

## Student Problems

Due to the late appearance of the July 2024 issue of the *Gazette*, we are repeating the July problems to give students the opportunity to tackle them.

Students up to the age of 19 are invited to send solutions to either or both of the following problems to Agnes Bokanyi-Toth, School of Science Reception, Schofield Building, Loughborough University, Loughborough, LE11 3TU. Two prizes will be awarded – a first prize of £25, and a second prize of £20 – to the senders of the most elegant solutions for either problem. It is not necessary to submit solutions to both. Solutions should arrive by 13th January 2025 and will be published in the March 2025 issue of the *Gazette*.

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 Mathematical Association 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 2024.3** (Paul Stephenson)

General Lucas sequences are defined by the recursion  $l_{n+2} = l_{n+1} + l_n$ . Two particular ones are the Fibonacci sequence, starting 0, 1, 1, 2, ... and the Lucas sequence, starting 2, 1, 3, 4, ... . Show that, after the third term, the two sequences have no terms in common.

### **Problem 2024.4** (Paul Stephenson)

Consider a convex hexagon whose vertices are grid points on a square lattice of unit edge and which has no boundary points other than vertices. By Pick's theorem, its area is given by  $A = i + \frac{1}{2}b - 1$ , where  $i$  is the number of interior points and  $b$  is the number of boundary points. Show that its area must be at least 4 units.

AGNES BOKANYI-TOTH

10.1017/mag.2024.135 © The Authors, 2024

Published by Cambridge University Press

on behalf of The Mathematical Association