

The Scottish Mathematical Council

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MATHEMATICAL CHALLENGE 2009–2010

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, Professor L E Fraenkel,

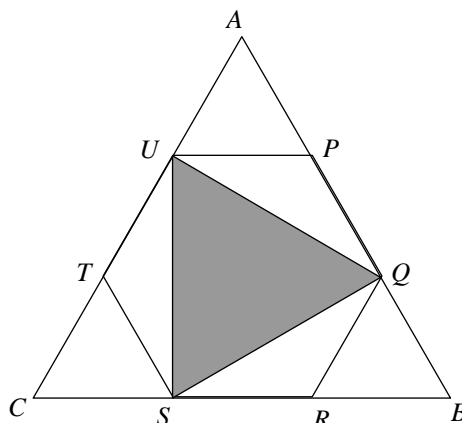
The London Mathematical Society and The Scottish International Education Trust.

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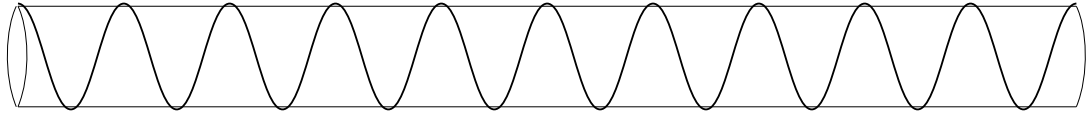
Particular thanks are due to the Universities of Aberdeen, Edinburgh, Glasgow, St Andrews, Strathclyde, and to Preston Lodge High School, Bearsden Academy, Beaconsfield School, St Aloysius College and Turriff Academy.

Middle Division: Problems 1

- M1.** Mr and Mrs McLeod have six children – Andrea, John, Eilidh, Rory, Fiona and Pat. Just before Christmas, the six children went on their own to town to do some shopping. They all spent some money, each spending a whole number of pounds. When they returned home, they told their parents, in a roundabout way, how much they had spent as follows: Andrea and John together had spent £26, Eilidh and Rory together had spent £20 and Fiona had spent £9. They didn't say how much Pat had spent, but they did say that one of them had spent £15 more than the average for all the children. Mr and Mrs McLeod thought about this and then started arguing about how much Pat had spent. Explain why they were arguing and say what you can about the amount Pat had spent.
- M2.** One of the tiles in a floor has the shape of a regular polygon. If the tile is removed from the floor and rotated through 50° , it will fit exactly into its original place on the floor. What is the least number of sides that the tile can have?
- M3.** Six years ago, an investor put a certain sum of money into stocks and shares. At the end of five years, the stocks and shares showed a total growth of 40% but in the sixth year they lost 30% of their value. At the same time, the investor put the same amount of money into a bank account giving 5% per annum for the first five years. In the sixth year, the bank account only gave 2.5%. Having left the bank interest to accrue over the six years, at the end of the six years, the total value of the stocks and shares and the money in the bank was slightly over £288 more than the amount initially invested. How much money did the investor initially put into stocks and shares?
- M4.** The corners are cut off an equilateral triangle ABC to form a regular hexagon $PQRSTU$ as shown in the diagram.
Find the ratio of the area of triangle UQS to that of triangle ABC .



M5.



Ten turns of a wire are helically wrapped round a cylindrical tube with outside circumference 4 inches and length 9 inches. At the start and the finish, the end of the wire is at the top. Find the length of the wire.

END OF PROBLEM SET 1