

# 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.*

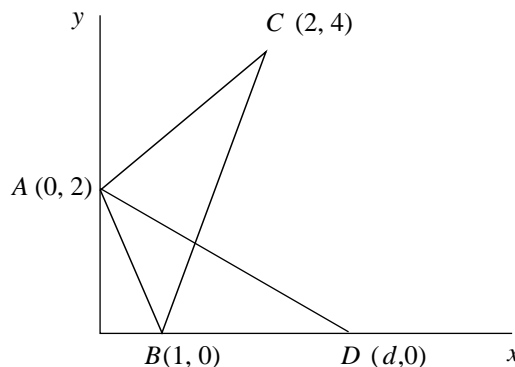
The Scottish Mathematical Council is indebted to the above for their generous support and gratefully acknowledges financial and other assistance from schools, universities and education authorities.

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.

### Junior Division: Problems 1

- J1.** Six integers have a mean of 32. The median is  $33\frac{1}{2}$ . The mode is 35, which is not the largest integer. The range is 11. What are the possible sets of 6 integers?
- J2.** One of the highlights of the local village social life is the stage production organised by the Amateur Youth Players and the rehearsals are in full swing for *The Gondoliers*. When I called the treasurer the other day he was estimating the costs. The first scene, in case you have forgotten, shows 24 maidens of Venice making up small bunches of red and white roses. He had intended that each girl would have three red and two white roses until he realised that the red roses cost twice as much each as the white ones. He decided to give half the girls three red and two white roses each and the remainder two red and three white roses. He had cut the cost by £3. How much is a red rose?
- J3.** At the secondary school down the road Chemistry, English, French, Geography, Maths and Physics are taught by Mr Brown, Mr Jones, Mrs Robinson and Ms Singh. Each teacher teaches three subjects and each subject is taught by two teachers. Two of Ms Singh's subjects are also taught by Mr Jones. Maths is shared by Ms Singh and Mrs Robinson. Both of the teachers of English also teach French. Mrs Robinson teaches Chemistry and Mr Jones does not teach Physics. Who are the two teachers of Geography?

**J4.**



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  $d$ .

**SEE OVER FOR QUESTION J5.**



# Mathematical Challenge Problems 1

JUNIOR DIVISION 2023-2024

PLEASE USE CAPITALS TO COMPLETE

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

- J5.** “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 voted?

**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](http://www.scot-maths.co.uk)**