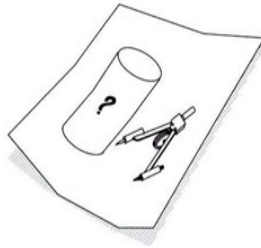


5. CANDY-COATED PENCILS

A special one off pack of Candy-Coated Pencils consisted of a large cylinder, radius A , which contained three identical smaller cylinders, radius a , which just fitted into the larger cylinder.

What is the radius of the smaller cylinders compared to the larger one?

The central section trapped between the three smaller cylinders is to be made of solid chocolate. If all the cylinders are of height h what is the volume of the solid chocolate?

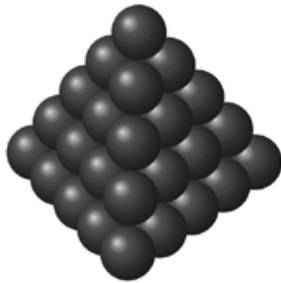


6. THE GREAT GOB-STOPPER CHALLENGE

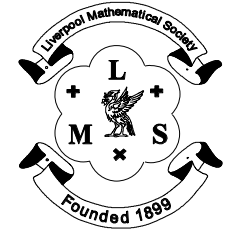
In the front window of a new sweet shop that had just opened there was a giant square pyramid of gobstoppers. To celebrate their opening, the owners challenged their customers to guess how many gobstoppers there were in the pyramid, offering a prize for those who got the correct number.

To help those taking part in the challenge, they mentioned that the total number of gobstoppers was also a square number.

Could you win this challenge?



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

Open Challenge '25 For Year 13 or below

Rules

It should be attempted at home during February half term.

Your entry must be your own work.

For individual entries only. You should attempt all questions.

Entries without any working out at all or written on this sheet will not be marked.

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.

You must print your name, date of birth and school in neat, legible writing on the front sheet.

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 7 March** to this address:

Open Challenge '25 Entries

Mrs A. Carter

Danes Court

Mudhouse Lane

Burton

Neston

CH64 5TS

The competition is promoted by Liverpool Mathematical Society (LivMS) www.livmathssoc.org.uk

The competition is sponsored by the Worshipful Company of Actuaries Charitable Trust

The MA is a Registered Charity (No. 313281). Drawings by P. H. Ackerley.

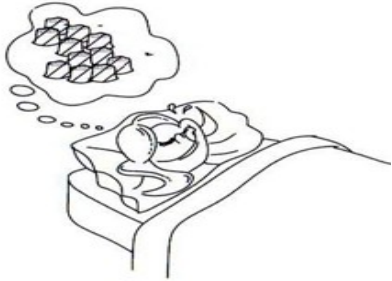
An evening of online activities will be held in early May during which there will be a virtual prizegiving.

Prizes and certificates **will be posted** to schools and colleges.

Solutions will be posted on www.livmathssoc.org.uk shortly afterwards.

We hope that you enjoy the questions.

1. FIND THE FUDGE



At a special family party the parents hide a large number of fudge bars for their three children to find. They are ably assisted by their pet squirrel, Red, who helps in the search. At the end of the day they have collected a huge pile which they agree to share equally in the morning.

During the night the eldest child awakes and decides to take his share first. He divides the pile into three but there is one left over which he gives to Red. He hides his share and goes back to bed. The second child then wakes up and decides that she will take her share of the bars. She divides the remaining bars into three, and she also has one fudge bar left over which she gives to Red. She hides her share and goes back to bed. Later the youngest child wakes up and decides to take his share. He divides the remaining bars into three and again one is left over which he gives to Red. He hides his share and goes back to bed. In the morning, the three children share out the remaining fudge bars, and find one left over, which they give to Red. What is the minimum number of fudge bars they could have collected for this to be possible and how many would each child have?

2. JENNY'S JELLY BEAN FEAST



Jenny recently took part in a sponsored Jelly Bean Eat. Her mother agreed to give her 10p per jelly bean for all the beans which she could eat, one at a time, in ten minutes.

She shared this money equally between two charities and the number of pence received by each was a perfect square. If the money had been shared equally between three charities then the number of pence received by each would have been a perfect cube. How many jelly beans did Jenny eat?

3. MELTING MOMENTS



One day, during hot weather, Gran thought her family would like a treat and decided to share the special chocolate bar she had been saving. This bar was twice as wide as it was high and twice as long as it was wide. As Gran fetched the bar from the cupboard the clock struck an hour, and she remarked that it had done this when she put it in the cupboard. However, whilst the slab had been in the cupboard, it had melted in the hot weather into a new shape. It was still cuboid and the new length was similarly twice the new width, but its height was not good. Grandad remarked that a slab had been left in the cupboard in similar weather for five whole days, and the height had dwindled away to nothing. The volume had remained the same throughout, though, he said cheerily.

The family decided to divide the whole slab into an exact number of chunks, by making a number of equally spaced slices along the length and width. Each chunk would be the height of the melted slab, and have a square cross-section with its side being four times the height. How many chunks were there, and how long had the slab been in the cupboard?

4. TAKE YOUR PICK

A box of chocolates contains milk, white and plain varieties. The number of plain chocolates is at least half the number of white chocolates and at most one third the number of milk chocolates.



Given that the total number of plain and white chocolates exceeds 55, find the minimum number of milk chocolates in the box.