SPC November 2019

Student Problems

Students up to the age of 19 are invited to send solutions to either or both of the following problems to Lewis Roberts, Exeter Maths School, Rougemont House, Castle Street, Exeter, Devon EX4 3PU.

Two prizes will be awarded − a first prize of £25, and a second prize of £20 − to the senders of the most impressive solutions for either problem. It is not necessary to submit solutions to both. Entries should arrive by 20th January 2020 and solutions will be published in the March 2020 edition.

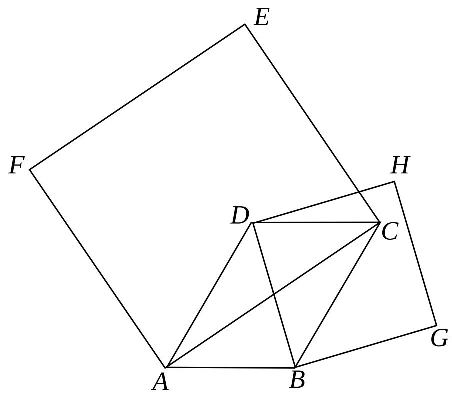
The Mathematical Association and the *Gazette* comply fully with the provisions of the 2018 GDPR legislation. Submissions **must** be accompanied by the SPC permission form which is available on the MA website

https://www.m-a.org.uk/the-mathematical-gazette

Note that if permission is not given, a pupil ***may still participate and will be eligible for a prize in the same way as others****.*

Problem 2019.5 (**Dao Thanh Oai**)

Let $ABCD$ be a parallelogram with A and B fixed points in a plane. Quadrilaterals $ACEF$ and $BGHD$ are squares. Show that the midpoint of FG remains fixed when the line segment CD is translated in the plane.



Problem 2019.6 (**Chris Starr**)

For n odd, prove that

$$\left(\binom{n}{2} + 2\binom{n}{4} + 2^2\binom{n}{6} + \dots\right)^2 + \left(\binom{n}{0} + \binom{n}{2} + 2\binom{n}{4} + 2^2\binom{n}{6} + \dots\right)^2$$

$$= \left(\binom{n}{1} + 2\binom{n}{3} + 2^2\binom{n}{5} + \dots\right)^2.$$