

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.

The Scottish Mathematical Council is indebted to the above for their generous support and gratefully acknowledges financial and other assistance from schools, universities and education authorities.

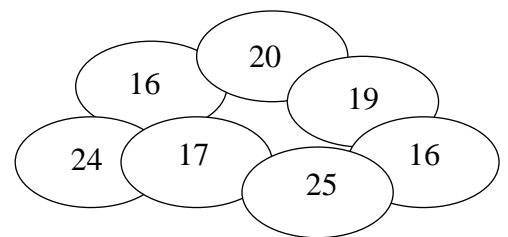
Particular thanks are due to the Universities of Aberdeen, Dundee, Edinburgh, Glasgow, Heriot-Watt, Paisley, Stirling, Strathclyde, and to Preston Lodge High School, Bearsden Academy, and Turriff Academy.

Middle Division: Problems 2

M1.

A merchant has an odd collection of barrels of wine and one barrel of beer as shown with their capacities in gallons.

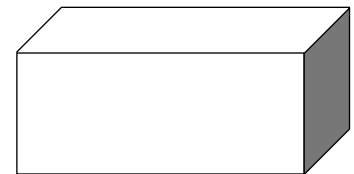
He gets rid of all of it by selling off some barrels of wine to one customer, twice that quantity of wine to another customer and keeping the barrel of beer for himself. How many gallons did the barrel of beer contain?



M2.

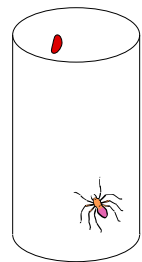
For Helen's birthday, she was given a box of chocolates. The area of the top of the box was 338 cm^2 , the area of the side was 104 cm^2 and the area of the end was 52 cm^2 .

What was the volume of the box?



M3.

A cylindrical beaker 8 cm high and 12 cm in circumference was standing on a table. On the *inside* of the beaker, 2 cm from the top, is a drop of honey. Diametrically opposite the honey and lower down is a spider which is on the *outside* of the beaker, 2 cm from the bottom. What is the shortest distance the spider has to walk to reach the honey?



M4.

An eccentric and wealthy man made a will in which he left £55,000 each year to secondary schools and primary schools in the area where he lived. The secondary schools were to receive £3,500 each and the primary schools £2,000 each. The terms of the legacy were that all the money had to be spent each year. But the eccentric clause was that, in each year, the number of secondary schools which benefit must be different from the number of secondary schools which had benefitted in all preceding years and the same must hold true for the number of primary schools. For how many years could the legacy be spent?

M5. Daryl put some black stones and some white stones into a bag. He then asked Ran to reach into the bag, without looking in, and draw out a stone. Ran drew out a black stone. Daryl asked Ran to draw out another stone and, once again, Ran drew out a black stone.

“There must be more black than white stones in the bag ,” said Ran. “I wonder what the probability is of my drawing a black stone on a third try?”

Daryl replied,” Exactly nine tenths of what it was of drawing a black stone on your first draw.”

Daryl told Ran that he had put “ten, give or take two or three” stones into the bag. How many stones were in the bag at the start?

END OF PROBLEM SET 2