

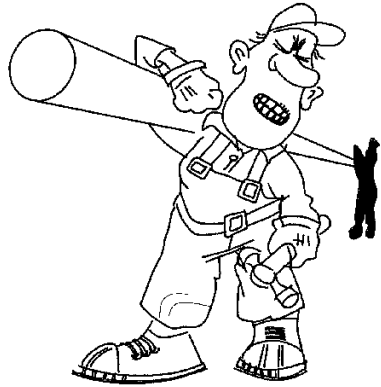


## 6. Matchmaking

An Olympic handball tournament was organised as follows: each day for 12 days, 5 teams were playing against each other. Any pair having met once could never meet again. The teams were chosen so that, on each day, all ten matches were allowed. Is it possible to do this with 20 teams taking part in the competition?

## 7. Pole Bearers

Two men are delivering flagpoles to the Olympic stadium. To enter the stadium, they have to carry each pole along a 3-metre wide corridor with a ceiling 2.5m high throughout. The corridor starts off straight, but then bends through 90 degrees, with the inside wall following an arc of a circle of radius 4m. The Bronze flag pole is 11.5m long, the Silver is 11.75m and the Gold is 12m long. Work out which poles can be carried through the corridor without bending the flag pole!



**The competition in Hampshire is organised by  
Mathematics and Mathematical Education Outreach Team  
University of Southampton**

With kind acknowledgement to MEM (Mathematical Education on Merseyside) for providing these questions and the concept of the Challenge Competition.

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

For more competitions and information on maths related careers look at:

[www.mathscareers.org.uk](http://www.mathscareers.org.uk)

# Hampshire Senior Maths Challenge '12

Administered by the University of Southampton

Illustrations by Peter H Ackerley

## Year 10 or Below

### Rules

1. The Challenge should be attempted at home during the February half term
2. Your entry must be your own work, though you may ask for help on how to start or for the meanings of unfamiliar words
3. Entries must be on a separate sheet and show all working out - **Entries that do not show working out and/or written on this sheet will NOT be marked**
4. 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!
5. Please write **your name and school in neat writing on every page**

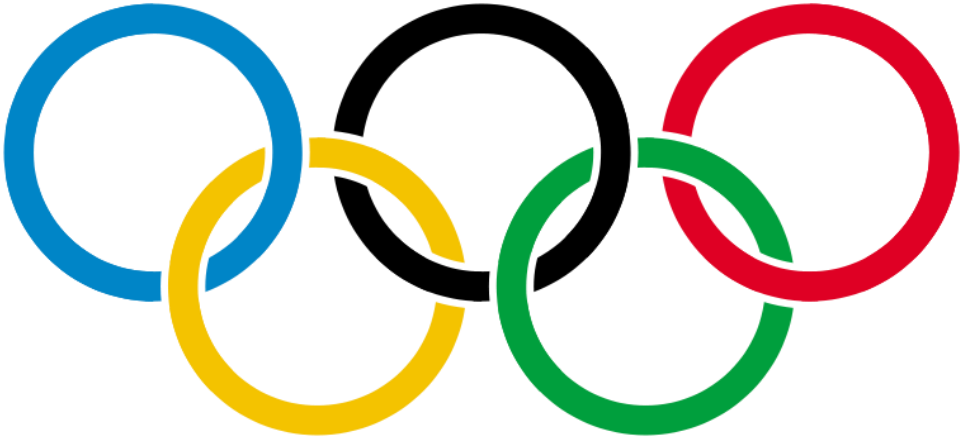
Either you or your maths teacher needs to return your entry by Friday 9 March 2012

Address for entries: **Hampshire Senior Maths Challenge '12 - Entries  
Professor T J Sluckin  
School of Mathematics  
University of Southampton  
Highfield  
SOUTHAMPTON  
SO17 1BJ**

All prizes will be awarded at an evening of mathematical recreation at the University of Southampton on Wednesday 16 May 2012. Solutions will be posted shortly afterwards on <http://www.soton.ac.uk/math/outreach/index.page> . We hope that you enjoy the challenge.

## 1. Ring Totals

Place the numbers 1 to 9 into the Olympic Rings, one in each white space, so that there is the same total inside each ring. Calculate each of the possible totals that satisfy this requirement.



## 2. Metal Medals

Gold costs twice as much as Silver, which costs  $1\frac{1}{2}$  times as much as Bronze. Gold weighs  $1\frac{1}{4}$  times as much as Silver, which weighs  $1\frac{3}{4}$  as much as Bronze.

For the boxing medals, twice as many Bronze medals are required as Gold and Silver medals.

There are 10 boxing events. A Silver medal weighs 40g and costs £120. How much will all of the boxing medals weigh and cost?

## 3. Common or Uncommon

Four sportswomen meet. Any two of them have something in common: first name, country of origin or the sport they compete in. However, there is nothing that any group of three of them have in common. How is this possible?





#### 4. Making Tracks

An 8-lane circular race track has a circumference of 400m in the centre of lane 1. Given that each lane is 122cm wide, how much further back does the runner in lane 1 start than the runner in each of the other lanes?

#### 5. Medals Table Mayhem

In a particular Olympic games, the top 4 countries in the medal table were China, USA, Russia and Great Britain (GBR), in that order. (The order is determined by the number of Gold medals won.) Each country won more than 10 medals of each type.

China won two more Gold than Silver and Bronze combined in their total of 100 medals.

USA's number of Gold medals matched their number of Bronze (a square number) and they won 10 more medals than China in total.

Russia and China won the same number of Silver medals and the same number of Bronze medals, the latter being the same number of medals as GBR's total for Silver and Bronze combined.

Russia averaged 24 medals of each type.

GBR's numbers of Gold and Silver were prime, and their total number of medals was 4 fewer than the number of Gold medals won by China.

The USA earned twice as many Silver medals as GBR earned Gold medals.

The number of Bronze medals for each country is a triangle number.

Re-construct the medals table.