September 2025

YBMA News

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The Newsletter of the Yorkshire Branch of the Mathematical Association

With the merger of the five mathematics teaching associations now agreed, readers may well have searched the web now and again for news of the next steps in the merger process. Like myself they will have found the AMiE website and added it to their bookmarks. At the time of writing the site consists of a single page and merely repeats the agreed message sent out by the individual associations in early July.

In the September issue of the MA eNews we are given assurances that much hard work is going on behind the scenes and MA members will receive further information shortly. Perhaps the vast majority of paid-up MA members are not unduly concerned about when updates are released and exactly what is happening?

Let us look at the numbers. Over 90% of votes at the MA annual general meeting were in favour of the merger, viz. 65 out of 72 votes cast. Based on recently published data, 39% of 3944 active members across the five associations belong to the MA. Thus the 72 votes cast represent less than 5% of MA members. Will the 95% who did not take part in the vote be enthusiastic enough to transfer their membership to AMiE?

The Yorkshire Branch of the MA is not an exclusive club reserved for MA members and we welcome anyone with an interest in mathematics and mathematics education to our meetings. Have any of us lost sleep over worrying what to call ourselves once AMiE is officially launched? No. Our 2025-26 programme of events will, we hope, appeal to all those with a genuine interest in mathematics education. You are cordially invited.

Our first event of 2025-26 is a talk by the current MA President, Professor Paul Glaister of Reading University. He has promised to show us some intriguing problems from various branches of mathematics. You can get a foretaste of what is in store by looking at his personal website. Come along - you will not be disappointed!

Advance Notice

Tuesday 24 February 2026
Tom Roper
Problems from the Ladies' Diary 1704-1817

Wednesday 25 March 2026 (tbc)
W P Milne Lecture
Julia Gog
Maths vs Disease

Saturday 6 June 2026
Summer Meeting & AGM
Chris Pritchard
A Tribute to Martin Gardner

Previous Newsletters can be found at
https://www.m-a.org.uk/branches/yorkshire

Autumn Meeting

Saturday, 4 October 2025
1.30pm for 2pm

MALL 1, School of Mathematics
University of Leeds

Paul Glaister

President, The Mathematical Association

Celebrating the beauty, power and joy of mathematics - a mathematician's miscellany, and an apology

Throughout his career Paul has enjoyed posing and exploring mathematical problems suitable for mathematics students (and their teachers/lecturers!). Some of these problems have appeared in his 480+ publications, 82 in the Mathematical Gazette/Mathematics in School.
In this session he will share some of this miscellany of problems, by way of an apology, in the spirit of the prestigious mathematicians and collaborators G H Hardy (a former President of the Mathematical Association and author of 'A Mathematician's Apology') and J E Littlewood (author of 'A Mathematician's Miscellany'), but at a somewhat more modest level!

Christmas Quiz

Wednesday, 3 December 2025
7pm for 7.30pm

MALL 1, School of Mathematics
University of Leeds

Seasonal Food and Drink! Prizes!

The role of question master to be shared by willing participants, so we hope you will bring along a round of questions, presented in any way you choose. Suggested time allowance: 5-10 minutes.

Come and enjoy yourself!
Bring a friend or colleague!

YBMA Officers 2025-26

President: Lindsey Sharp (lindseyelizab50@hotmail.com)

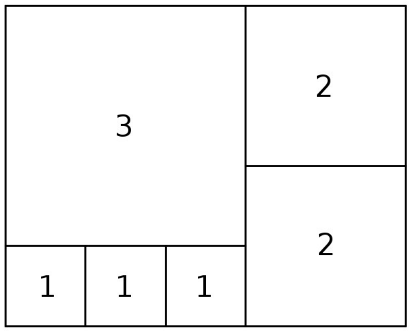
Secretary & Newsletter: Bill Bardelang (rgb43@gmx.com)

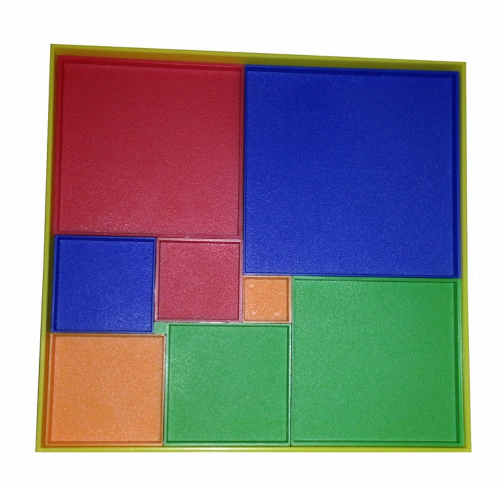
Treasurer: Jane Turnbull (da.turnbull@ntlworld.com)

Mathematics in the Classroom

A Patchwork of Squares

Identical squares are easily arranged to form a rectangle without leaving gaps or creating overlaps. Conversely, a rectangle can be dissected into identical squares if its sides are commensurable. When adjacent squares within the rectangle can form larger squares, it can be dissected into squares of various sizes. The diagram on the right shows a 4×5 rectangle cut into a 3×3 square, two 2×2 squares and three unit squares. The labels give the length of a side, not the area.





The question of forming a rectangle using squares no two of which the same size, appears to have received little or no attention until the first half of the 20th century. The earliest published examples appeared in a paper by Zbigniew Moroń in 1925. The photo on the left shows a commercially produced puzzle based on one of them. It is the smallest possible “squared rectangle” and there are none containing fewer squares.

There is a relatively easy way to create such rectangles and a little care and patience will usually ensure success. Start by sketching a rectangle and fill it with squares one at a time. Make sure that adjoining squares never have an entire side in common. If some of the intended squares don’t look like squares, that doesn’t really matter. Avoid introducing symmetry into the diagram.

Label one of the small squares x. This means it has sides of length x, as yet unknown. Label an adjoining square y. The length of every interior edge on the sketch depends on the squares touching it and is equal to the separate totals on either side of it. Identify an edge that allows you to calculate the size of another square in terms of the unknowns and label the square accordingly. It may be necessary to introduce further unknowns, but avoid this if at all possible. Continue in this manner until all squares have been labelled.

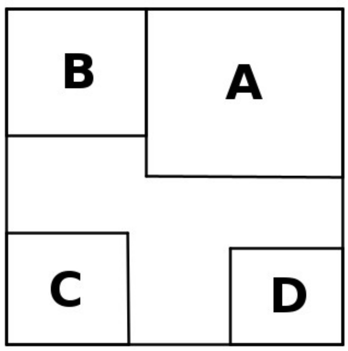
One or more interior edges will not have been used. Each will give us an equation relating the unknowns. Only the ratio of the unknowns can be found and we choose the least integer values.

The method is shown one step at a time in the presentation accompanying this newsletter. Readers tempted to create their own “squared rectangle” are advised to start off with a large rectangle, otherwise labelling the smaller squares can become difficult.

Finally, a problem to challenge the reader. Four squares occupy the corners of a rectangle. Squares A and B are touching. Squares C and D do not touch A or B or each other.

Treat the diagram as a sketch - it is not intended to show the relative sizes of the squares or the shape of the rectangle.

Create a “squared rectangle” by adding seven more squares to the diagram. We have found two distinct ways of doing this.



A little Mental Arithmetic - Solutions

(i) $\sqrt[3]{95{,}443{,}993} = 457$

The conventional way of using a comma to space out the digits of a large number is helpful. Here we have three groups of digits and thus the answer is a 3-digit number. The 100s digit is 4 since 95 lies between 4^3 and 5^3.

There is a 1-1 correspondence between the units digit of a number and the units digit of its cube, evident from the first two rows of the table below. Here the units digits is 7 since $7^3 = 343$.

We use the same idea to determine the one digit we have yet to find, but use modulo 11 instead of modulo 10. Again there is a 1-1 correspondence between n (mod 11) and n^3 (mod 11).

n	1	2	3	4	5	6	7	8	9	10
n^3	1	8	27	64	125	216	343	512	729	1000
n^3 (mod 11)	1	8	5	9	4	7	2	6	3	10

We can find the residue of a number modulo 11 by alternately adding and subtracting its digits starting from the right, then adding or subtracting 11 if necessary. In our case

n^3 (mod 11) = 3 – 9 + 9 – 3 + 4 – 4 + 5 – 9 = -4 and then -4 + 11 = 7

n (mod 11) = 7 – D + 4 = 6 ,

where D is our missing digit and 6 obtained from the table above. Note how we can exchange D and 6 and calculate D = 7 – 6 + 4 = 5.

(ii) $\sqrt[3]{56{,}888{,}939{,}736} = 3{,}846$

The 1000s digit 3 and the units digit 6 are obvious, but that leaves two as yet unknown digits. A relatively painfree way to obtain the 100s digit is as follows.

$$39^3 = (40-1)^3 = 64{,}000 - 3\times1600 + \ldots \approx 59{,}200$$
$$38^3 = (40-2)^3 = 64{,}000 - 3\times1600\times2 + \ldots \approx 54{,}400$$

These estimates are sufficient to tell us that the 100s digit is 8. The 10s digit can now be found as described in (i).

(iii) $\sqrt[5]{1{,}350{,}125{,}107} = 67$

Separating the digits into groups of five gives 13501,25107. The answer is a 2-digit number and the table below gives all the fifth powers we need.

n	1	2	3	4	5	6	7	8	9
n^5	1	32	243	1,024	3,125	7,776	16,807	32,768	59,049

The units digit of n is the same as the units digit of n^5. We could use estimates to find the 10s digit:

$6^2 = 36$, $6^3 = 216$, so $6^5 \approx 40 \times 200 = 8000$ and $7^2 = 49$, $7^3 = 343$, so $7^5 \approx 50 \times 340 = 17000$.