105 μαθημα, τεταρτη, 10-05-2023,

Webex meeting recording: 105 WEDNESDAY INM-20230510 0912-1

Password: yKjhnqk6

Recording link: <https://uoa.webex.com/uoa/ldr.php?RCID=389c71b873b74799d9f75dfa92af4880>,

105BioCardanoErgas26b27b,

 ΣΧΕΔΙΑΣΜΟΣ,

 Ανεβηκε το μαθημα 104,

 Εργασιες 26b, 27b,

 Ergasies 28, 31, 32, ti kanoyme?

 Ειδοποιηση για ΜΙΓΑΔΙΚΟΥΣ,

# ΕΞΙΣΩΣΕΙΣ ΤΡΙΤΟΥ ΒΑΘΜΟΥ,

 See KATZ, p. 383,

But of number, cosa [unknown], and

cubo [cube of the unknown], however

they are compounded . . . , nobody until

now has formed general rules, because they

are not ?? proportional among them. . . . And

therefore, until now, for their equations,

one cannot give general rules except that,

sometimes, by trial, . . . in some particular

cases. And therefore when in your equations

you find terms with different intervals

without proportion, you shall say that the

art, until now, **has not given the solution to**

**this case, . . . even if the case may be possible**.

—From the **Summa de arithmetica**,

geometrica, proportioni et proportionalita

of **Luca Pacioli, 1494**

##  CARDANO JEROLAMO BIO, JEROLAMO CARDANO, ΙΕΡΟΝΥΜΟΣ ΚΑΡΔΑΝΟΣ,

###  WIKIPEDIA,

<https://en.wikipedia.org/wiki/Gerolamo_Cardano>,

Gerolamo Cardano

"Cardanus" redirects here. For the lunar crater, see Cardanus (crater).

Gerolamo Cardano

Girolamo Cardano. Stipple engraving by R. Cooper. Wellcome V0001004.jpg

17th-century portrait engraving of Cardano

Born 24 September 1501

Pavia, Duchy of Milan

Died 21 September 1576 (aged 74)

Rome, Papal States

Nationality Italian

Alma mater University of Pavia

Known for Cardano–Tartaglia formula

First systematic use of negative numbers in Europe

Scientific career

Fields Science, mathematics, philosophy, and literature

Notable students Lodovico Ferrari

Influences Archimedes, Muḥammad ibn Mūsā al-Khwārizmī, Leonardo Fibonacci

Influenced Blaise Pascal,[1] François Viète,[2] Pierre de Fermat,[1] Isaac Newton, Gottfried Wilhelm von Leibniz, Maria Gaetana Agnesi, Joseph-Louis Lagrange, Carl Friedrich Gauss, Euclid,

Gerolamo Cardano (Italian: [dʒeˈrɔːlamo karˈdaːno]; also Girolamo[3] or Geronimo;[4] French: Jérôme Cardan; Latin: Hieronymus Cardanus; 24 September 1501– 21 September 1576) was an Italian polymath, whose interests and proficiencies ranged through those **of mathematician, physician, biologist, physicist, chemist, astrologer, astronomer, philosopher, writer, and gambler**.[5] He was one of the most **influential mathematicians of the Renaissance**, and was one of the key figures in the foundation of probability and the earliest introducer of the binomial coefficients and the binomial theorem in the Western world. He wrote more than 200 works on science.[6]

Cardano partially invented and described several mechanical devices including the combination lock, the gimbal consisting of three concentric rings allowing a supported compass or gyroscope to rotate freely, and the Cardan shaft with universal joints, which allows the transmission of rotary motion at various angles and is used in vehicles to this day. He made significant contributions to hypocycloids, published in De proportionibus, in 1570. The generating circles of these hypocycloids were later named Cardano circles or cardanic circles and were used for the construction of the first high-speed printing presses.[7]

Today, he is well known for his achievements in algebra. In his 1545 book Ars Magna, he made the first systematic use of negative numbers in Europe, published with attribution the solutions of other mathematicians for the cubic and quartic equations, and acknowledged the existence of imaginary numbers.

 SGP. ΣΧΟΛΙΑ. “first systematic use of negative numbers in Europe”.

FibonacciSiglerLiberAbaciS.pdf, p. 320. *On a Purse Found by Five Men.* Einai kapos asafes. To ekshgei kallitera o KATZ, p. 345.

 ΣΧΟΛΙΑ. «acknowledged the existence of imaginary numbers»

See CardanoArsMagnaTranWitmerS.pdf, p. pdf 243-244.



So progresses arithmetic subtlety, the end of which, as is said, is as refined (εκλεπτισμενος), as it is useless.

#### Early life and education

Cardano was born on 24 September 1501[8] in Pavia, Lombardy, the illegitimate child of Fazio Cardano, a **mathematically gifted jurist, lawyer, and close friend of Leonardo da Vinci.** **In his autobiography (De propria vita, 1821), Cardano wrote that his mother, Chiara Micheri, had taken "various abortive medicines**" (p. 4) to terminate the pregnancy; he said: "I was taken by violent means from my mother; I was almost dead." She was in labour ? for three days.[9] Shortly before his birth, his mother had to move from Milan to Pavia to escape the Plague; her three other children died from the disease.

From CardanoGirolamoBookΟfMyLifeDeVitaPropriaLiber]

After a depressing childhood, with frequent illnesses, and the rough upbringing by his overbearing father, in 1520, Cardano entered the **University of Pavia** against the wish of his father, who wanted his son to undertake studies of law, but Girolamo felt more attracted to philosophy and science. During the Italian War of 1521–1526, however, the authorities in Pavia were forced to close the university in 1524.[10] Cardano **resumed his studies at the University of Padua**, where he graduated with a doctorate in medicine in 1525.[11] His eccentric and confrontational style did not earn him many friends and he had a difficult time finding work after his studies had ended. In 1525, Cardano **repeatedly applied to the College of Physicians in Milan, but was not admitted owing to his combative reputation and illegitimate birth**. However, he was consulted by many members of the College of Physicians, because of his irrefutable intelligence.[12]

#### Early career as a physician

Cardano wanted to practice medicine in a large, rich city like Milan, but he was **denied a license to practice, so he settled for the town of Piove di Sacco**, where he practiced without a license. There, he married Lucia Banderini in 1531. Before her death in 1546, they had three children, Giovanni Battista (1534), Chiara (1537) and Aldo Urbano (1543).[9] Cardano later wrote that those were the happiest days of his life.

With the help of a few noblemen, Cardano obtained a teaching position in mathematics in Milan. **Having finally received his medical license, he practiced mathematics and medicine simultaneously, treating a few influential patients in the** process. Because of this, he became one of the most sought-after doctors in Milan. In fact, by 1536, he was able to quit his teaching position, although he was still interested in mathematics. His notability in the medical field was such that the aristocracy tried to lure him out of Milan. Cardano later wrote that he turned down offers from the kings of Denmark and France, and the Queen of Scotland.[13]

#### Mathematics

Portrait of Cardano on display at the School of Mathematics and Statistics, University of St Andrews

Gerolamo Cardano was the first European mathematician to make systematic use of negative numbers.[14] He published with attribution the solution of Scipione del Ferro to the cubic equation and the solution of Cardano's student Lodovico Ferrari to the quartic equation in his 1545 book Ars Magna, an influential work on algebra. The solution to one particular case of the cubic equation a x 3 + b x + c = 0 ax^3+bx+c=0[15] (in modern notation) had been communicated to him in 1539 by **Niccolò Fontana Tartaglia** (who later claimed that Cardano had sworn not to reveal it, and engaged Cardano in a decade-long dispute) in the form of a poem,[16] but del Ferro's solution predated Tartaglia's.[13] In his exposition, he acknowledged the existence of what are now called imaginary numbers, although he did not understand their properties, described for the first time by his Italian contemporary Rafael Bombelli. In Opus novum de proportionibus he introduced the binomial coefficients and the binomial theorem.

ARS MAGNA p. 8.



Cardano was notoriously short of money and kept himself solvent by being an accomplished gambler and chess player. His book about games of chance, Liber de ludo aleae ("Book on Games of Chance"), written around 1564,[17] but not published until 1663, contains the first systematic treatment of probability,[18] as well as a section on effective cheating methods. He used the game of throwing dice to understand the basic concepts of probability. He demonstrated the efficacy of defining odds as the ratio of favourable to unfavourable outcomes (which implies that the probability of an event is given by the ratio of favourable outcomes to the total number of possible outcomes).[19] He was also aware of the multiplication rule for independent events but was not certain about what values should be multiplied.[20]

#### Later years and death

**In 1553 Cardano traveled to Scotland to treat the Archbishop of St Andrews who suffered of a disease that had left him speechless and was thought incurable. The treatment was a success and the diplomat Thomas Randolph recorded that "merry tales" about Cardano's methods were still current in Edinburgh in** 1562.[24] Cardano wrote that the Archbishop had been short of breath for ten years, and after the cure was effected by his assistant, he was paid 1,400 gold crowns.[25]

INFO. GOOGLE What is a Scottish church called?

Church of Scotland, **national church in Scotland,** which accepted the Presbyterian faith during the 16th-century Reformation. John Knox. Areas Of Involvement: Reformed and Presbyterian churches Related People: John Knox Alexander Henderson.

Medallion portrait of Cardano aged 49 by Leone Leoni (1509–1590)

**Two of Cardano's children — Giovanni Battista and Aldo Urbano — came to ignoble ends.** Giovanni Battista, Cardano's eldest and favorite son was arrested in 1560 for having poisoned his wife,[13] after he had discovered that their three children were not his. Giovanni was put to trial and, when Cardano could not pay the restitution demanded by the victim's family, was sentenced to death and beheaded. Cardano's other son Aldo Urbano was a gambler, who stole money from his father, and so Gerolamo disinherited him in 1569.

Cardano moved from Pavia to Bologna, in part because he believed that the decision to execute his son was influenced by Gerolamo's battles with the academic establishment in Pavia, and his colleagues' jealousy at his scientific achievements, and also because he was beset with allegations of sexual impropriety with his students.[9] He obtained a position as professor of medicine at the University of Bologna.

##### Cardano was arrested by the Inquisition in 1570

**after an accusation of heresy by the Inquisitor of Como, who targeted Cardano's De rerum varietate (1557) (ΔΙΑΦΟΡΑ ΠΡΑΓΜΑΤΑ) .**[26] The inquisitors complained about Cardano's writings on astrology, especially his claim that self-harming religiously motivated actions of martyrs and heretics were caused by the stars.[27] In his 1543 book De Supplemento Almanach, a commentary on the astrological work Tetrabiblos by Ptolemy, Cardano had also published a horoscope of Jesus. Cardano was imprisoned for several months and lost his professorship in Bologna. He abjured (απεποιηθην), and was freed, probably with help from powerful churchmen in Rome.[27**] All his non-medical works were prohibited and placed on the Index.[27]**

######  DEDICATION ars magna,

*Girolamo Cardano,* Physician, to the most erudite *Andreas Osiander,*1

greetings:

 Wikipedia, Andreas Osiander

<https://en.wikipedia.org/wiki/Andreas_Osiander>,

Andreas Osiander (German: [ˈoːziˌandɐ]; 19 December 1498 – 17 October 1552) was a German Lutheran theologian and Protestant reformer.