

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,

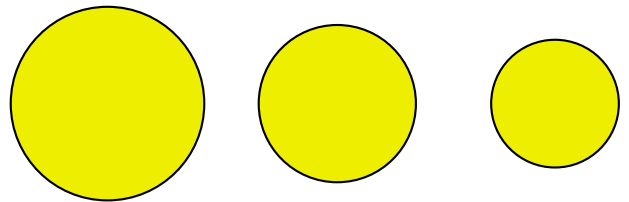
The London Mathematical Society and The Scottish International Education Trust.

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, Paisley, St Andrews, Strathclyde, and to Preston Lodge High School, Bearsden Academy, and Turriff Academy.

Senior Division: Problems 1

- S1.** Three large pancakes, as shown, each of the same thickness are to be shared equally among four people. The diameters of the pancakes form a Pythagorean triple. Without measuring, show how to cut the pancakes to make a total of just five pieces so that each person can get the same amount.



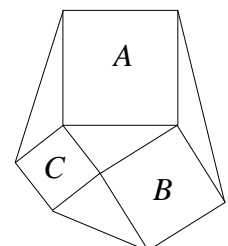
Explain your reasoning.

- S2.** In Tiffany's, a world famous jewellery store, there is a string necklace of 33 pearls. The middle one is the largest and most valuable. The pearls are arranged so that starting from one end, each pearl is worth \$100 more than the preceding one, up to the middle one; and starting from the other end, each pearl is worth \$150 more than the preceding one, up to the middle one. If the total value of the necklace is \$65,000 what is the value of the largest pearl?
- S3.** Find the ten-digit number which uses each of the digits 0 to 9 such that the numbers formed
- by the first digits is divisible by 1,
 - by the first two digits is divisible by 2,
 - by the first three digits is divisible by 3,
 - by the first four digits is divisible by 4,
 - by the first five digits is divisible by 5,
 - by the first six digits is divisible by 6,
 - by the first seven digits is divisible by 7,
 - by the first eight digits is divisible by 8,
 - by the first nine digits is divisible by 9,
 - by the first ten digits is divisible by 10.

- S4.** A farmer owns three square fields of areas A , B , C which are located as shown in the diagram.

He then buys the four triangular plots of land shown so that he can put a fence with six straight edges round his property.

Show that the area of each of the triangular plots of land is the same. Further, if A is 26 acres, B is 20 acres and C is 18 acres, find the total area included inside the farmer's fence.



- S5.** You are given three positive whole numbers whose sum is M . If you subtract $\frac{1}{3}M$ from the first one, add 2 to the second one and multiply the third by 2, you get the same set of three numbers back again. Work out all possible values for the three numbers.

END OF PROBLEM SET 1