

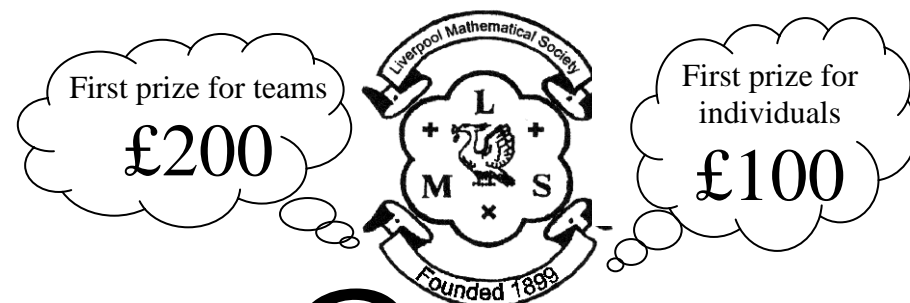
6. MONGO'S KINGS

After the defeat of Ming, the calendar of Mongo was restarted, with the first year of King Barin's reign becoming the new Year 1. Barin ruled for 33 years and was succeeded by his son. Another Barin was also succeeded by his own son, but himself followed his own brother, and ruled for 23 years. One king Zann succeeded his own brother and reigned for 8 years, and the other followed his own father and reigned for 3 years, but they were both succeeded by their own brothers. King Tyber succeeded his own father, and was followed by a Zann after a reign of 14 years. Even with this repetition of names, no two brothers bore the same name, of course. One king Urai ruled for 11 years after his brother, and was succeeded by another Urai. An Urai also succeeded the Urai who reigned for 17 years after his own father. The Urai who followed his own brother's son enjoyed a reign of 23 years, and was succeeded by his own brother. The current king is also an Urai, and he succeeded his own father.

What are the dates of these nine kings?

The competition is promoted by
Liverpool Mathematical Society,
The Department of Mathematical Sciences,
University of Liverpool,
Liverpool,
L69 7ZL.

The Liverpool Mathematical Society incorporates the
Liverpool Branch of the Mathematical Association.
The MA is a Registered Charity (No. 313281).



Open Challenge '11 For Teams or Individuals

Illustrations by Peter H Ackerley

Rules

- 1) It should be attempted at home during February half term.
- 2) Your entry must be your own work, though of course you may ask for help on how to start or for the meanings of unfamiliar words.
- 3) Entries without any working out at all or written on this sheet will not be marked.
- 4) For individual entries you should attempt any four questions. For team entries (two or more students) you should attempt all six questions.
- 5) It is possible to win a prize even if you have not completed all of the questions, so hand in your entry even if it is not quite finished.
- 6) You must write your **name(s), date(s) of birth and school in neat writing on every page.**
- 7) Pupils under 15 years of age should only attempt this in exceptional circumstances.

Either you or your maths teacher needs to return your entry by 11th March to this address:

Open Challenge '11 Entries, Mr & Mrs Carter, Danes Court, Mudhouse Lane,
Burton, Neston, CH64 5TS.

All of the prizes will be awarded at an evening of mathematical recreation at the University of Liverpool on 4th May. We hope that you enjoy the questions.

Prizes for runners-up!

1. MONGO MONEY

Dr. Zarkov gave Flash four Mongo coins totalling 28 mingols, and Dale five coins totalling 21 mingols. The same three denominations of coin were included, each obviously a whole number of mingols. What were these three coins worth?



2. HAWKBALL

The Hawkmen of Mongo love to play a game called Hawkball. In this game two teams of players fly up and aim the ball at a target of 3 concentric rings. The team that scores the most points within one hour is the winner. There are 3 ways to score points. The centre gold scores 7 points; the middle red scores 4 points, while an outer blue scores 2 points. The first match report sent back to Mingo City was not very clear because of static, so not all the details are certain. However, it was clear that Vultan's Team won. They scored "something-seven" points altogether (only the last number could be clearly heard). It was also learned that they had exactly 16 successful scoring shots.



(a) What are the possible numbers of golds which Vultan's Team could have scored?

(b) A later report added the information that Vultan's Team scored the same number of golds and reds. How many points did Vultan's Team score altogether?

Explain why your answer is the only possible solution.

3. MINGO CITY

Between 2312 and 2362 the population of Mingo City increased by 30 000. Dividing up the population into adults and children, and males and females, the following information can be given about the number of men, women, boys and girls.

In 2312 the census showed that 60% of the people were males. There were half as many boys as females and for every four boys there were three girls.

In the 2362 census, 25% of the total were children. The number of adults was five times the number of boys, and there were as many women as males. The number of children now equalled the number of females in 2312. How many women were there in 2312, and how many in 2362?



4. THE ARBORIA CUP

The Tree-Men of Arboria compete in teams for the Arboria Cup. Each team has two members who compete together by running and rocket-cycling over the course, which is 42 km long. Here are some of the rules for the race:

- Each team starts together at the start line.
- Each team of two is allowed only one rocket-cycle. Only one team member may ride the rocket-cycle at any time. (This usually means that one member cycles at the start, sets the rocket-cycle down at some point on the course, and then runs to the finish line. The other team member starts by running. When he or she reaches the rocket-cycle, they mount it and cycle to the finish line.)
- Both team members have to cross the finish line.
- The time recorded for a team is the time for the second member to cross the finish line, or the time for both members if they cross the line together.



The table shows the steady running and cycling speeds, all in km/h, for three teams. Assume that these are the speeds for the team members in the actual 42 km race.

Which team won the Arboria Cup?

Team	Members	Running	Cycling
A	Tahl Julah	12 12	28 28
B	Ronkol Rena	16 10	35 15
C	Undina Hanak	10 14	35 25

5. MING'S CAPTURE

Flash, chasing Ming, starts on the planet marked with F, while Ming starts on the planet marked with M.

Flash makes the first move along one of the hyperspace links between the planets, and then Ming makes a move, and so on in turns until Flash reaches the same planet as Ming and captures him. Although each must always move along a hyperspace link to the next planet only, and Ming may do his utmost to avoid capture, Flash must infallibly win. But how?

