Story of Maths - Part 2.1: Chinese mathematics 00 - 19:45

2. The genius of the East

A. Chinese mathematics

Nearly 2,000 years in the making, the Great Wall of China was begun in 220BC to protect China's growing empire. As soon as they started building it, the ancient Chinese realised they had to make calculations about distances, angles of elevation and amounts of material. So it isn't surprising that this inspired some very clever mathematics to help build Imperial China.

At the heart of ancient Chinese mathematics was an incredibly simple number system. When a mathematician wanted to do a sum, he would use small bamboo rods.

These rods were arranged to represent the numbers one to nine. They were then placed in columns, each column representing units, tens, hundreds, thousands and so on.

So the number 924 was represented by putting the symbol 4 in the units column, the symbol 2 in the tens column and the symbol 9 in the hundreds column. This is what we call a decimal place-value system, and it's very similar to the one we use today. Not only were the ancient Chinese the first to use such a system, but they did so over 1,000 years before we adopted it in the West. But they only used it when calculating with the rods. When writing the numbers down, the ancient Chinese couldn't use the place-value system because they didn't have a concept of zero. They didn't have a symbol for zero. It just didn't exist as a number. Using the counting rods, they would use a blank space where today we would write a zero. So when they wanted to write down a number, they used a far more laborious method, in which special symbols stood for tens, hundreds, thousands and so on.

According to legend, the first sovereign of China, the Yellow Emperor, had one of his deities create mathematics in 2800BC, believing that number held cosmic significance. And to this day, the Chinese still believe in the mystical power of numbers. And the ancient Chinese were drawn to patterns in numbers, developing their own rather early version of Sudoku. It was called the magic square. all the numbers in each line - horizontal, vertical and diagonal - all add up to the same number. But mathematics also played a vital role in the running of the emperor's court. The calendar and the movement of the planets were of the utmost importance to the emperor, influencing all his decisions, so astronomers became prized members of the imperial court, and astronomers were always mathematicians.

Ancient China was a vast and growing empire with a strict legal code, widespread taxation and a standardised system of weights, measures and money. The empire needed a highly trained civil service, competent in mathematics. And to educate these civil servants was a mathematical textbook, probably written in around 200BC - the Nine Chapters. The book is a compilation of 246 problems in practical areas such as trade, payment of wages and taxes. And at the heart of these problems lies one of the central themes of mathematics, how to solve equations.

What's extraordinary is that this particular system of solving equations didn't appear in the West until the beginning of the 19th century. In 1809, while analysing a rock called Pallas in the asteroid belt, Carl Friedrich Gauss, who would become known as the prince of mathematics, rediscovered this method which had been formulated in ancient China centuries earlier. But the Chinese were to go on to solve even more complicated equations involving far larger numbers. In what's become known as the Chinese remainder theorem, the Chinese came up with a new kind of problem. By the 6th century AD, the Chinese remainder theorem was being used in ancient Chinese astronomy to measure planetary movement. But today it still has practical uses. Internet cryptography encodes numbers using mathematics that has its origins in the Chinese remainder theorem.

By the 13th century, The golden age of Chinese maths had arrived. And its most important mathematician was called Qin Jiushao. Legend has it that Qin Jiushao was something of a scoundrel. He was a fantastically corrupt imperial administrator who crisscrossed China, lurching from one post to another. Repeatedly sacked for embezzling government money, he poisoned anyone who got in his way. Qin Jiushao was reputedly described as "as violent as a tiger or a wolf and as poisonous as a scorpion or a viper". So, not surprisingly, he made a fierce warrior. but for much of that time he was complaining that his military life took him away from his true passion: not corruption, but mathematics.

Qin started trying to solve cubic equations ; these involve numbers which are cubed, and they were perfect for capturing three-dimensional shapes. What's striking is that Qin's method for solving equations wasn't discovered in the West until the 17th century, when Isaac Newton came up with a very similar approximation method. Qin even used his techniques to solve an equation involving numbers up to the power of ten. This was highly complex mathematics , but his technique only gave him an approximate solution.