

The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2023–2024

Entries must be the unaided efforts of individual pupils.

Solutions must include explanations and answers without explanation will be given no credit.

Do not feel that you must hand in answers to all the questions.

CURRENT AND RECENT SPONSORS OF MATHEMATICAL CHALLENGE ARE

The Edinburgh Mathematical Society, The Maxwell Foundation,

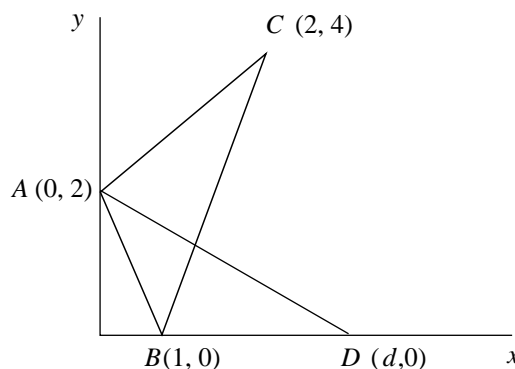
The London Mathematical Society and The Scottish International Education Trust.

The Scottish Mathematical Council is indebted to the above for their generous support and gratefully acknowledges financial and other assistance from schools, universities and education authorities.

Particular thanks are due to the Universities of Aberdeen, Edinburgh Napier, Moray House, St Andrews, Stirling, Strathclyde and to George Heriot's School, Gryffe High School and Kelvinside Academy.

Middle Division: Problems 1

M1.



In the diagram, $D(d, 0)$ lies on the x -axis beyond B . The triangles ABC and ABD have the same area. Determine the value of d .

M2. “Will those in favour of the resolution please hold up their hands?” said the chairperson at a public meeting.

On a count of hands, it appeared that the resolution was carried by a majority of 7. It was then found that, in the excitement of the moment, 6% of those in favour were holding up both their hands. When this had been allowed for, the actual result of the vote proved to be a majority of 2 against the resolution.

How many people were asked to record their vote?

M3. The distance from St Andrews to Leven is 20 miles by one road and 24 miles by another. A cyclist uses one road going out and the other coming back but whichever way she goes her return journey is 2 mph slower than the outward journey. She also found that if she goes out by the longer road and returns on the shorter she takes 6 minutes less time than if she went the other way round.

What is her speed on the outward journey?

SEE OVER FOR QUESTIONS M4 & M5.



Mathematical Challenge Problems 1

MIDDLE DIVISION 2023-2024

PLEASE USE CAPITALS TO COMPLETE

SURNAME	<input type="text"/>	FOR OFFICIAL USE								
OTHER NAME(S) (underline the one you prefer)	<input type="text"/>	Marker <input type="text"/>								
SCHOOL	<input type="text"/>	Marks								
AGE	<input type="text"/>	YEAR OF STUDY	S	<input type="text"/>	<input type="text"/>	1	2	3	4	5
						Total	<input type="text"/>			

— — — — - CUT ALONG HERE — — — —

Please write your solutions on A4 paper and staple the above form to them.

PLEASE WRITE YOUR NAME ON EVERY PAGE.

Send your entry through your school to the section organiser.

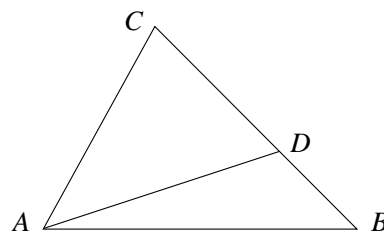
For further information on the competition, please see the School Materials which have been distributed to schools. A copy of these Materials can be obtained from

<http://www.wpr3.co.uk/MC/materials/index.html>

There are separate links for primary and secondary schools. This page also includes a list of authorities in each section and names and addresses of section organisers.

M4. In the diagram, $2\angle BAC = 3\angle ABC$ and D lies on BC such that $\angle DAC = 2\angle DAB$. Suppose that $BC = a$, $AC = b$, $AB = c$, $AD = d$ and $CD = e$.

Find expressions for d and e in terms of a , b and c only.



M5. A school assembly hall has a rectangular array of chairs. There are exactly 12 boys seated in each of the r rows and exactly 10 girls seated in each of the c columns. There are fewer than 1000 boys and girls in the school. There is just one empty chair.

How many chairs are there in the assembly hall?

END OF PROBLEM SET 1

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

3 November 2023

Look out for Problems 2 in late November!

For information about Mathematical Challenge, look on the SMC web site:

www.scot-maths.co.uk