

# The Scottish Mathematical Council

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## MATHEMATICAL CHALLENGE 2012–2013

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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### Junior Division: Problems 2

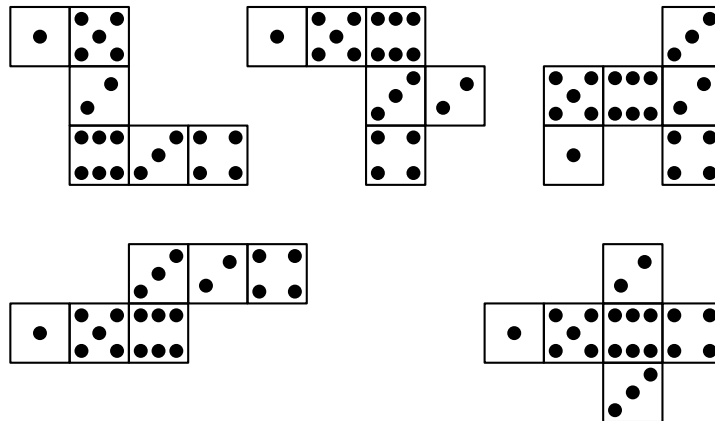
**J1.** Andrew has forgotten the code to allow him to unlock his bicycle.

He knows:

- it is a 3-digit number;
- the sum of the digits is 13;
- the outer digits are even;
- subject to these conditions, the product of the digits is as large as possible.

What is the code? Explain clearly.

**J2.** A cube can be opened out into a net made up of six squares. But which nets below made up of six squares fold up into a cube? For those that do not, use the spots to explain why not. For those that do, with the given spots, which form a standard dice? Explain.

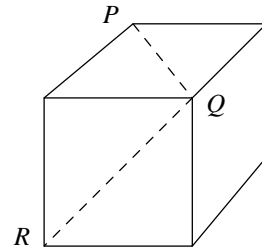


**J3.** Twins Justin and Julie decided to have a snack; Justin bought a can of coke for himself and Julie bought a carton of juice and a biscuit. All three items together cost £1.60.

On their way home, Justin noted that if Julie hadn't bought the biscuit, he could have had the cake he fancied and the same amount of money would have been spent. "But," said Julie "that wouldn't have been fair since then we would have spent on you, just 20p short of five times what we would have been spent on me. As it was, exactly the same amount was spent on each of us."

What was the price of each of the items they purchased?

- J4.**  $PQ$  and  $QR$  are diagonals on two faces of a cube as shown. What is the size of  $\angle PQR$ ?



- J5.** Very shortly after leaving Elmouth by bus on the half-hour ride to Elwick one day, we met a bus coming towards us. I wondered to myself how many such buses we should meet before we reached our destination. There is a ten minute service each way.  
I assumed that all buses concerned travelled on time and at a constant speed. How many buses should we have met before we reached our destination?

**END OF PROBLEM SET 2**