

The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2017–2018

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, Professor L E Fraenkel,
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, Heriot Watt, St Andrews, Stirling, Strathclyde and to Bearsden Academy, Kelvinside Academy and Northfield Academy.

Middle Division: Problems 1

M1. The value of $50!$ is the product of all the whole numbers from 1 to 50 inclusive, i.e.

$$50! = 1 \times 2 \times 3 \times 4 \times \dots \times 49 \times 50.$$

Find how many times 2 will divide $50!$.

M2. A path, 3 metres wide, runs around the outside edge of a rectangular court.

The court is half as long again as it is wide.

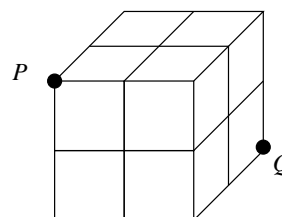
The area of the path is 1596 square metres.

What are the dimensions of the court?

M3. How many times must I toss a coin in order that the odds are more than 100 to 1 that I get at least one head?

M4. In a trapezium $PQRS$, PQ is parallel to SR and $\angle SPQ = \angle RQP = 135^\circ$. The trapezium contains an inscribed circle and the length of PQ is 1 cm. What is the **exact** length of QR ?

M5. Each of the six faces of a solid cube is divided into four squares as indicated in the diagram. Starting from vertex P paths can be travelled to vertex Q along connected line segments. Each movement along a path must take one closer to Q . How many possible paths are there from P to Q ?



END OF PROBLEM SET 1

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

29 September 2017

Look out for Problems 2 in early December!

Look on the SMC web site:

www.scot-maths.co.uk

for information about Mathematical Challenge



Mathematical Challenge Problems 1

MIDDLE DIVISION 2017-2018

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 | 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 organisers.

For further information on the competition, please see the Information Circular, which has been distributed to all secondary schools. Please contact the local organiser, whose name and address are given above, if you require a further copy.
