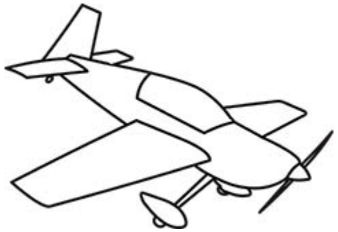
5. ORDER, ORDER!

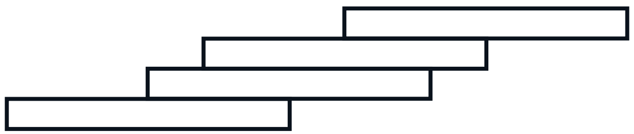


In the final leg of the 400km air-race there were 7 competitors numbered 1 to 7. There was one competitor from each of the following countries: Australia, Belgium, Canada, Denmark, Egypt, France and Germany.
Ken trailed in a bad last due to technical problems.
No. 5 and No. 2 finished in 4^{th} and 5^{th} places (but not necessarily in that order). No. 1 was from either Australia or Canada. The race was won by No. 4, Denmark's plane who just beat Ian.
Mark, from Germany, was not in the first four, but No. 3 was. No plane finished in the same position as his number.
Luke was not from Belgium nor Canada, but he finished 5^{th}.
Egypt was 2^{nd}. John, from Australia, finished behind No.6.
Nigel was from Belgium or France.
Oscar was also a competitor.
What was the number of each competitor, their name, the country they represented and the position in which they finished?

6. FLIGHT OF STAIRS

Ariel is constructing a model flight of stairs using 10 uniform blocks each of length 6cm. She stacks them lengthways, overlapping each other as shown. The amount of overlap between each block and the one above it can vary as she goes up the stack.
What is the greatest possible size of the overhang?

Diagram shows how some of the blocks **may** overlap but **NOT** the actual amount.



The competition is promoted by Liverpool Mathematical Society (LivMS) www.livmathssoc.org.uk
The MA is a Registered Charity (No. 313281). Drawings by P. H. Ackerley.

(INCORPORATING THE LIVERPOOL BRANCH OF AMiE)

Open Challenge '26

For Year 13 or below

Rules

It should be attempted at home during February half term.
Your entry must be your own work.
For individual entries only. You should attempt all questions.
Entries without any working out at all or written on this sheet will not be marked.
It is possible to win a prize even if you have not completed all of the questions, so hand in your entry even if it is not quite finished.
You must print your name, date of birth and school in neat, legible writing on the front sheet.
Pupils under 15 years of age should only attempt this in exceptional circumstances.

Either you or your maths teacher needs to **return your entry by 6 March** to this address:

Open Challenge '26 Entries
Mrs A. Carter
Danes Court
Mudhouse Lane
Burton
Neston
CH64 5TS

A Prize-Giving Evening will be held at the University of Liverpool on Wednesday 6 May .

Solutions will be posted on www.livmathssoc.org.uk. after the event

We hope that you enjoy the questions.

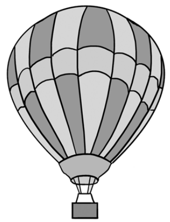
1. ISLAND HOPPING

Each island in a certain archipelago has an airstrip, no two of the airstrips being the same distance apart. From each airstrip a plane takes off for the nearest neighbouring airstrip.

Prove that no airstrip has to cope with the arrival of more than five planes.

2. FLYER'S REST

Sue, a keen hot-air balloonist, has crash landed at point P situated in moorland 12km due east of the Flyer's Rest pub which is on a straight road that runs northwards from the Flyer's Rest to her tent at the Firefly campsite. She sets out from P in a direction θ° north of west, walking in a straight line across the moor to the road at 3km/h.

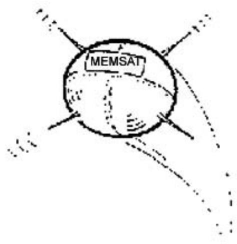


When Sue reaches the road, she accelerates to a speed of 5km/h back to the campsite. Assuming that the distance between the Flyer's Rest pub and the Firefly campsite is x, find an expression involving x and θ for the total time of travel from P to the Firefly campsite. By plotting graphs, determine Sue's quickest routes to the campsite when x= 12km and when x = 6km.

3. SHARP RETURN

The Red Arrows have arranged to give three flying displays, each lasting twenty-five minutes, in the same afternoon. One is in Western Wales, 160km to the South-West of their base, another is in Eastern England, 300km to the East of the Welsh display, while the third is in Southern Scotland, directly to the North of the Welsh display and to the North-West of the English display and fifteen minutes' flying time from their base.
They are briefed to leave the base at 1400 hours and fly each leg at the same average speed. The squadron leader is due to play squash with his commanding officer at 1639 hours. Investigate whether or not he can arrange the order of displays so as to return to base in time for his match.

4. FLYOVER



A satellite, MEMSAT, flies directly over the North Pole, Liverpool and the South Pole, taking 24 hours to cover one circular orbit.
At midnight GMT, MEMSAT is directly over the North Pole.
At what time in the morning is it directly over Liverpool?
Find the countries directly below the satellite at 7.00 a.m. (GMT) and 9.00 p.m. (GMT).