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YBMA News

The Newsletter of the Yorkshire Branch of the Mathematical Association

Our next meeting

Saturday, January 25th 2020 at 1.30pm for 2pm in the MALL,
School of Mathematics, University of Leeds
(see our programme at ybma.org.uk for car parking details)

What do The Rosetta Stone, Maths and Magic all have in common?

Andrew Jeffrey – the mathemagician

The Rosetta Stone changed our understanding of Ancient Egypt completely. But what could it possibly have to do with maths, and specifically how children learn it? Come along and find out! During this talk Andrew will explain his thinking behind what works and why. He will also play noughts and crosses, show you an impossible card trick, and even attempt to predict the evening's Lottery results!

Having taught for 20 years, Andrew set up **Magic Message Maths** in 2007 to serve the needs of maths teachers at both primary and secondary level.

He is the author of several books for teachers, including the best-selling e-book *Always, Sometimes, Never*, and is a regular keynote speaker at conferences in the UK and abroad.

Andrew's most recent book is *Greater Depth in Primary Mathematics*, published in 2019. A *few* copies will be available to buy!

He is passionate about children and how they learn (as well as why they don't), and can often be seen using magic tricks to help enhance children's understanding of mathematical principles.

Andrew is also the founder of 'Maths Week England', a national celebration of mathematics in England.

Dates for your diary

Wednesday, April 1st 2020 at 2.30pm

Rupert Beckett Lecture Theatre
University of Leeds

How often do curves meet?

Dr James Cranch
University of Sheffield

This is our annual W.P.Milne lecture for A-level students – **but it is open to all who are interested.**

It forms part of a Key Stage 5 Maths Day – please go to www.stem.leeds.ac.uk/KS5mathsday for details.

Saturday, May 9th:
Centenary celebration (details to follow)

See overleaf for *Mathematics in the Classroom*

Officers of the Yorkshire Branch of the Mathematical Association 2019-20

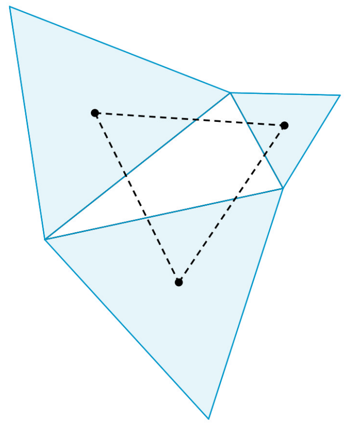
President: Bill Bardelang (rgb43@gmx.com)

Secretary: Alan Slomson (a.slomson@leeds.ac.uk)

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

Mathematics in the Classroom

Whose Theorem?



From our Christmas Quiz:

"If equilateral triangles are drawn on the sides of a triangle, the centres of the equilateral triangles form an equilateral triangle."

To whom is this theorem attributed (probably wrongly)?

a) The Emperor Napoleon Bonaparte
b) The Duke of Wellington
c) Field Marshall Gebhard von Blücher

Can you answer this question? Can you prove the theorem?

The area of an octagon

In the last issue we asked for the area of an octagon whose vertices lie on a circle, and which has four sides of length 1, and four sides of length 3, in some order, for example, as shown in figure 1.

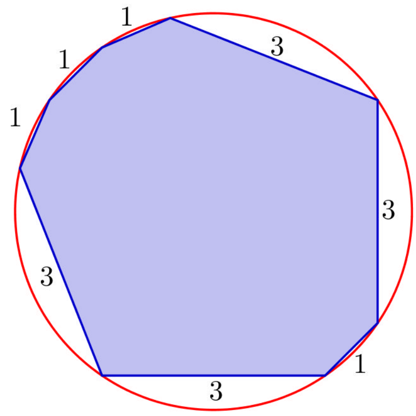


figure 1

The key to the solution is that if the radius of the circle, say *r*, stays the same, but the order of the sides of the octagon changes, then the area of the octagon is unchanged.

Consider, in particular, the case where the sides of lengths 1 and 3 alternate, as shown in figure 2.

By joining the vertices of the octagon to the centre of the circle, *O*, the octagon is divided into eight isosceles triangles, four with side lengths 1, *r* and *r*, and four with side lengths 3, *r* and *r*. The octagon of figure 1 can similarly be divided into four triangles with side lengths 1, *r*, *r* and four with side lengths 3, *r*, *r*. So the two octagons have the same area.

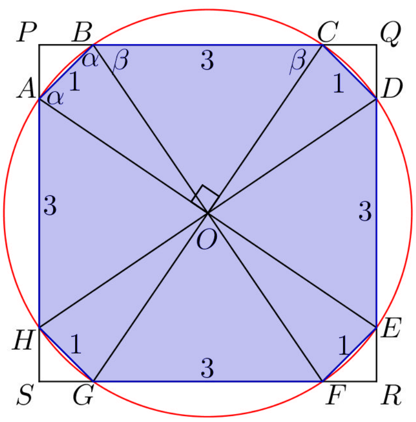


figure 2

We now consider the octagon of figure 2. It may be seen that $\angle AOC = 90^\circ$ and that the two angles marked α are equal, as are the two angles marked β.

Therefore, from the quadrilateral *ABCO*, we have 2α + 2β + $90^\circ = 360^\circ$, and hence α + β $= 135^\circ$. It follows that *PAB* is an isosceles right-angled triangle with hypotenuse of length 1. Hence *PA* and *PB* have length $1/\sqrt{2}$ and the triangle *PAB* has area 1/4. The area of the octagon *ABCDEFGH* is therefore the area of a square with side lengths $3 + 2/\sqrt{2}$, that is $3 + \sqrt{2}$, less the area of four triangles each with area 1/4.

Hence the area of the octagon is $(3 + \sqrt{2})^2 - 1 = 10 + 6\sqrt{2}$.