

# The Scottish Mathematical Council

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## MATHEMATICAL CHALLENGE 2015–2016

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*

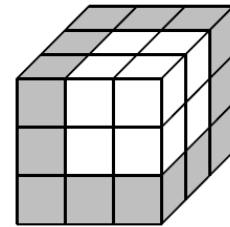
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The London Mathematical Society and The Scottish International Education Trust.*

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### Junior Division: Problems 1

- J1.** The solid large cube in the diagram is made up from individual smaller cubes. The individual small cubes were all originally white until some faces were painted grey as shown. What is the largest possible number of completely white cubes?

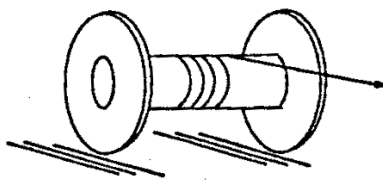


- J2.** Tessa was practising subtraction. After doing a calculation correctly, she copied it into her notebook but was distracted and instead of writing down each figure, she wrote either the figure one higher or the figure one lower in the sequence 0, 1, ..., 9. What she wrote down is shown alongside. Find the correct figures, explaining how you worked it out.

$$\begin{array}{r} 2910 \\ -1497 \\ \hline 2106 \end{array}$$

- J3.** Robin was born in May when his mother (whose birthday fell in July) was 37 and his father (whose birthday fell in August) was 40. They decided to have a special party if any of them ever had a birthday on which all three had prime number ages. Show that however long they live, there will only be one special party.
- J4.** On July 1st, Bill started to read a book recommended by friends, and, by reading the same number of pages each day of the month, managed to finish it on the 31st. Another friend, Clare, also started reading the book at the same time. She read a quarter of that number of pages on the first of the month and, on each following day, one more page than on the previous day. She also finished on the 31st. How many pages did the book contain?

**J5.**



An almost empty bobbin is pulled along a flat surface by a thread which is wrapped around it, as shown in the diagram. The diameter of the inner reel is 5 cm and that of each outer wheel is 10 cm. Assuming no slipping or sliding, how far has the bobbin moved when the end of the thread has moved 12 cm?

END OF PROBLEM SET 1