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.

Junior Division: Problems 2

J1. A triangle can be formed with sides of lengths 3, 4 and 6 cm but not with sides of lengths 3, 4 and 7 cm. Oliver has 8 sticks each with length a whole number of cm, but he cannot form a triangle with any 3 of them.

What is the shortest possible length of the longest stick?

J2. In a chemistry lab there are two bottles, each containing a mixture of acid and water:

bottle A contains 140 grams of which 10% is acid,

bottle B contains 60 grams of which 25% is acid.

The lab technician uses some of the mixture from each of the bottles to create a mixture with mass 120 grams of which 15% is acid. Then the lab technician mixes the remaining contents of the bottles to create a new mixture. What percentage of the new mixture is acid?

J3. Three types of item, A, B and C, are for sale. Items of type A sell at 8 for £1. Items of type B sell for £1 each. Items of type C sell for £10 each. A selection of 100 items of all three types costs £100. How many items of type B were there in the selection?

J4. A bag contains 21 balls, each of which is red or blue. The balls are identical except for their colour. Sasha reaches into the bag and removes two balls at random. Each ball in the bag is equally likely to be removed. The probability that two red balls are removed is exactly $\frac{1}{2}$.

How many of the 21 balls are red?

J5. Two joggers live beside a canal. The distance between their houses along the towpath is 5 miles. They each set out at the same time to jog along the towpath to the other's house and back. One jogs at a constant speed of 5 mph and the other is faster with a constant speed of 7 mph.

How far from home will the faster jogger be when they meet for the second time? And how long after they set out is this?

END OF PROBLEM SET 2

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

21 February 2025

SEE OVER FOR LINKS TO THE MATHS CHALLENGES ARCHIVES

SMC

Mathematical Challenge Problems 2

JUNIOR 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

– – – – - 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.

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

www.scot-maths.co.uk

MATHS CHALLENGES ARCHIVES

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

Here is a shortcut for your smartphone or tablet