SPC November 2020

Student Problems

Students up to the age of 19 are invited to send solutions to either or both of the following problems to Stan Dolan, 126A Harpenden Road, St Albans, Herts., AL3 6BZ.

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 2021 and solutions will be published in the March 2021 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 2020.5 (**Gaurav Chaurasia**)

Let $O(n) = 1 + 9 + \dots + (2n - 1)^2$ and $E(n) = 4 + 16 + \dots + (2n)^2$.

Find and prove expressions for $O(n)$ and $E(n)$ in terms of T, where

$$T(n) = 1 + 3 + \dots + \frac{n(n + 1)}{2},$$

is the sum of the first n triangular numbers.

Problem 2020.6 (**Paul Stephenson**)

Let n be any positive integer. Define b to be the number of 1s in the binary expansion of n and define f to be the power of 2 in a prime power factorisation of $n!$.

Find and prove a simple connection between b and f.

Sharpen your skills
Student Problems From The Mathematical Gazette

Price: £9.00   ISBN:0906-588-499
https://members.m-a.org.uk/Shop/product/50

The source of the material contained in this book is the column 'Student Problems' which began in 1992 in *The Mathematical Gazette*. The book contains the 57 problems that were used from 1992 to 2001, all with full solutions and many with alternatives.