Story of Maths - Part 2.4: Italian medieval mathematics 47:00 - 57:16

D. Italian medieval mathematics

Hindu-Arabic numbers - Leonardo of Pisa (Fibonacci)

Leonardo of Pisa, better known as Fibonacci, was the son of a customs official, and he would become Europe's first great medieval mathematician. He had travelled around North Africa with his father, and had learned about Arabic mathematics, and especially Hindu-Arabic numerals. In his Book Of Calculating, Fibonacci promoted the new number system, demonstrating how simple it was compared to the Roman numerals that were in use across Europe. But there was widespread suspicion of these new numbers: some believed the new numbers would be more open to fraud, others believed that they'd be so easy to use for calculations that it would empower the masses, taking authority away from the intelligentsia who knew how to use the old sort of numbers. The city of Florence even banned them in 1299; but over time, common sense prevailed, the new system spread throughout Europe, and the old Roman system slowly became defunct.

Today Fibonacci is best known for the discovery of some numbers, now called the Fibonacci sequence, that arose when he was trying to solve a riddle about the mating habits of rabbits. Suppose a farmer has a pair of rabbits. Rabbits take two months to reach maturity, and after that they give birth to another pair of rabbits each month. So the problem was how to determine how many pairs of rabbits there will be in any given month. 1...1...2...3...5...8...13...21...34...55...and so on. The Fibonacci numbers are nature's favourite numbers: one can find them in the number of petals in a flower, the number of segments in a pinapple, the shape of a snail's shell... Wherever you find growth in nature, you find the Fibonacci numbers.

Cubic equations - Tartaglia and Cardano

But the next major breakthrough in European mathematics wouldn't happen until the early 16th century. It would involve finding the general method that would solve all cubic equations, and it would happen in the Italian city of Bologna.

The University of Bologna was the crucible of European mathematical thought at the beginning of the 16th century. Pupils from all over Europe flocked here and developed a new form of spectator sport - the mathematical competition. Large audiences would gather to watch mathematicians challenge each other with numbers, a kind of intellectual fencing match. But even then, it was generally assumed that finding a general method to solve all cubic equations was impossible. But one scholar was to prove everyone wrong.

His name was Tartaglia. At the age of 12, he'd been slashed across the face with a sabre by a rampaging French army. The result was a terrible facial scar and a devastating speech impediment. In fact, Tartaglia was the nickname he'd been given as a child and means "the stammerer". Shunned by his schoolmates, Tartaglia lost himself in mathematics, and it wasn't long before he'd found the formula to solve one type of cubic equation. But Tartaglia soon discovered that he wasn't the only one to believe he'd cracked the cubic. A young Italian called Fior was boasting that he too held the secret formula for solving cubic equations. When news broke about the discoveries made by the two mathematicians, a competition was arranged to pit them against each other. The intellectual fencing match of the century was about to begin.

The trouble was that Tartaglia only knew how to solve one sort of cubic equation, and Fior was ready to challenge him with questions about a different sort. But just a few days before the contest, Tartaglia worked out how to solve this different sort, and with this new weapon in his arsenal he thrashed his opponent, solving all the questions in under two hours. Tartaglia went on to find the formula to solve all types of cubic equations. News soon spread, and a mathematician in Milan called Cardano became so desperate to find the solution that he persuaded a reluctant Tartaglia to reveal the secret, but on one condition - that Cardano keep the secret and never publish. But Cardano couldn't resist discussing Tartaglia's solution with his brilliant student, Ferrari. As Ferrari got to grips with Tartaglia's work, he realised that he could use it to solve the more complicated quartic equation, an amazing achievement. Cardano couldn't deny his student his just rewards, and he broke his vow of secrecy, publishing Tartaglia's work together with Ferrari's brilliant solution of the quartic. Poor Tartaglia never recovered and died penniless, and to this day, the formula that solves the cubic equation is known as Cardano's formula.