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

\[
\binom{n}{2} + 2\binom{n}{4} + 2^2\binom{n}{6} + \ldots + \left(\binom{n}{0} + \binom{n}{2} + 2\binom{n}{4} + 2^2\binom{n}{6} + \ldots\right)^2
= \left(\binom{n}{1} + 2\binom{n}{3} + 2^2\binom{n}{5} + \ldots\right)^2.
\]