September 2015

YBMA News

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The Newsletter of the Yorkshire Branch of the Mathematical Association

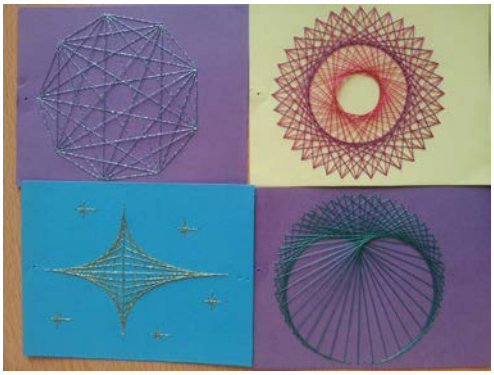
Our next meeting

Saturday, October 17th 2015
2pm for 2.30pm

MALL 1, School of Mathematics
The University of Leeds

Dr Vicky Neale

Mathematical greetings cards and envelopes



Straight lines can be used to create many interesting mathematical curves. This translates beautifully to stitched greetings cards. This workshop will explore some of the underlying mathematical ideas, and participants will produce their own designs.

Vicky Neale is Whitehead Lecturer in the Mathematical Institute, Oxford, and at Balliol College. Her research interests are in number theory.

Part of her role is to explain mathematics to a wider audience. She has broadcast on Melvyn Bragg's *In Our Time* and other programmes.

Tuesday, November 3rd 2015 at 5pm for 5.30pm, School of Mathematics, University of Leeds

Lindsay Lee – University of Leeds

A statistical toolbox to help us understand climate and weather models

Advances in computing power mean that it is now possible to use statistics to unravel the increased complexity of weather and climate models. This talk will introduce some of the most powerful statistical methods available to weather and climate science.

Thursday, December 3rd 2015 at 7pm for 7.30pm, School of Mathematics, University of Leeds

Christmas Quiz and Buffet

Non-members will be welcome at these meetings. Please bring them to the attention of your colleagues and friends and encourage them to come along. Our meetings are very friendly and include refreshments.

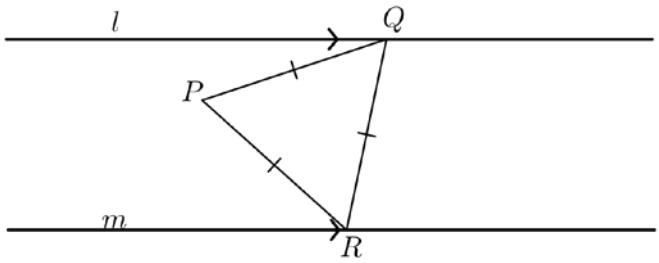
Anyone who would like to be added to our email list should send their name and email address to a.slomson@leeds.ac.uk

For more information about the Yorkshire Branch of the Mathematical Association, please go to our website http://ybma.org.uk.

see overleaf for Mathematics in the Classroom.

Mathematics In the Classroom

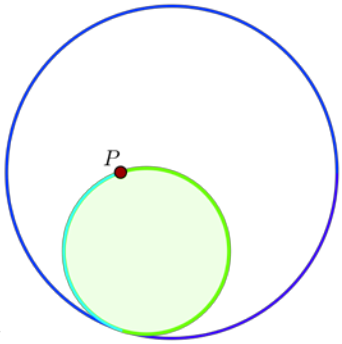
An Equilateral Triangle



Let l and m be two lines which are parallel and let P be point which is between these lines.

Can you construct, using just a straight edge and a compass, an equilateral triangle which has as its vertices, the point P, a point Q which is on the line l, and a point R which is on the line m ?

The May problem



In May we asked you to find the locus of a point P on a smaller circle which rolls without slipping inside a larger circle whose radius is twice that of the smaller circle.

The surprising fact is that in this case the locus of P is a segment of a straight line.

We prove this as follows.

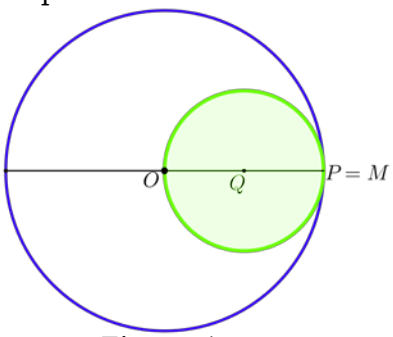


Figure 1

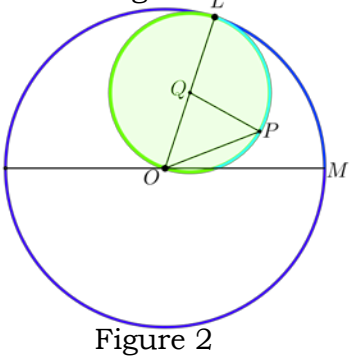


Figure 2

We let O be the centre of the larger circle and let Q be the centre of the smaller circle.

We suppose that the rolling begins in a position where P is on the circumference of the larger circle. We let M be the point on the circumference of the larger circle which coincides with the initial position of P, as shown in Figure 1.

Figure 2 shows the position after the smaller circle has rolled. We let L be the point where the two circles now touch.

Because the circle rolls without slipping, the arc LP of the smaller circle has the same length as the arc LM of the lager circle. The radius of the smaller circle is half that of the larger circle. It therefore follows from the formula $r\theta$ for length of an arc that $\angle LQP = 2\angle LOM$.

Because the angle subtended by an arc at the centre of a circle is twice the angle subtended at the circumference, $\angle LQP = 2\angle LOP$.

It follows from these two equations that $\angle LOM = \angle LOP$. It follows that P lies on the diameter through O and M. Therefore the locus of P as the smaller circle rolls is this diameter – a segment of a straight line.

Mathematics in Schools: A member has copies of this magazine going back to the 1980s that they would be glad to pass on to anyone who would like to have them. Please contact a.slomson@leeds.ac.uk if you are interested.