

LIVERPOOL MATHEMATICAL SOCIETY

# OPEN CHALLENGE

## '08

**First prize for teams £200**

**First prize for individuals £100**

**Prizes for runners-up**

**Teams can be of any size greater than one but the prize is independent of the number in the team**

**Certificates for good entries**

**Team Competition.** Teams may be of any size (greater than one), but all members must be under 18 on 31.8.08. **Each team should submit a single set of answers to all SIX questions.** The first page should contain the **PRINTED** name and address of the school and printed names and dates of birth of all team members.

**Individual Competition.** The individual competition is open to anyone who is under 18 years of age on 31.8.08. **You should submit answers to FOUR questions only.** The first page of your entry must contain your **PRINTED** full name, school (including school address) and date of birth. If you are entering as a member of a team, you may **not** enter also as an individual.

**Both competitions.** Begin each problem on a separate sheet of paper. Credit will be given for partially correct working and bonus marks may be awarded for particularly good solutions.

A copy of our solutions will be sent to you if you enclose a stamped, addressed envelope, but we are not able to return entries.

**Entries must be posted (either by teachers, or directly by individuals) no later than Friday 14 November 2008 to Mrs. A. Carter, Danes Court, Mudhouse Lane, Burton, Neston, Cheshire CH64 5TS.**

Prizes and certificates will be presented at an evening of mathematical entertainment at the University of Liverpool next term to which all those who do well will be invited (including at least one from each school from which we receive entries).

### LMS SIXTH FORM POP MATHS QUIZ

Saturday 7 March 2009 10:00 a.m. – 2:00 p.m.

Liverpool John Moores University

FREE!

Teams compete in this Pub style Quiz

PRIZES GALORE!

The Liverpool Mathematical Society incorporates the Liverpool Branch  
of the Mathematical Association.

The MA is a Registered Charity (No. 313281).

## 1. I SAW HER STANDING THERE

The map shows the relative positions of nine 'Superlambananas': Kitty, Lucy, Milly, Nancy, Polly, Queeny, Ruby, Sally & Tracy. The distance between each pair of adjacent Superlambananas is as shown, in metres. Unfortunately, their names have been left off the map, but luckily we have the following information about the distances between some of the Superlambananas. (Each distance means the shortest distance by a suitable choice of roads.)

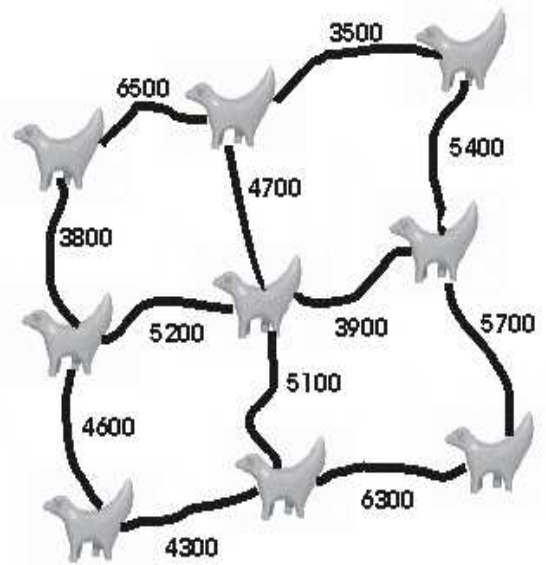
The two Superlambananas that are furthest apart are Sally and Kitty.

The distance from Sally to Queeny is the same as the distance from Tracy to Milly.

The distance from Polly to Nancy is 100 metres more than the distance from Polly to Milly.

The distance from Queeny to Ruby is twice the distance from Queeny to Polly.

Can you place the Superlambananas in their correct positions?



## 2. ALL I'VE GOT TO DO



In the Liverpool Chess competition Boris Goodinnuff challenged all comers to place two pawns on an 8x8 chessboard, one at Q4 and the other at K5. Now all they had to do was place the remaining 14 pawns (16 in all) so that no three pawns were in a straight line in any direction.

The pawns must be regarded as points in space placed at the centres of the squares.

Could you have shown him how to do this?

### 3. NOT A SECOND TIME

One of the tall ships coming into Liverpool has one of its guy ropes 8 metres long and another 10 metres long. The guy wires stretch from the top of each mast to the base of the other mast. The wires cross at a height of 4 metres above the deck. How far apart are the masts?



Another one of the tall ships coming into Liverpool has one of its masts 6 metres tall and another 4 metres tall. Guy wires stretch from the top of each mast to the base of the other mast. The wires cross at a height of 2.4 metres above the deck. How far apart are the masts?

### 4. PLEASE MR POSTMAN

Beatle Drive is a quiet straight road in Liverpool in which all the houses are alike. Each doorway faces its twin across the intervening 112 feet of grass and road. There are no fences and the lawn runs right along each side between the houses and the pavement, broken only by neat flagged paths.

The postman comes to Beatle Drive from Lennon Street and leaves by Harrison Way. Mrs Starr, who lives at No. 7 and always watches for her mail, noticed the postman, Mr McCartney, was following a different route with his letters. When he reached her door she mentioned this.

“Yes” he replied, “I worked out I was wasting shoe leather so now I get around in the shortest possible distance.”

“But you went down the other side today and then back to the beginning of this side by a long diagonal, and now you’ll have to finish this side. You ought to do it my way. Start at No. 1, cross the road to No. 2 and then call at the next house No. 4, then back across the road to No. 3 followed by No. 5 and so on.”

“But the distance would be exactly the same,” the postman told her. And as each house is built on a frontage of 64 feet, Mrs Starr had to agree. So how many houses are there in Beatle Drive?



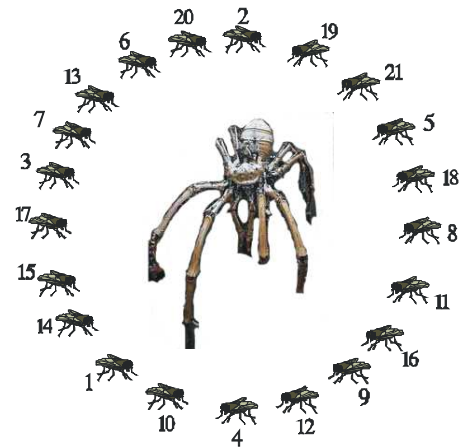
## 5. MONEY (THAT'S WHAT I WANT)



Back in 1968, John bought 40 copies of 'White Album' which were priced at  $17/6$  each. As he paid in cash the dealer let him have these at a discount. John told Paul that he paid an exact number of pounds. "So what?" said Paul. "But I paid cash," said John, "pounds, ten-shilling notes and all the coins down to threepenny bits, the same number of each." So how much did John pay?

## 6. YOU'VE REALLY GOT A HOLD ON ME

La Princesse has 21 flies in her web in the order shown. She can start from any fly and count "one, two, three", etc. in a clockwise direction and when her count matches the number of the fly she devours it. Then she starts at the next fly and begins her count once again. If she goes beyond 21 she can never devour the rest of the flies. However it is not possible for her to devour all 21 flies as shown. If she changes two of the flies (e.g. change the 6 with the 2, or the 7 with the 11, or any other pair) she will be able to devour them all. How does she manage this?



### **!BONUS!**

Which question is the odd one out and why?

### **LIVERPOOL UNIVERSITY MATHS CLUB**

This highly successful club has been running for many years. It is ideal for students of Year10 or above who are keen to take on substantial maths challenges.

Sessions are held once a month on Saturday mornings during term time at Liverpool University.

More details are available from:

David Lewis [d.m.lewis@liv.ac.uk](mailto:d.m.lewis@liv.ac.uk)

[www.maths.liv.ac.uk/~mathsclub/](http://www.maths.liv.ac.uk/~mathsclub/)

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Drawings by P. H. Ackerley