walking behind three parishioners. The Vicar says, "The product of the ages of those three in front is 2450 and the sum of their ages is twice yours. Can you tell me their ages?" "Impossible to say with that information", says the Verger. "Quite right!", says the Vicar, "but if I tell you I am older than any of them...." "Oh well they must be A B and C," says the Verger "Quite right!", says the Vicar. How old is the Vicar?

Problem Sheets and Solutions

Do continue sending in ideas for problems and sample solutions to Andrew Holt (draaholtco@yahoo.com) for use in future editions of Andrew's problem sheets. The next one is planned for August.

Future Newsletters and Problems

Newsletters are now planned for April, August and December to coincide with problem sheets with sample solutions sent out a week after the problems. The next newsletter is planned for August.

Tom Roper, President of the Mathematical Association, writes:

Taxi-cab geometry continued – again!!

In the last article, using the idea of a perpendicular bisector in taxi-cab geometry you were asked to find where you might establish a burger bar so that it was equidistant from three schools at given points. In normal Euclidean geometry the three schools are the three vertices of a triangle and where the Euclidean perpendicular bisectors meet is called the circumcentre. And, with this point as centre you can draw a circle through all three vertices of the triangle, the circumcircle.

So two things to look at. First, using taxi-cab geometry can you draw a taxi circle centred on the burger bar which passes through the three points represented by the schools?

Second, in Euclidean geometry, all triangles have a circumcentre and circumcircle, but is this so in taxi-cab geometry? Look at the triangles defined in each of the following cases and construct the perpendicular bisectors of the sides in taxi-cab geometry. Do the perpendicular bisectors meet in a single point? If they do not, why not? Can you hazard a guess at what kinds of triangles in taxi-cab geometry do have circumcentres and circumcircles and which do not?

- (a) A(6, -3), B(0, 6), C(8, 4)
- (b) A(-3, 0), B(0, 1), C(5, 5)
- (c) A(-6, 0), B(0, 6), C(9, -1)

To test or not to test

In the last newsletter we posed the following question:

A disease affects 1% of the population. The test for the disease gives a positive result for 90% of the people who have the disease, but also 5% of the people who do not have the disease. If you receive a positive test result, what is the probability that you have the disease? Is this as you expected? What are the implications?

Applying Bayes' theorem (you may wish to draw a diagram that illustrates this)

$$\begin{aligned} &P(\text{disease} \mid \text{positive}) \\ &= P(\text{disease}) \times P(\text{positive} \mid \text{disease}) / P(\text{positive}) \\ &= 0.01 \times 0.9 / 0.0585 = 0.154 \end{aligned}$$

Thus, on average, about 5 in 6 persons receiving a positive result will not have the disease. There might be some reluctance to use the test if there are no other symptoms.