The Scottish Mathematical Council
www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2007–2008

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
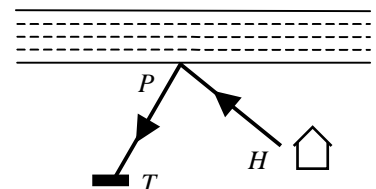**The Edinburgh Mathematical Society, Professor L E Fraenkel,**
The London Mathematical Society and The Scottish International Education Trust.

Junior Division: Problems 2

J1. Oor Wullie and his pals are exploring in the jungle and have to cross a rope bridge at midnight. Unfortunately the bridge is only strong enough to support two people at a time. As it is dark, they also need a torch to be used every time the bridge is crossed but they only have one torch. Wullie can cross the bridge in five minutes, Wee Eck can cross in seven minutes and Fat Bob can cross in eleven minutes. But it takes PC Murdoch twenty minutes to get across. How quickly can all four get across the bridge?

J2. A palindromic number is a number which reads the same backwards and forwards, for example 838, 14541. As generally we do not write numbers with an initial zero, numbers such as 070 will not be included here.
(a)   Which are there more of: 10-digit or 11-digit palindromic numbers?
(b)   Which are there more of: 11-digit or 12-digit palindromic numbers?
Explain your reasoning.

J3. In school, Jim is about to take the last of a series of tests. If he gets 23 in this test, it will improve his average by 1. If he scores 39 it will improve his average by 3. What was his average score before the last test?

J4. In the village of Piffle, some of the animals are really strange. Ten percent of the dogs think they are cats and ten percent of the cats think they are dogs. All the other cats and dogs are perfectly normal. One day the official village animal psychologist tested all the cats and dogs in the village and found that twenty percent of them thought that they were cats. What percentage of them really were cats?

J5. Every morning, Ruth goes out to take water to her pet armadillo. She picks up her water bucket by her house at the point H on the diagram below, goes down to the edge of the straight river, fills the bucket with water and takes it to the armadillo's trough at T. She has been doing this so often that she knows exactly where the point P on the river bank is, so that she walks the shortest distance. Explain how you should choose the point P on the river bank so that the distance from H to T via P is shortest.

END OF PROBLEM SET 2