October 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

Tuesday, October 13th

at 7pm

by ZOOM

Let's work together: Effective collaboration in the mathematics classroom

A session led by Ems Lord, Director of NRICH, and a former President of the Mathematical Association

In this workshop, Ems will share some of her favourite rich mathematical activities, exploring ways to maximise their potential for developing collaborative problem-solving skills. During the session, Ems will offer an insider's guide to the NRICH website, including top tips for classes hoping to see their solutions published on NRICH.

To be sent the Zoom link for this meeting please send a message to:

a.slomson@leeds.ac.uk

Zoom is very easy to use. If you have not used it before, and would like some advice about using it, please let us know.

Obituaries

We regret to have to report the death of two former stalwarts of the YBMA.

Margaret Lawton was President of the Branch from 1972 to 1974. Before retirement Margaret taught at Notre Dame School.

David Carter, a former member of the School of Education at the University of Leeds, was Secretary of the Branch from 1976 to 1980, and President from 1992 to 1994.

Our condolences go to the members of their families.

A photograph from our 50th anniversary lunch in 1970. We believe that Margaret Lawton is the lady shown front left.

Officers of the Yorkshire Branch of the Mathematical Association 2020-21

President: Bill Bardelang (rgb43@gmx.com)

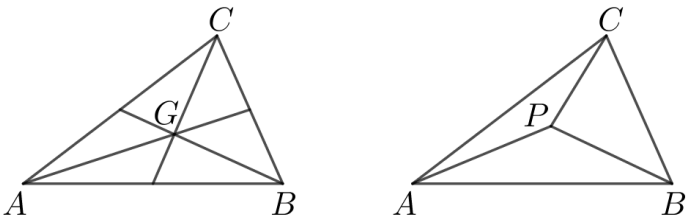
Secretary: Alan Slomson (a.slomson@leeds.ac.uk)

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

See overleaf for *Mathematics in the Classroom*

Mathematics in the Classroom

A minimum point in a triangle



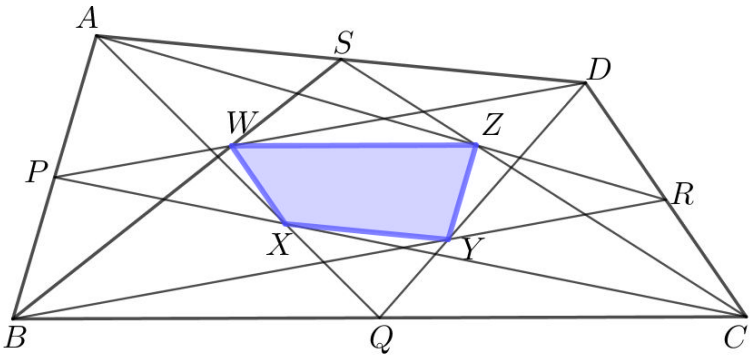
It is well known that the centroid G of a triangle ABC is the point G that minimizes the sum, $GA^2 + GB^2 + GC^2$, of the squares of the distances of G from the vertices of the triangle.

The centroid is the point where the medians of a triangle meet. Therefore there is a straightforward straight-edge and compass construction to locate the centroid.

Show how to construct the point P that minimizes the sum, $PA + PB + PC$, of the distances of P from the vertices of a triangle.

A quadrilateral question

In the last Newsletter we asked for the ratio of the area of the quadrilateral $WXYZ$ to that of the quadrilateral $ABCD$.



Here the points P, Q, R and S are the midpoints of the edges of the quadrilateral $ABCD$, the line BS meets DP at W; AQ meets CP at X; BR meets DQ at Y; and AR meets CS at Z.

Solution

W is the point where the medians BS and DP of the triangle ABD meet. Therefore W is the centroid of this triangle and divides each median in the ratio $1:2$. In particular $PW : WD = 1:2$.

Similarly, X is the centroid of the triangle BCA and $PX : XC = 1:2$.

Because $PW : WD = PX : XC = 1:2$, it follows that WX is parallel to CD and is one third of its length.

In the same way it follows that XY, YZ and ZW are parallel to and one third the length of DA, AB and BC, respectively.

Therefore the quadrilateral $WXYZ$ is similar to $ABCD$ and has one third of its linear dimensions. Therefore the ratio of the area of $WXYZ$ to the area of $ABCD$ is $1^2 : 3^2$, that is, 1:9.

Note: This question may also be answered using vectors. Let $\mathbf{a}, \mathbf{b}, \mathbf{c}$ and $\mathbf{d}$ be the vectors corresponding to the points A, B, C and D, respectively. Then the vectors corresponding to W and X are $\frac{1}{3}(\mathbf{a}+\mathbf{b}+\mathbf{d})$ and $\frac{1}{3}(\mathbf{a}+\mathbf{b}+\mathbf{c})$. Therefore WX corresponds to the vector $\frac{1}{3}(\mathbf{a}+\mathbf{b}+\mathbf{c}) - \frac{1}{3}(\mathbf{a}+\mathbf{b}+\mathbf{d}) = \frac{1}{3}(\mathbf{c}-\mathbf{d})$.

It follows WX is parallel to CD and one third of its length, etc.