

The Scottish Mathematical Council

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MATHEMATICAL CHALLENGE 2006–2007

Entries must be the unaided efforts of individual pupils. Solutions must include explanations.

Answers without explanation will be given no credit.

CURRENT AND RECENT SPONSORS OF MATHEMATICAL CHALLENGE ARE

The Edinburgh Mathematical Society, Professor L E Fraenkel,

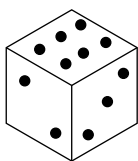
The London Mathematical Society and The Scottish International Education Trust.

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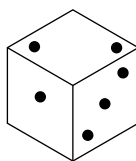
Particular thanks are due to the Universities of Aberdeen, Dundee, Edinburgh, Glasgow, Heriot-Watt, Paisley, Stirling, Strathclyde, and to Preston Lodge High School, Bearsden Academy, and Turriff Academy.

Junior Division: Problems 1

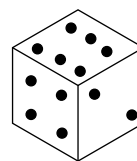
- J1.** During a very hard winter, Liam had only enough hay and corn to feed his six horses for another 30 days and it would be another 75 days before spring would arrive. On the seventh day, before feeding time, Liam sold four of his horses. Will he be able to feed his remaining two horses for the rest of the winter? **Explain your reasoning.**
- J2.** A dice maker makes mistakes when painting the spots on some dice. Below are three views of one of the dice he makes. How many spots are there on the bottom face in view 1 (i.e. the face opposite the six)? **Explain your reasoning.**



View 1



View 2



View 3

- J3.** Alice has three daughters all of whom are at least one year old. Alice challenged a friend Morag to work out the ages from the following clues:

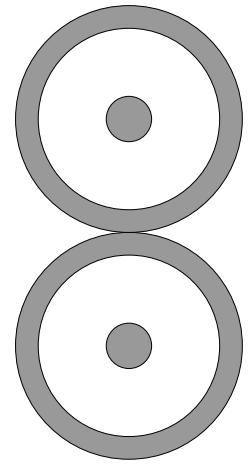
- the sum of their ages is 11;
- the product of their ages is either 16 years less or 16 years more than Morag's age.

Morag said she could not identify the ages and would need another clue so Alice said that the daughter whose age in years is greatest is learning to play the clarinet.

Morag now knew the three ages. What were they, and how did Morag know?

- J4.** The islands of North Oost and South Oost have fewer than 2000 residents all together. North Oost is bigger having at least 50 more residents than South Oost. One third, one fourth, one fifth and one seventh of the population of North Oost are all whole numbers. The sum of these whole numbers gives the population of South Oost. What is the population of South Oost?

- J5.** The diagram shows two wheels of the same diameter. The lower wheel is fixed and the upper wheel rotates without slipping about the lower wheel, the two wheels always being in contact. How many times does the upper wheel turn on its axis in making a complete revolution of the lower wheel?



END OF PROBLEM SET 1