

SPC July 2020

STUDENT PROBLEM CORNER

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Student Problem Corner

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 September 2020 and solutions will be published in the November 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 2020.3 (Stan Dolan)

Points X and Y lie on the edges AB and CD respectively of parallelogram $ABCD$. Given that $\angle ADX = \angle BDC$ and $\angle DAY = \angle CAB$, prove that XY is parallel to AD .

Problem 2020.4 (Chris Starr)

For given positive integers a and b , let $f(x) = \left\lfloor \frac{x+a}{b} \right\rfloor$ and $g(x) = \left\lfloor \frac{x+b}{a} \right\rfloor$. Show that $fg(x) - gf(x)$ takes at most two values for real x .

N.B. $\lfloor x \rfloor$ denotes the greatest integer less than or equal to x .