The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2024−2025

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.

Senior Division: Problems 1

S1. In the addition sum below, only one out of the five decimal points is in the correct position.

$$\begin{array}{r} 47.5 \\ 38.627 \\ 125.4 \\ 1583.3 \\ \hline 4508.57 \end{array}$$

Find all the possible ways to alter the four incorrect decimal places and make the sum add up correctly.

S2. When Oliver walks briskly down a downward moving escalator he takes 60 steps of the escalator to reach the bottom. When Oliver walks slowly down the escalator at half his previous speed he takes 42 steps of the escalator to reach the bottom. Assuming constant speeds for walking briskly, walking slowly and the movement of the escalator, find how many steps the escalator shows when it is stationary.

S3. Four cards with integers on are placed face down on a table. Five people in succession each take two cards and state the total value of the two cards, but do not reveal the individual values. These totals are

8, 13, 14, 17 and 11.

Determine the numbers on each of the four individual cards.

S4. Cyclic quadrilateral $ABCD$ has $AB = AD = 1$, $CD = \cos\angle ABC$ and $\cos\angle BAD = -\frac{1}{3}$.
Prove that BC is a diameter of the circumscribed circle.

S5. Choose 6 different non-zero digits.

(a) How many different 6 digit numbers can be formed from these 6 digits?

(b) Find the largest prime factor of the sum of all of these different 6 digit numbers.

END OF PROBLEM SET 1

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

1 November 2024

Look out for Problems 2 in late November!

SEE OVER FOR LINKS TO THE MATHS CHALLENGES ARCHIVES

SMC

Mathematical Challenge Problems 1

SENIOR DIVISION 2024-2025

PLEASE USE CAPITALS TO COMPLETE

SURNAME	
OTHER NAME(S) (underline the one you prefer)	
SCHOOL	
AGE	
YEAR OF STUDY	S

FOR OFFICIAL USE

Marker

Marks

1	2	3	4	5

Total	

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.

For information about Mathematical Challenge, look on the MC web site:
www.scot-maths.co.uk

MATHS CHALLENGES ARCHIVES

There are archives of previous questions on: **www.wpr3.co.uk/MC-archive/S/index-S.html**

Here is a shortcut for your smartphone or tablet