

# The Scottish Mathematical Council

www.scot-maths.co.uk

## MATHEMATICAL CHALLENGE 2021–2022

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,*

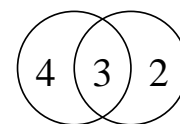
*The London Mathematical Society and The Scottish International Education Trust.*

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, Glasgow, St Andrews, Stirling, Strathclyde and to George Heriot's School, Gryffe High School and Kelvinside Academy.

### Primary Division: Problems II

- P2.1.** Professor A. M. Nesia is a mathematician who likes to keep her papers secure but can never remember the combinations for the locks. She has a journal where she keeps reminders and the entry for the filing cabinet is 432.

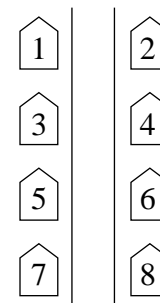


This reminder tells her that the actual 3 digit code is less than 432 where

- The first two digits make a number which can be written both as the sum of 4 and 3 consecutive positive integers but not 2 or 5 or more consecutive positive integers.
- The last digit is the first number which can be written as the sum of 3 consecutive positive integers and also the sum 2 consecutive positive integers.

Find the actual code.

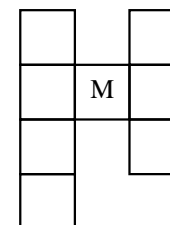
- P2.2.** Algebra Avenue has eight houses, numbered 1 to 8. All the even-numbered houses are on one side of the street, with the odd-numbered ones opposite. A mathematics student, working as a postman during the Christmas holidays, delivers to the street in a very particular way.



He delivers alternately to odd and even numbered houses, and he never crosses the road to a house directly opposite one to which he has just delivered mail. He always starts at House No. 1 and always returns to there at the end of his route.

Assuming he delivers mail to each of the eight houses, how many different routes can he use?

- P2.3.** The number cards 2,3,4,5,6,7,8 and 9 are placed in the grid alongside. The four numbers in the vertical line add up to 20. The three numbers in the horizontal line also add up to 20 as do the three numbers in a vertical line.



- (a) What number has to be placed at the middle position M? Justify your answer.  
(b) Give two example completions of the grid to show that it is not possible to be sure of the number in any other position in the grid.

### END OF PROBLEM SET II

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

26 November 2021

Look out for Problems III in January 2022!

Look on the SMC web site: [www.scot-maths.co.uk](http://www.scot-maths.co.uk) for information about Mathematical Challenge and for loads of practice items why not visit the MC archive?

[www.wpr3.co.uk/MC-archive/index](http://www.wpr3.co.uk/MC-archive/index)



# Mathematical Challenge Problems II

PRIMARY DIVISION

2021-2022

**PLEASE USE CAPITALS TO COMPLETE**

SURNAME

OTHER NAME(S)  
(underline the one  
you prefer)

SCHOOL

AGE

YEAR OF STUDY

FOR OFFICIAL USE

Marker

Marks

1	2	3	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 organiser of the section.

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.

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