June 2020

YBMA News

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The Newsletter of the Yorkshire Branch of the Mathematical Association

We hope that you and your families are in good health, and are keeping cheerful in these difficult times.

Our next meeting

Saturday, June 27th at 2pm

A Virtual Maths-Mash-Up

followed by the AGM

Because we cannot meet face to face, we have decided to make this a virtual meeting via Zoom.

We hope members will contribute short presentations on some mathematical topic of interest.

If you would like to participate in this way please send any file – powerpoint, pdf, etc – you will wish to use to

da.turnbull@ntlworld.com

If you would like to attend this meeting, please e-mail

a.slomson@leeds.ac.uk

so that we can send you a link to the meeting. [Zoom is very easy to use.]

Our Centenary Celebration

It was sad that this celebration had to be postponed. In view of the continued uncertainty about the possibility of meetings in the autumn, the Committee has decided to postpone the celebration to May 2021.

We hope to make it a prime 101st anniversary event.

More details will be given later.

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)

Dr Janet Jagger

It is with great sadness that we announce the death of Dr Janet (Jan) Jagger.

Before retiring Jan worked as a lecturer in mathematical education at what is now the Leeds Trinity University.

One of her main interests was in the ways in which students learn mechanics. Her research greatly assisted the Leeds University based Mechanics in Action Project.

Jan was a member of our Committee for many years, serving as President from 1987 to 1989.

She also made a big contribution to MA at national level, serving as Chair of the Teaching Committee from 1996 to 1999, and as chair of the local organising committee when in 1996 the MA annual conference came to Leeds.

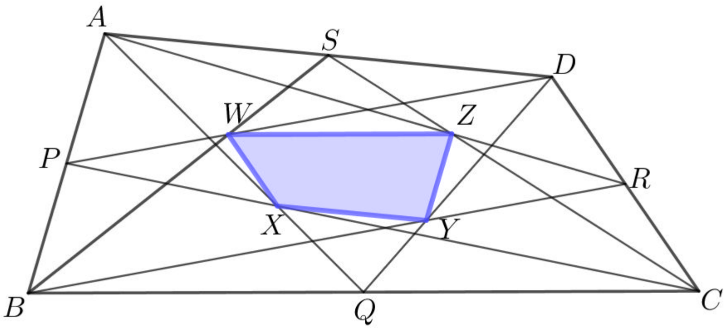
In recent years Jan's activities were curtailed by ill-health but she still attended our meetings in her wheelchair, smiling as broadly as ever and making telling contributions to discussions.

She will be sadly missed by all who knew her and worked with her. We send our condolences to the members of her family.

See overleaf for *Mathematics in the Classroom*

Mathematics in the Classroom

A quadrilateral question

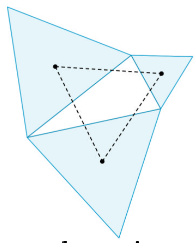


The points P, Q, R and S are the midpoints of the edges of the quadrilateral $ABCD$, as shown.

The line BS meets DP at W; AQ meets CP at X; BR meets DQ at Y; and AR meets CS at Z.

What is the ratio of the area of the quadrilateral $WXYZ$ to the area of the quadrilateral $ABCD$?

Whose Theorem?



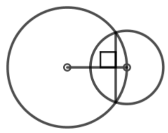
In the last issue we asked to whom the following theorem is attributed: "If equilateral triangles are drawn on the sides of a triangle, the centres of the equilateral triangles form an equilateral triangle." and for a proof of the theorem.

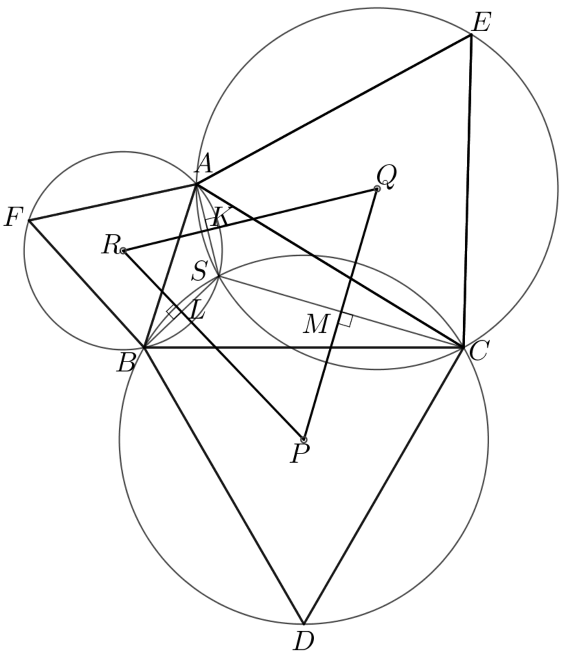
This theorem is called *Napoleon's Theorem*, though what is has to do with Napoleon is obscure. There are several different proofs. The proof given here is based on that in the book *The Geometry of the Triangle*, Gerry Leversha, UKMT, 2013.

The proof uses the following two facts:

(a) In a cyclic quadrilateral, the sum of opposite angles is 180°.

(b) If two circles meet the common chord is at right angles to the line joining the centres of the circles.





Let ABC be a triangle and let P, Q and R be the centres of the equilateral triangles drawn on the sides of the triangle ABC. Let the other points be as shown.

We suppose that the circumcircles of the triangles BDC and CEA meet at S. Since $SBDC$ is cyclic, $\angle BSC + \angle CDB = 180^\circ$. Hence, as $\angle CDB = 60^\circ$, it follows that $\angle BSC = 120^\circ$.

Similarly, $\angle CSA = 120^\circ$. It follows that $\angle ASB = 120^\circ$.

Since $\angle SMP = \angle PLS = 90^\circ$, it follows that $\angle LSM + \angle MPL = 180^\circ$. Now $\angle LSM = 120^\circ$. Hence $\angle MPL = 60^\circ$.

Similarly, $\angle LRK = \angle KQM = 60^\circ$.

It follows that the triangle PQR is equilateral.