

# MATHEMATICAL

*funfair*



*Brian Bolt*

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# **THE MATHEMATICAL FUNFAIR**

**Brian Bolt**

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# Introduction

Mathematical puzzles and games appeal to a wide range of people from all walks of life. Puzzles appear in all sorts of places: on matchboxes, in Xmas crackers, on breakfast cereal packets, on beer mats, in newspapers, in magazines, and last but not least, in puzzle books. This book has been written following the success of my earlier book, *The Amazing Mathematical Amusement Arcade*. It has well over a hundred different puzzles with which to capture your imagination. They range widely from matchstick and coin puzzles, to railway shunting problems, number puzzles, chess-board puzzles, topological impossibilities, tricks, games, and yet more on magic squares. Some puzzles are variations on well tried but worth repeating themes, but there are enough original ones here to challenge the most ardent puzzler.

The second part of the book is given over to a detailed commentary so that you can check your solution, or find help when baffled. But don't give up too quickly for the real satisfaction comes in solving a puzzle for yourself.

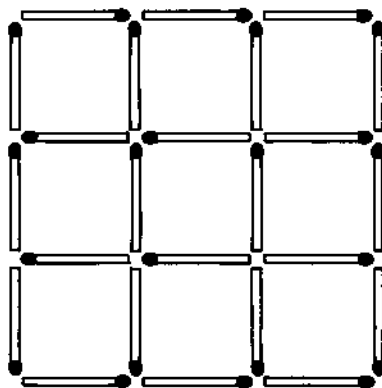
Brian Bolt



## 1 Matchstick magic

Remove only four matches from the  $3 \times 3$  array to leave exactly five identical squares.

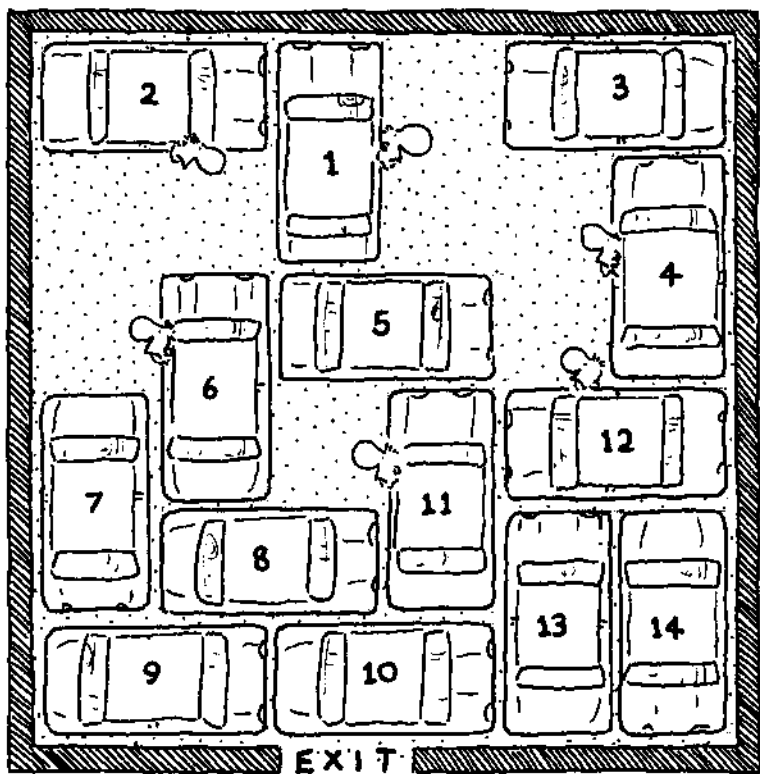
What is the smallest number of matches you can remove to leave just two squares?



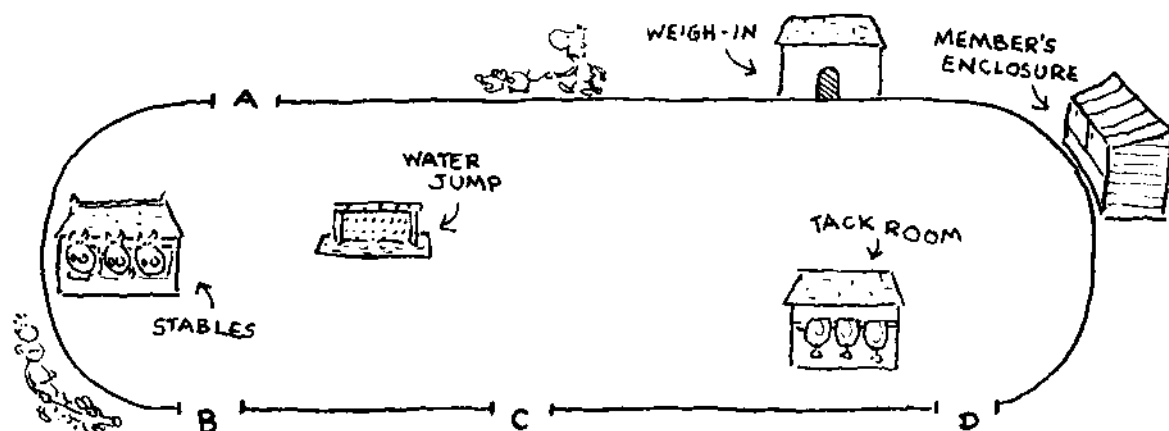
## 2 The car jam

In a small underground private car park in the centre of London the cars were packed in like sardines. So tightly were the cars parked that the only way a car could be moved was to push it forwards or backwards along its length. The car marked 1 in the diagram belonged to the managing director of the firm owning the car park. He was in a hurry to get out! Help the car park attendant by finding the minimum number of car moves required for car 1 to be released from the jam it is in.

A set of dominoes makes a very handy visual aid when trying to solve this puzzle.



### 3 Who nobbled the racehorse?



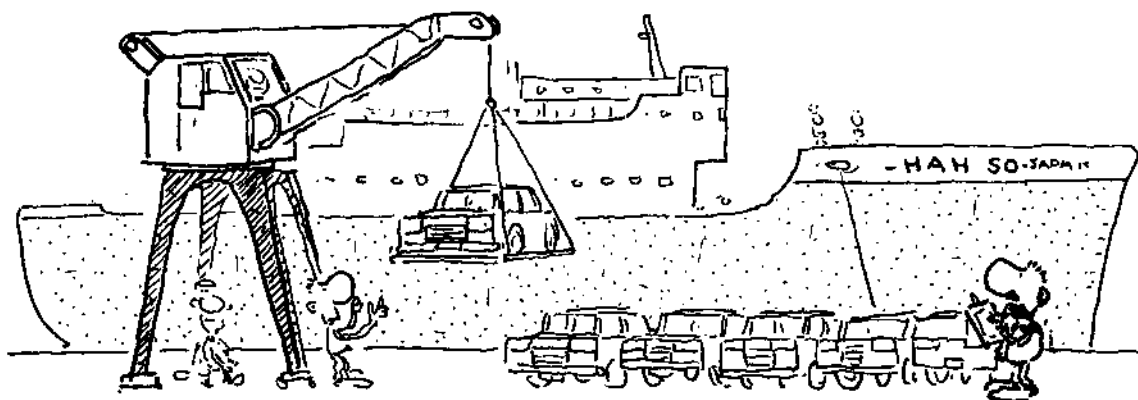
The favourite for the Winter Race Meeting at Aincot was stabled inside the racecourse on the night before the big race. Security inside the racecourse on that night was very tight with no one allowed inside the boundary fence from 11 p.m. until 7 a.m. the next morning. The guards and their dogs had had a cold night patrolling the grounds and at 7 a.m. when the four main gates were unlocked by the groundsmen and they were about to go home it began to snow. The snow delayed the arrival of the stable lad who entered at *B* and, before going to the stables to feed and exercise the favourite, had a few words in the tack room with the groom, who was there cleaning the saddle. He stayed with the horse right up to the start of the race, so imagine his distress when the horse ran very badly, finished last, and was shown to have been doped. He had his suspicions that one of the team of people surrounding the horse was guilty, so he set out to gather evidence about their movements between 7 a.m. and 7.15 a.m. when he had reached the stable. In this period of time he found that the owner of the horse had entered at *C* and strolled across to the member's enclosure. On the way the owner passed the trainer, who had entered at *D*, inspecting the water jump. The owner also saw the jockey on his way from *B* to the weigh-in, while the jockey passed the time of day with the groom, who had entered at *A*, when he was on his way to the tack room. They had all discussed the snow and remarked on their trails of footmarks which strangely didn't cross anywhere.

Who nobbled the horse?

## 4 The car importer

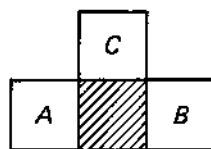
A new assignment of Japanese cars had just been off-loaded from the freighter onto the dockside. The car importer checked that they were all of the same model as ordered, and went to complete the necessary paper work with the customs officials. While there, he was intrigued to notice that the total retail value of all the new cars was £1 111 111.

What was the retail price of the car (a whole number of pounds) and how many were there?

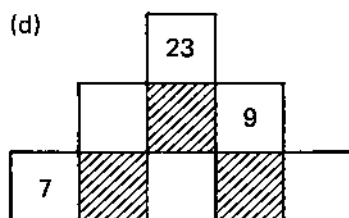
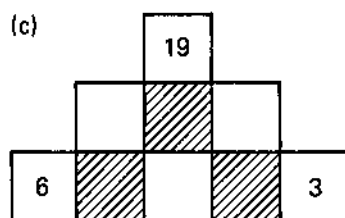
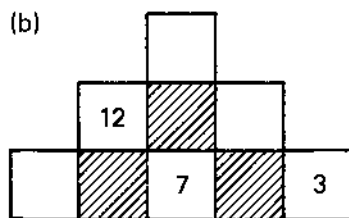
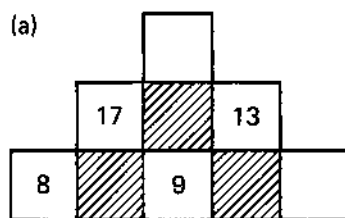


## 5 Number pyramids

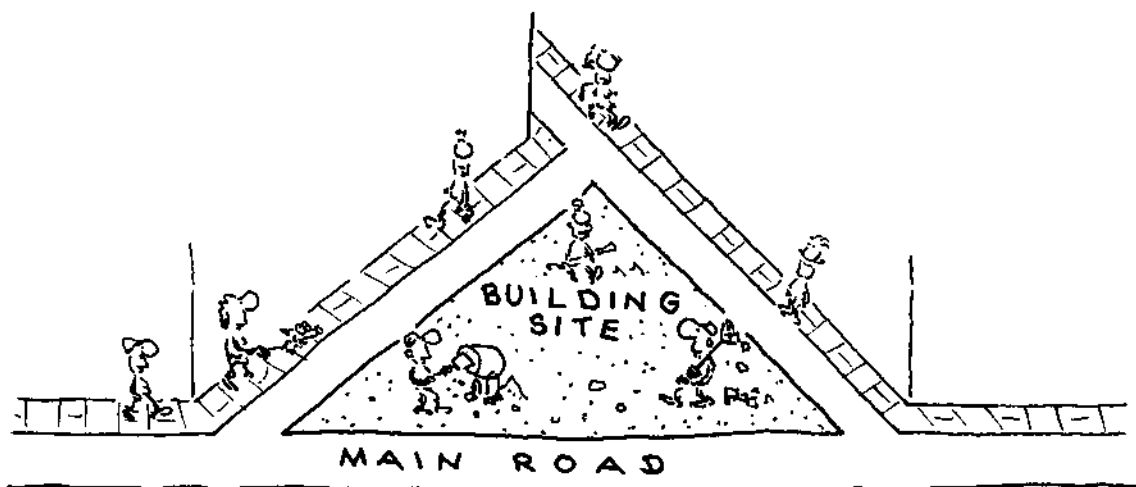
In the number pyramids which follow the numbers in each new level of the pyramid are derived from the level below by the simple addition rule shown on the right. Find the missing numbers in each case.



$$C = A + B$$



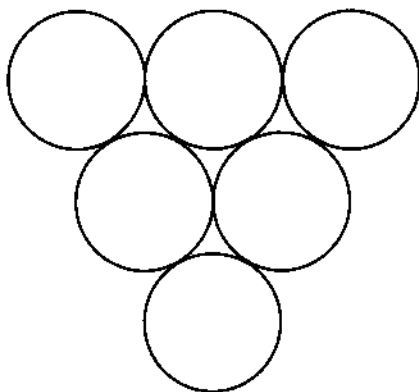
## 6 The triangular building site



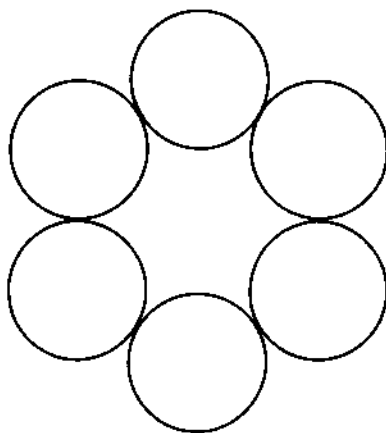
A builder acquired planning permission to erect three detached houses on a triangular building plot bounded by three roads. To make the best of the site the builder proposed to divide it into three triangular sites each having the same area.

How can this be done?

## 7 Ring the triangle



(a)



(b)

Make a triangle of six pennies as shown in (a). What is the smallest number of pennies you can move by sliding to form the ring of pennies as in (b), if every time a penny is moved it must be put into contact with two other pennies? Note you are not allowed to push one coin with another.

## 8 The jeweller's chain

A jeweller had an urgent order to make a chain with 25 links for a local mayor. At the time she had an assistant and five apprentices so they each set to with a will to make a part of the chain. The links were large so the jeweller was well pleased when by 5 o'clock they had made the 25 links. She then realised how inefficient they had been, for between them they had seven pieces of chain; two with 2 links, two with 3 links and one each of 4 links, 5 links and 6 links. To join the pieces into one chain of 25 links she would need to cut and rejoin some of the links. She reckoned that to cut and join a single link would take her 20 minutes so she decided to stay on and finish the job by herself.

What was the earliest time the jeweller could have gone home with the 25-link chain complete?

