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.

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Middle Division: Problems 1

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

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

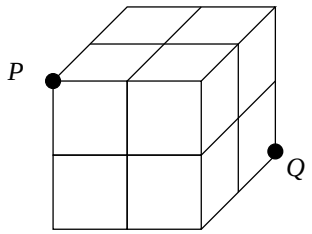
Find how many times 2 will divide 50!.

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 $\angle SPQ = \angle RQP = 135°$. 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