The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2025−2026

Golden Jubilee Year

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 and Gryffe High School.

Senior Division: Problems 1

S1. A sealed bottle contains water. It consists of a cylinder of radius 3 cm with another cylinder of radius 1 cm on top, as shown in Figure 1. When the bottle is the right way up the height of the water is 16 cm as shown in the cross section in Figure 2. When the bottle is upside down the height of the water is 22 cm as shown in the cross section in Figure 3. What is the total height of the bottle?

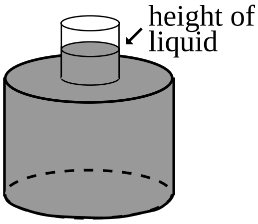


Figure 1

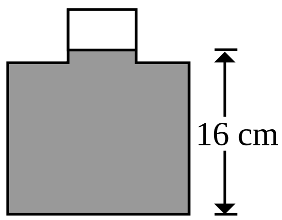


Figure 2

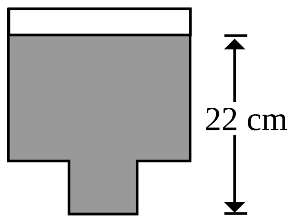
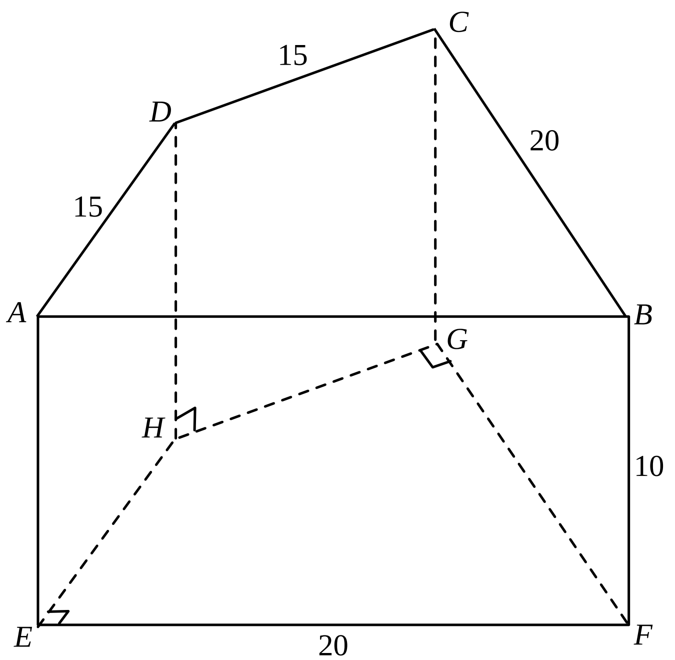


Figure 3

S2.



The diagram shows a right prism with quadrilateral base $EFGH$ which has right angles at E and G.
$AD = 15$, $BC = 20$, $CD = 15$ and $EF = 20$ the height of the prism is 10.
Find the distance from A to G.

SEE OVER FOR QUESTIONS S3, S4, S5.

Mathematical Challenge Problems 1

SMC

SENIOR DIVISION 2025-2026

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

Senior Division: Problems 1 continued

S3. Starting from a random place, Hira decided to find the sum of 9 consecutive powers of 3. She was interested to know whether that could give her the same answer as adding up some number of consecutive integers starting at 1.

Find a solution to Hira's problem. Show whether or not there are any other solutions.

S4. For the system of equations $x^2 + x^2y^2 + x^2y^4 = 525$ and $x + xy + xy^2 = 35$, find all the real solutions for x and y.

S5. There are 5 beads on a metal ring, each with a number on. If the beads are numbered 1,2,3,4,5 consecutively round the ring, show that it is possible to make every value from 1 to 15 using the total value of combinations of adjacent beads.

What is the maximum possible total value of all five beads for which it could be possible to obtain each lower total from 1 upwards using combinations of adjacent beads?

Show how the beads can be numbered so that it is possible to make every value from 1 to this maximum possible total using the total value of combinations of adjacent beads.

END OF PROBLEM SET 1

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

31 October 2025 **Look out for Problems 2 in late November!**

THE LINK TO THE MATHS CHALLENGES ARCHIVES

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