5. RUNAWAY RESULTS

In a competition for ten hockey teams, the league table after four matches was as shown. The fixture secretary had lost the actual results of these matches.

FIXTURE LIST			
AvE	CvH	AvG	CvA
BvJ	DvI	BvH	FvD
GvC	EvB	DvC	GvJ
HvD	FvG	EvI	HvE
IvF	JvA	JvF	IvB

	HOME						AWAY					
	P	W	D	L	F	A	W	D	L	F	A	Points
A	4	2	0	0	4	1	1	1	0	4	2	7
B	4	1	1	0	4	1	1	1	0	4	2	6
C	4	1	1	0	3	2	1	1	0	3	1	6
D	4	1	0	1	4	2	1	1	0	2	0	5
E	4	1	1	0	3	1	1	0	1	1	1	5
F	4	1	0	1	6	4	1	0	1	4	4	4
G	4	1	1	0	3	2	0	0	2	3	9	3
H	4	0	1	1	0	1	0	1	1	2	3	2
I	4	1	0	1	3	4	0	0	2	0	6	2
J	4	0	0	2	3	6	0	0	2	1	5	0

Work out a possible set of results using the fixture list.
Can you find more than one possible set of results from the fixtures satisfying the given league table?

6. SOCIAL SQUASH

Twelve friends meet once a week, and during the evening each friend plays at most one game of squash. The squash court is hired at £5 per game. How much will the total cost of hire be for each friend to play every other friend twice? How many weeks are needed for all these matches to take place? Can you find the cost of hire and the time needed for larger groups of friends playing under the same conditions?

The competition is promoted by Liverpool Mathematical Society (LMS)
www.maths.liv.ac.uk/lms.html
The Liverpool Mathematical Society incorporates the Liverpool Branch of the Mathematical Association.
The MA is a Registered Charity (No. 313281).

(INCORPORATING THE LIVERPOOL BRANCH OF THE MA AND THE ATM)

Open Challenge '17

For Year 13 or below

Rules

1) It should be attempted at home during February half term.
2) Your entry must be your own work.
3) For individual entries only. You should attempt all six questions.
4) Entries without any working out at all or written on this sheet will not be marked.
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 print your name, date of birth and school in neat, legible writing on the front sheet.**
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 10 March to this address:

Open Challenge '17 Entries,
Mrs A. Carter,
Danes Court,
Mudhouse Lane,
Burton,
Neston.
CH64 5TS.

All of the prizes and certificates will be awarded at an evening of mathematical recreation at the University of Liverpool on 3 May. Solutions will be posted on www.maths.liv.ac.uk/lms.html shortly afterwards. We hope that you enjoy the questions.

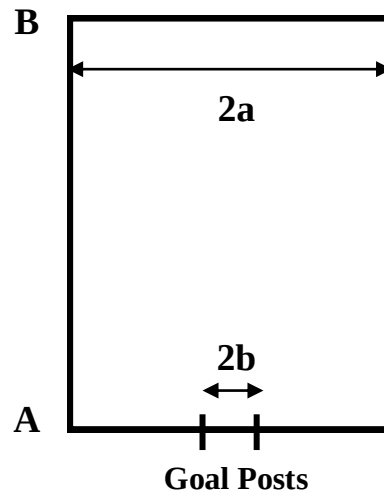
1. TERRY'S TARGET

When Terry started playing darts, his skill was such that on a standard board he had a 40% chance of hitting the number at which he aimed. When he was unsuccessful he hit either of the two numbers adjacent to his target with equal chances of 30%. He never scored doubles or trebles. Where did he aim to achieve the highest score for a typical three dart throw?

After some practice he is now able to hit a double with one throw in five and a treble with one throw in ten. Should Terry revise his strategy?

2. KEVIN'S KICK

In a particular rugby match, the final try was scored adjacent to the corner flag – located at A on the sketch. To win the match, Kevin has to convert this try in the dying seconds of the game. He has to kick the ball from anywhere on the line AB, between the goal posts and over the bar. He has never had any problem over length or height, but direction is a problem. From where on the line AB should he best take the kick in order to maximise his chance of making the conversion?



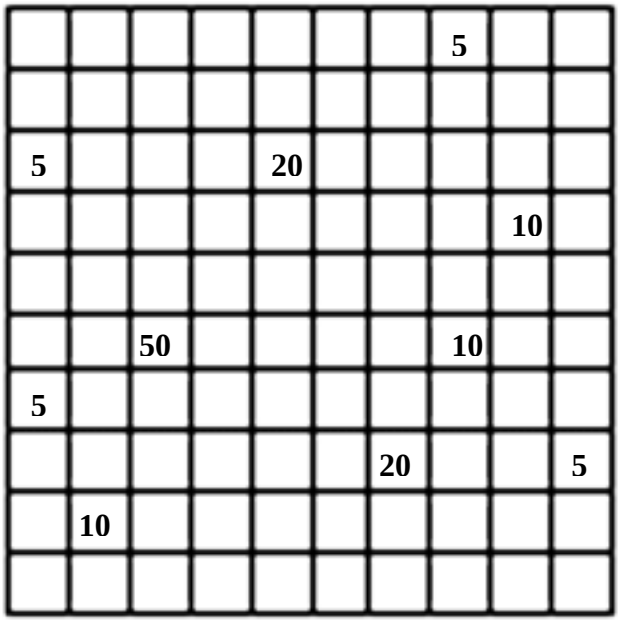
3. 2 DIE 4

You and a friend are playing '24' with dice. There are six 4-faced dice; four 6-faced dice; three 8-faced dice; and two 12-faced dice. You take all the dice of a given type and your friend then takes all of one of the remaining types. Each player rolls all their dice, and the higher sum wins. Ties are re-rolled.

Which set of dice would you choose?

A new rule is added that says any roll achieving a total above *n* is scored as zero. For what values of *n* would your choice be different?

4. FAIR GAME?



The squares show a 10x10 design for a 'roll a coin' board at a local fair. The design is repeated throughout the board. The squares are each of side 5 cm and the only coins used are 2p of diameter 2.5 cm. (Ignore the thickness of the lines.) Show that the probability that a coin of this diameter will soon come to rest not touching the side of a square is 0.25.

Coins are rolled on to the board and a prize is won if the coin comes to rest not touching a line. The prize is either the amount, in pence, written on the square or, if the square is blank, the coin is returned. Coins which come to rest on a line are losers.

Would this game make a profit or a loss and what fraction of the takings could be expected to be given out as prizes?

Make a 10x10 design for a 'roll a coin' board so that all the takings can be expected to be given back as prizes, using at least one of each of 50p, 20p, 10p and 5p squares.