# Niccolò Tartaglia

## Quick Info

**Born**
1500
Brescia, Republic of Venice (now Italy)

**Died**
13 December 1557
Venice, Republic of Venice (now Italy)

**Summary**
**Tartaglia** was an Italian mathematician who was famed for his algebraic solution of cubic equations which was eventually published in Cardan's *Ars Magna*.

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## Biography

**Niccolò Fontana**, known as **Tartaglia,** was born in Brescia in 1499 or 1500, the son of an honest mail rider Michele Fontana who was known as 'Micheletto the Rider'. Micheletto would ride his horse between Brescia and other towns in the district making deliveries. Although he was poor, Micheletto did his best for his wife, daughter and two sons, and Niccolò attended school from the age of about four years. Life might have been very different for Niccolò had tragedy not come when he was six years old, for at that time his father was murdered while out making deliveries. From being a child in a poor family, he was suddenly plunged into total poverty.

Niccolò was nearly killed as a teenager when, in 1512, the French captured his home town and put it to the sword. The French army was commanded by Gaston de Foix and they had suffered humiliation at the hands of some determined Brescia militia. They decided to teach the local inhabitants a lesson and retook Brescia during seven days of fighting in which time 46,000 residents of the city were killed in an act of revenge. Amidst the general slaughter, the twelve year old Niccolò took refuge in the cathedral with his mother and younger sister, but was dealt horrific facial sabre wounds by a French soldier that cut his jaw and palate. He was left for dead and even when his mother discovered that he was still alive she could not afford to pay for any medical help. However, his mother's tender care ensured that the youngster did survive, but in later life Niccolò always wore a beard to camouflage his disfiguring scars and he could only speak with difficulty, hence his nickname Tartaglia, or stammerer.

Tartaglia was self taught in mathematics but, having an extraordinary ability, his mother was able to find him a patron. Ludovico Balbisonio took him to Padua to study there, but when he returned with his patron to Brescia he made himself unpopular by having an inflated opinion of himself. He left Brescia to earn his living teaching mathematics at Verona which he did between 1516 and 1518. Later, still in Verona, he taught at a school in the Palazzo Mizzanti but it is recorded that at that time he was married with a family, yet was very poor. He moved to Venice in 1534. As a lowly mathematics teacher in Venice, Tartaglia gradually acquired a reputation as a promising mathematician by participating successfully in a large number of debates.

The first person known to have solved cubic equations algebraically was del Ferro but he told nobody of his achievement. On his deathbed, however, del Ferro passed on the secret to his (rather poor) student Fior. For mathematicians of this time there was more than one type of cubic equation and Fior had only been shown by del Ferro how to solve one type, namely 'unknowns and cubes equal to numbers' or (in modern notation) $x^3 + ax = b$. As negative numbers were not used this led to a number of other cases, even for equations without a square term. Fior began to boast that he was able to solve cubics and a challenge between him and Tartaglia was arranged in 1535. In fact Tartaglia had also discovered how to solve one type of cubic equation since his friend Zuanne da Coi had set two problems which had led Tartaglia to a general solution of a different type from that which Fior could solve, namely 'squares and cubes equal to numbers' or (in modern notation) $x^3 + ax^2 = b$. For the contest between Tartaglia and Fior, each man was to submit thirty questions for the other to solve. Fior was supremely confident that his ability to solve cubics would be enough to defeat Tartaglia but Tartaglia submitted a variety of different questions, exposing Fior as an, at best, mediocre mathematician. Fior, on the other hand, offered Tartaglia thirty opportunities to solve the 'unknowns and cubes' problem since he believed that he would be unable to solve this type, as in fact had been the case when the contest was set up. However, in the early hours of 13 February 1535, inspiration came to Tartaglia and he discovered the

method to solve 'squares and cubes equal to numbers'. Tartaglia was then able to solve all thirty of Fior's problems in less than two hours. As Fior had made little headway with Tartaglia's questions, it was obvious to all who was the winner. Tartaglia did not take his prize for winning from Fior, however, the honour of winning was enough.

At this point Cardan enters the story. As public lecturer of mathematics at the Piatti Foundation in Milan, he was aware of the problem of solving cubic equations, but, until the contest, he had taken Pacioli at his word and assumed that, as Pacioli stated in the *Summa* Ⓣ published in 1494, solutions were impossible. Cardan was greatly intrigued when Zuanne da Coi told him about the contest and he immediately set to work trying to discover Tartaglia's method for himself, but was unsuccessful. A few years later, in 1539, he contacted Tartaglia, through an intermediary, requesting that the method could be included in a book he was publishing that year. Tartaglia declined this opportunity, stating his intention to publish his formula in a book of his own that he was going to write at a later date. Cardan, accepting this, then asked to be shown the method, promising to keep it secret. Tartaglia, however, refused.

An incensed Cardan now wrote to Tartaglia directly, expressing his bitterness, challenging him to a debate but, at the same time, hinting that he had been discussing Tartaglia's brilliance with the governor of Milan, Alfonso d'Avalos, the Marchese del Vasto, who was one of Cardan's powerful patrons. On receipt of this letter, Tartaglia radically revised his attitude, realising that acquaintance with the influential Milanese governor could be very rewarding and could provide a way out of the modest teacher's job he then held, and into a lucrative job at the Milanese court. He wrote back to Cardan in friendly terms, angling for an introduction to the Signor Marchese. Cardan was delighted at Tartaglia's new approach, and, inviting him to his house, assured Tartaglia that he would arrange a meeting with d'Avalos.

So, in March 1539, Tartaglia left Venice and travelled to Milan. To Tartaglia's dismay, the governor was temporarily absent from Milan but Cardan attended to his guest's every need and soon the conversation turned to the problem of cubic equations. Tartaglia, after much persuasion, agreed to tell Cardan his method, if Cardan would swear never to reveal it and furthermore, to only ever write it down in code so that on his death, nobody would discover the secret from his papers. This Cardan readily agreed to, and Tartaglia divulged his formula in the form of a poem, to help protect the secret, should the paper fall into the wrong hands. Anxious now to leave Cardan's house, he obtained from his host, a letter of introduction to the Marchese and left to seek him out. Instead though, he turned back for Venice, wondering if his decision to part with his formula had been a mistake.

By the time he had reached Venice, Tartaglia was sure he had made a mistake in trusting Cardan and began to feel very angry that he had been induced to reveal his secret formula. Cardan published two mathematical books later that year and, as soon as he could get copies, Tartaglia checked to make sure his formula was not included. Though he felt a little happier to find that the formula was not included in the texts, when Cardan wrote to him in a friendly manner Tartaglia rebuffed his offer of continued friendship and mercilessly ridiculed his books on the merest trivialities.

Based on Tartaglia's formula, Cardan and Ferrari, his assistant, made remarkable progress finding proofs of all cases of the cubic and, even more impressively, solving the quartic equation. Tartaglia made no move to publish his formula despite the fact that, by now, it had become well known that such a method existed. Tartaglia probably wished to keep his formula in reserve for any upcoming debates.

Cardan and Ferrari travelled to Bologna in 1543 and learnt from della Nave that it had been del Ferro, not Tartaglia, who had been the first to solve the cubic equation. Cardan felt that although he had sworn not to reveal Tartaglia's method surely nothing prevented him from publishing del Ferro's formula. In 1545 Cardan published *Artis magnae sive de regulis algebraicis liber unus* Ⓣ , or *Ars magna* Ⓣ as it is more commonly known, which contained solutions to both the cubic and quartic equations and all of the additional work he had completed on Tartaglia's formula. Del Ferro and Tartaglia are credited with their discoveries, as is Ferrari, and the story written down in the text.

Tartaglia was furious when he discovered that Cardan had disregarded his oath and his intense dislike of Cardan turned into a pathological hatred. The following year Tartaglia published a book, *New Problems and Inventions* which clearly stated his side of the story and his belief that Cardan had acted in extreme bad faith. For good measure, he added a few malicious personal insults directed against Cardan.

*Ars Magna* Ⓣ had clearly established Cardan as the world's leading mathematician and he was not much damaged by Tartaglia's venomous attacks. Ferrari, however, wrote to Tartaglia, berating him mercilessly and challenged him to a public debate. Tartaglia was extremely reluctant to dispute with Ferrari, still a relatively unknown mathematician, against whom even a victory would do little material good. A debate with Cardan, on the other hand, held great appeal for Tartaglia. Not only did he hate him but Cardan was a leading figure in the mathematical, medical and literary worlds, and even to enter a debate with him would greatly enhance Tartaglia's standing. For all the brilliance of his discovery of the solution to the cubic equation problem, Tartaglia was still a relatively poor mathematics teacher in Venice.

So Tartaglia replied to Ferrari, trying to bring Cardan into the debate. Cardan, however, had no intention of debating with Tartaglia. Ferrari and Tartaglia wrote fruitlessly to each other for about a year, trading the most offensive personal insults but achieving little in the way of resolving the dispute. Suddenly in 1548, Tartaglia received an impressive offer of a lectureship in his home town, Brescia. To clearly establish his credentials for the post, Tartaglia was asked to journey to Milan and take part in the contest with Ferrari.

On 10 August 1548 the contest took place in the Church in the Garden of the Frati Zoccolanti. Tartaglia was vastly experienced in such debates and he expected to win. However, by the end of the first day, it was clear that things were not going his way. Ferrari clearly understood the cubic and quartic equations more thoroughly, and Tartaglia decided that he would leave Milan that night and thus leave the contest unresolved. With Tartaglia departing ignominiously, victory was left to Ferrari.

Tartaglia suffered as a result of the contest. After giving his lectures for a year in Brescia, he was informed that his stipend was not going to be honoured. Even after numerous lawsuits, Tartaglia could not get any payment and returned, seriously out of pocket, to his previous job in Venice, nursing a huge resentment of Cardan. The defeat in Milan would appear to be responsible for Tartaglia's non-payment.

Tartaglia is now remember in that the name of the formula for solving the cubic has been named the Cardan-Tartaglia formula. However, Tartaglia did contribute to mathematics in a number of other ways. Fairly early in his career, before he became involved in the arguments about the cubic equation, he wrote *Nova Scientia* (1537) on the application of mathematics to artillery fire. In the work he described new ballistic methods and instruments, including the first firing tables. He also wrote a popular arithmetic text and was the first Italian translator and publisher of Euclid's *Elements* in 1543. In 1546 he published *Quesiti et Inventioni diverse de Nicolo Tartalea* referred to above.

We give many quotes from this work by Tartaglia in the article Tartaglia v Cardan where the events described above are recounted in the mathematicians own words.

Tartaglia also published Latin editions of Archimedes' works. He died in poverty in his house in the Calle del Sturion near the Rialto Bridge (not the present one which was constructed about 30 years later) in Venice.

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Quotations by Tartaglia
Other Mathematicians born in Italy
A Poster of Tartaglia

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## References (show)

## Additional Resources (show)

## Honours (show)

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