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CODEinMATHS

CREATIVE OPINIONS DIFFERENTIATE EDUCATION IN MATHS

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CREATIVE OPINIONS DIFFERENTIATE EDUCATION IN MATHS

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**Project Title: Creative Opinions Differentiate Education
In Maths**

Project Acronym: C.O.D.E in Maths

Main objective of the project: Exchange of Good Practices

Project Start Date: 01-09-2018

Project End Date: 31-08-2020

Project Total Duration: 24 months

Applicant Organisation: Denizli Erbakir Fen Lisesi, Turkey

Website: <https://codeinmaths.weebly.com>

Partner Organisations:

Colegiul Tehnic "Gheorghe Cartianu", Romania

Technikum Informatyki Edukacji Innowacyjnej, Poland

Istituto Tecnico Settore Tecnologico - Liceo Scientifico "E. Mattei", Italy

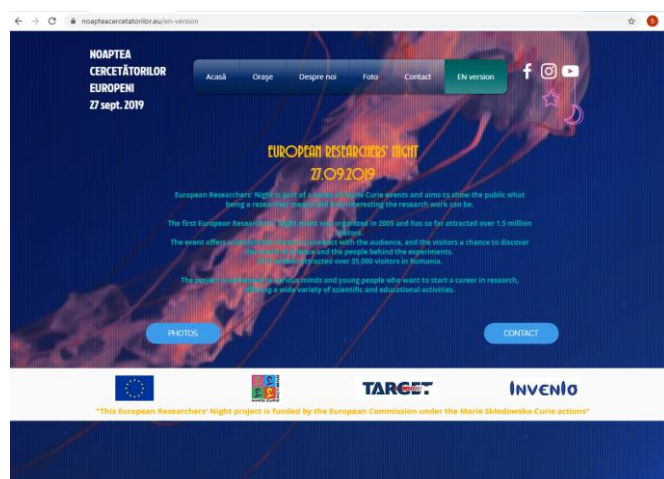
Centro Integrado De Formación Profesional Medina Del Campo, Spain

European Researchers' Night 2019

Gabriela-Brândușa Horlescu, teacher
Ana-Irina Secara, teacher

On September 27, 2019, our students will participate in the "European Researchers Night". They will present some applications made in our Erasmus + project. Students from the Technical College "Gheorghe Cartianu" organized an exhibition of "Electronics and Robotics "with our experiments.

"This European Researchers' Night project is funded by the European Commission under the Marie Skłodowska-Curie actions."



<https://www.noapteacercetatorilor.eu/en-version>



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Academic researches for the coding and roboticization of VIP persons

Gabriela-Brândușa Horlescu, teacher

Claudia Vaideanu, teacher

Mini-conference - Academic researches for the coding and roboticization of VIP persons, September 23, 2019 – Colegiul Tehnic Gheorghe Cartianu





Our students discover some personalities in mathematics, robotics and computer science: David Hanson, Jacques de Vaucanson, Ctesibius of Alexandria, George Charles Devol, Archytas of Tarentum, Steven Paul Jobs, Vasile Baltac, Joseph Frederick Engelberger and Leonardo da Vinci. The world of science is fascinating!







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Personality	Biography	Invention
<p>David Hanson</p>  <p>https://www.itu.int/en/ITU-T/AI/Pages/hanson.david.aspx</p>	<p>David Hanson Jr. is the founder of Hanson Robotics, a Hong Kong-based robotics company founded in 2013.</p> <p>https://en.wikipedia.org/wiki/David_Hanson_(robotics_designer)</p>	<p>He created it human-like robots.</p>  <p>https://www.hansonrobotics.com/david-hanson/</p>
<p>George Charles Devol</p>  <p>http://www.howld.co/person/george-devol</p>	<p>“In the year 1954, the american inventor, transformed modern manufacturing when he devised the first programmable robotic arm, for which he received a U.S. patent in 1961.”</p> <p>https://www.britannica.com/biography/George-C-Devol</p>	<p>“George Devol’s most famous invention—the first programmable industrial robot—started a revolution in manufacturing that continues to this day.”</p>  <p>https://spectrum.ieee.org/automation/robotics/industrial-robots/george-devol-a-life-devoted-to-invention-and-robots</p>


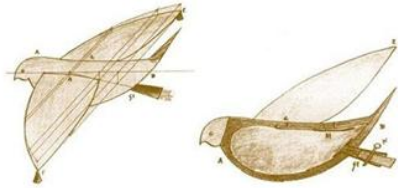
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Personality	Biography	Invention
<p data-bbox="225 190 427 324">Joseph Frederick Engelberger</p>  <p data-bbox="188 674 464 808">https://en.wikipedia.org/wiki/Joseph_Engelberger</p>	<p data-bbox="488 190 956 618">“American engineer founded in 1956 the world’s first robot-manufacturing company and earned the sobriquet “father of robotics” for his almost evangelical role in the development and marketing of robots with industrial and medical applications.”</p> <p data-bbox="488 678 959 763">https://www.britannica.com/biography/Joseph-F-Engelberger</p>	<p data-bbox="983 190 1474 465">“Licensing the original patent awarded to inventor George Devol, Engelberger developed the first industrial robot in the United States, the Unimate, in the 1950s.”</p>  <p data-bbox="983 864 1469 949">https://www.robotics.org/joseph-engelberger/about.cfm</p>
<p data-bbox="220 1057 432 1140">Leonardo da Vinci</p>  <p data-bbox="188 1621 464 1756">https://en.wikipedia.org/wiki/Leonardo_da_Vinci</p>	<p data-bbox="488 1057 956 1386">“He is among the most influential artists in history, having left a significant legacy not only in the realm of art but in science as well, each discipline informing his mastery of the other.”</p> <p data-bbox="488 1449 959 1534">https://www.leonardodavinci.net/</p>	<p data-bbox="983 1057 1474 1238">Leonardo's Robot is a humanoid robot that was designed by Leonardo da Vinci around 1495.</p>  <p data-bbox="983 1695 1469 1780">https://ro.wikipedia.org/wiki/Robotul_lui_Leonardo_da_Vinci</p>

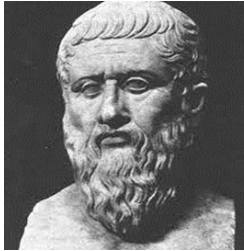
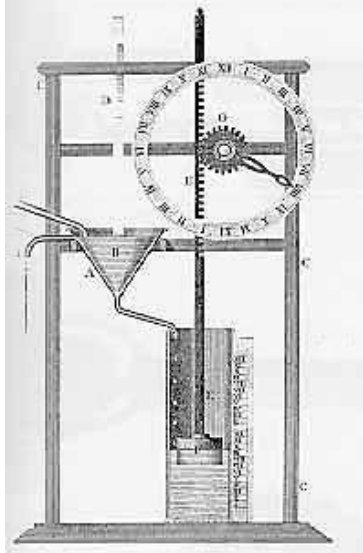

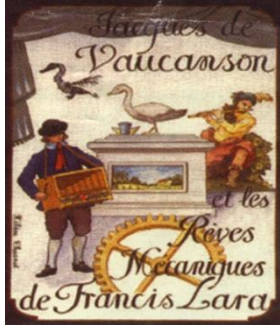
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Personality	Biography	Invention
<p>Vasile Baltac</p>  <p>https://ro.wikipedia.org/wiki/Vasile_Baltac</p>	<p>Engineer, computer scientist, university professor, pioneer in computer science in Romania.</p> <p>https://sites.google.com/site/vasilebaltac/home-page/Bio</p>	<p>He published books and papers on computers, software and information technology.</p>  <p>https://sites.google.com/site/vasilebaltac/Home/carti</p>
<p>Steven Paul Jobs</p>  <p>https://www.iasitvlife.ro/stiri/showbiz/steve-jobs-era-un-sef-exigent-care-isi-dadea-afara-angajatii-fara-mila/</p>	<p>An American industrial designer, investor, and media proprietor.</p> <p>https://en.wikipedia.org/wiki/Steve_Jobs</p>	<p>Co-founder of Apple Computer Inc. Founded: 1976</p> <p><i>"We started out to get a computer in the hands of everyday people, and we succeeded beyond our wildest dreams."</i>-Steve Jobs</p>  <p>https://www.entrepreneur.com/article/197538</p>

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Personality	Biography	Invention
<p data-bbox="233 188 424 271">Archytas of Tarentum</p>  <p data-bbox="193 651 461 786">https://ro.wikipedia.org/wiki/Archytas</p>	<p data-bbox="491 188 959 322">Archytas (428 BC - 347 BC) was born in Magna Graecia, today Taranto, Italy.</p> <p data-bbox="491 383 938 472">https://en.wikipedia.org/wiki/Archytas</p>	<p data-bbox="984 188 1471 322">He is the first researcher from the Pythagorean school. He was also a good friend of Plato.</p> <p data-bbox="984 331 1471 517">He demonstrated that $\sqrt{2}$ is irrational and is the first to apply geometry in mechanics and arithmetic in music.</p> <p data-bbox="984 526 1471 815">He laid the foundations of applied mathematics in mechanics. In the sec. IV i.e., he designed a mechanical bird, called "The Pigeon" (Pigeon) driven by steam.</p> <p data-bbox="984 824 1471 1113">It was the first volatile autonomous car of antiquity. It consisted of a light but strong shell, which was shaped like a pigeon and had the inside of a large animal's bladder.</p>  <p data-bbox="984 1417 1458 1507">http://kotsanas.com/gb/exh.php?exhibit=2001001</p> <p data-bbox="984 1516 1406 1753">https://www.ancient-origins.net/ancient-technology/steam-powered-pigeon-archytas-flying-machine-antiquity-002179</p>

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Personality	Biography	Invention
<p data-bbox="233 188 424 271">Ctesibius of Alexandria</p>  <p data-bbox="197 591 459 1021">https://novoscriptorium.com/2018/04/21/did-you-know-keyboard-instruments-exist-since-the-3rd-century-b-c-ctesibius-of-alexandria/</p>	<p data-bbox="488 188 959 517">Ctesibius (Greek Κτησίβιος) of Alexandria, Egypt, is a Greek inventor and mathematician, the first great figure of the ancient engineering tradition of Alexandria.</p> <p data-bbox="488 584 959 768">Greek physicist and inventor, the first great figure of the ancient engineering tradition of Alexandria, Egypt.</p> <p data-bbox="488 831 951 965">https://www.britannica.com/biography/Ctesibius-of-Alexandria</p>	<p data-bbox="981 188 1474 421">In addition to inventing the water organ (hydraulis) and suction pump, Ctesibius also perfected the first accurate water clock.</p>  <p data-bbox="981 994 1437 1077">https://history-computer.com/Dreamers/Ctesibius.html</p>
<p data-bbox="237 1095 419 1178">Jacques de Vaucanson</p>  <p data-bbox="193 1576 462 1760">https://en.wikipedia.org/wiki/Jacques_de_Vaucanson</p>	<p data-bbox="488 1095 943 1274">A French inventor who was responsible for the creation of impressive and innovative automata.</p> <p data-bbox="488 1290 932 1424">He design an automatic loom and built the first all-metal lathe.</p> <p data-bbox="488 1487 951 1621">https://www.britannica.com/biography/Jacques-de-Vaucanson</p>	<p data-bbox="981 1095 1474 1328">“Vaucanson's most famous creation was undoubtedly "The Duck." This mechanical beast could flap its wings, eat, and digest grain.”</p>  <p data-bbox="981 1671 1461 1800">https://www.swarthmore.edu/Humanities/pschmid1/essays/pynchon/vaucanson.html</p>

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SHORT-TERM EXCHANGE OF PUPILS
C3.Coding and STEM in Flipped Classroom
Italy, 21st-25th October 2019

Claudia Văideanu, teacher

Between October 21 and 25, 2019 was the third meeting of the project. The meeting was in the city of Vasto, Italy.



The activities were organized by Istituto Tecnico Settore Tecnologico - Liceo Scientifico "E. Mattei", Vasto.

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Program of activities

Days	Activities
Sunday 20th October 2019 - Arrivals	
Monday 21st October 2019	
08:30	Pick up from Hotel dei Sette.
9:00-11:00	Welcome address by Mr Luigi Gaetano Fuiano, Principal of IIS “E. Mattei”. All the participants introduce their schools and countries: Poland, Romania, Spain, Turkey and Italy . Guided tour of the school with the Italian project students.
11:15-13:00	Coding workshop: Making Mobile Apps with JavaScript on Code.org .
11:15	
13:30	Lunch at Ohimà Restaurant.
15:30-17:30	Art workshop at ArtiBus.
Tuesday 22nd October 2019	
09:00-13:00	Maths and Physics workshop with the Flipped Classroom methodology: Physics: “Discovering Boyle’s Law” – Maths: “Julie in the garden of Mathematics”.
09:30	Teachers: visit to a cheese factory
13:30	Lunch at Ohimà Restaurant.
15:00	Town hall: welcome address by the Mayor of Vasto, Mr Francesco Menna.
15:30-19:00	Guided visit to Vasto town centre.
Wednesday 23rd October 2019	
06:30	Pick up from the hotel for day trip to Naples
13:30	Lunch
18:30	Departure
Thursday 24th October 2019	
09:30-13:00	Science workshop with the Flipped Classroom methodology: “Chemistry in action: the murder of the jeweller Beketov”. Teachers: visit to a “Trabocco” typical “fishing building”.
13:30	Lunch at Ohimà Restaurant .

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15:00-18:00	Visit to the natural reserve Punta Aderci and Punta Penna.
21:00	Farewell dinner at Mamitas pizza restaurant
Friday 25th October 2019	
10:00-12:00	Presentation of works about Art by each country
12:00-13:00	Closure
13:30	Lunch at Ohimà Restaurant
15:00-20:30	Departure for Pescara and visit of the city centre
26th October 2019 - Departure	

Monday 21st October 2019

Students and teachers participated in the opening ceremony. The teachers from IIS “E. Mattei” welcomed all the participants.

All the participants introduced their schools and countries. They made PowerPoint presentations or movies.



The students participated in a coding workshop: Making mobile applications with JavaScript on Code.org.



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On the same day the teachers had a parallel activity: they visited “Frantoio”, olive oil mill.

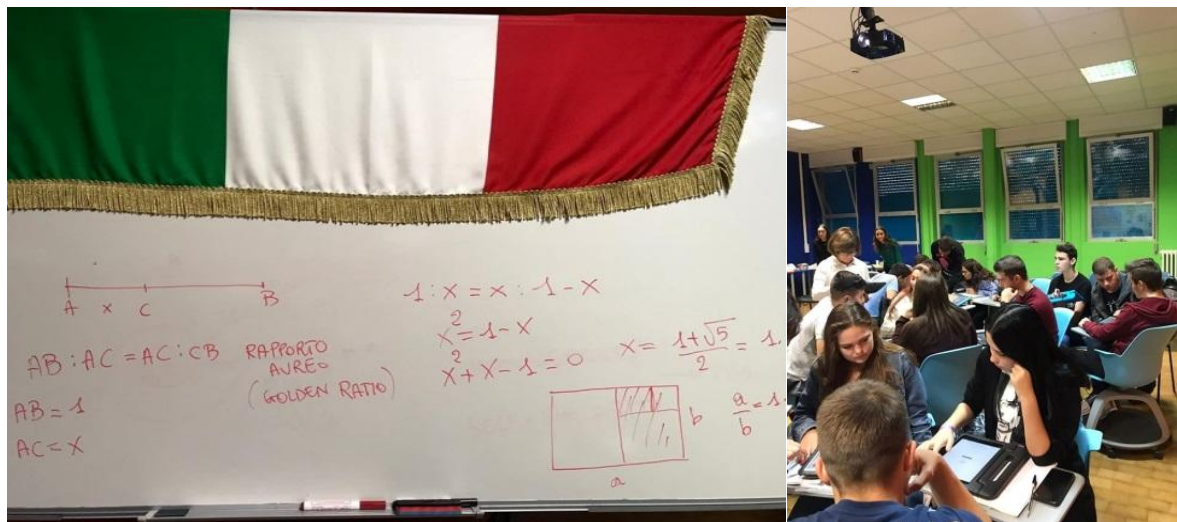


The students and teachers participated in the art workshop at ArtiBus.



Tuesday 22nd October 2019

The students participated at a Maths and Physics workshop with the Flipped Classroom methodology: Physics (“Discovering Boyle’s Law”) and Maths (“Julie in the garden of Mathematics”).



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On the same day the teachers had a parallel activity. They visited a cheese factory.



All participants visited the town hall and listened to speeches about the history, culture and economy of the city of Vasto.



After the visit to the town hall, students and teachers visited the center of Vasto.



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Wednesday 23rd October 2019

All participants visited the main touristic attractions of Naples.



Thursday 24th October 2019

The students participated in a science workshop with the Flipped Classroom methodology: “Chemistry in action: the murder of the jeweller Beketov”.

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At the same time, the teachers visited a “Trabocco” typical “fishing building”.



After lunch, students and teachers visited the natural reserve Punta Aderci and Punta Penna.



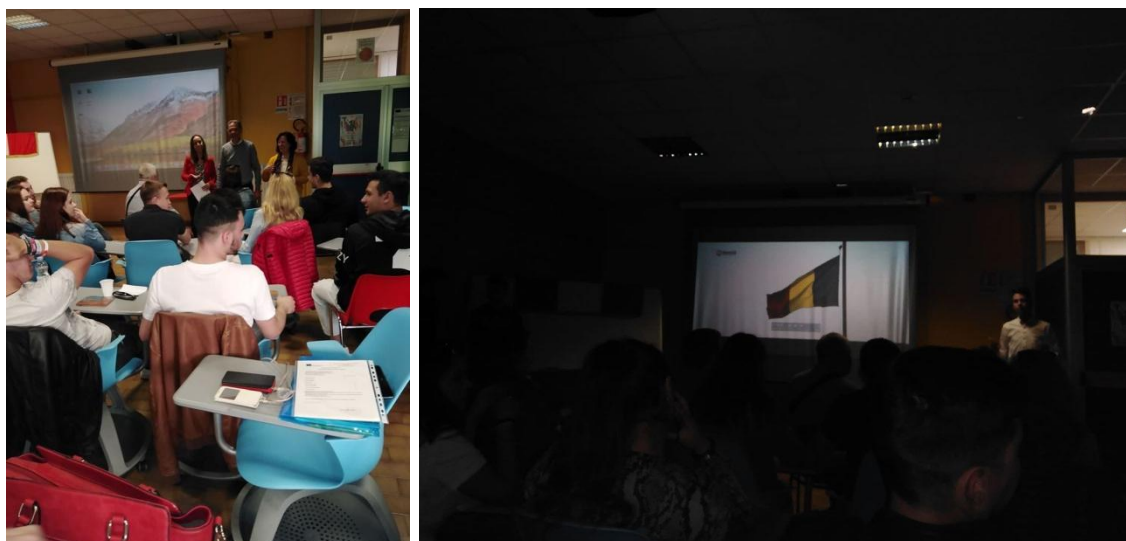
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In the evening, it was farewell dinner at the Mamitas pizza restaurant. It was a socializing event during students and teachers learned about traditional Italian food, dances and music specific to each country.



Friday 25th October 2019

In that day each country presented informations about art. The students made movies and PowerPoint presentations. Also, they got the works of art made on the first day.



Later, all participants went to Pescara to visit the city centre.

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The third meeting of the project was an experience for teachers and students because they had the opportunity to meet people interested in the same topics, to learn about culture of other countries, to see new places. Also, new ties and friendships were made that will help for future projects.

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Maker Faire Rome
October 18-20, 2019, #MFR19

Gabriela-Brândușa Horlescu, teacher

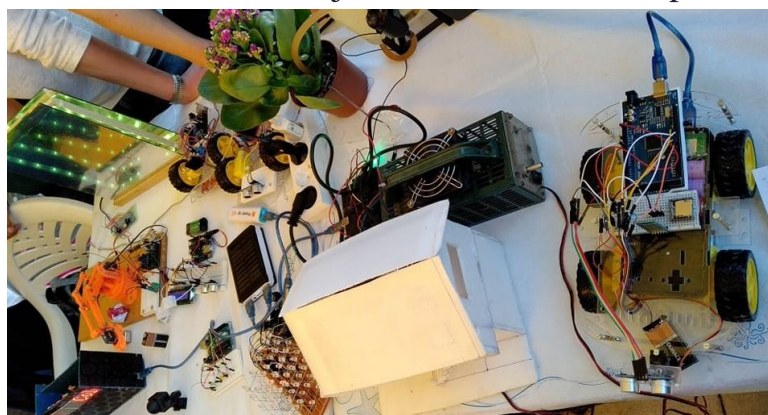
START to adventure, knowledge, training, exploration, exchange of experience at European and international level. The team of our school presents the achievements of the students in the field of robotics, electronics, science and art realized during the school and extracurricular activities, as well in the Erasmus + projects.

Our school presented “*ARC - Center of Electronics and Robotics*” project.

The main objective of the project is the professional development of students using their creativity and imagination, benefiting from the opportunities of the digital era, using science and new technologies.

Specific objectives:

- to develop the research technical and scientific spirit;
- to develop creative and innovative abilities;
- to provide technical and practical training;
- to become aware of the new technical jobs for a future work place.



<https://clubarcrobotica.wordpress.com/>

Teachers:

- Gabriela-Brândușa Horlescu – coordinator
- Carmen-Simona Stanciu – technical coordinator
- Virgil Baci – member
- Secara Ana-Irina – English teacher

Students: Alterescu Mihail-Cristian , Albața George, Azoitei Andrei, Azoitei Adrian, Badîngă Alexandru-Nicolae, Catană Adelin Gabriel, Giurică Constantin-Alexandru, Grădinaru Nicoleta-Daniela, Irimia Alin-Constantin, Irimia Petru-Dorin,

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Irimia Cosmin-Valentin, Mihăilescu Lucian, Mihăilescu Codruț, Nistor Ciprian
Alexandru, Tătaru Călin Gabriel, Țuvichi Alin-Marian

Collaborator: Manea Dragoș Andrei

"Explore makers, exhibitors and projects coming to Maker Faire Rome – The European Edition 2019":

<https://2019.makerfairerome.eu/en/exhibitors/>

<https://2019.makerfairerome.eu/en/exhibitors/?ids=4>

<https://www.facebook.com/MakerFaireRome>



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The scientific meeting of the Electrotechnics, Electromechanics and Automation Department

Gabriela-Brandusa Horlescu, teacher

The scientific meeting of the Electrotechnics, Electromechanics and Automation Department was held on 12 November 2019 at "Gheorghe Cartianu" Technical High School. The activity was attended by the teachers from the high schools in our town and those in Târgu-Neamț, a town next to ours. The schedule included:

- Presentation of our school, of the professional qualifications we certify, of the curricular and extracurricular events done by the members of the Electrotechnics, Electromechanics and Automation Department in our school;
- Sample lesson teaching in the field of Basics in Digital Electronics, 10th class;
- Robotics workshop activity done by the students of our high school, the team of Electronics and Robotics from Neamt County Excellence Center;
- Presentation of the Erasmus+ projects which our high school is developing at present;
- Technical and scientific papers;
- Discussions, debates and round tables.

The information exchange, the examples of good practices as well as the educational projects were the key elements during our educational and scientific activity. All these aspects highlighted that team work, the good cooperation among our colleagues and among schools lead without any doubt to the teachers' professional success as well as to our students' educational success.



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Science Faire at the G.T.Kirileanu” County Library Neamț November 14, 2019

Gabriela-Brândușa Horlescu, teacher

The students in the 11th form participated at the Science Faire which was held in the Conference Room between 10 am and 3 pm.

Our students organized a display stand where they presented their works in the field of S.T.E.M. (Science, Technology, Engineering and Mathematics), works which were made during the practical activities of the Electronics and Robotics team from the The Neamț County Excellence Centre.

On this occasion they also disseminated our European projects in front of the people.

There were present visitors from ”Ion Creangă” National Children Library in Chișinău, The Republic of Moldavia, which showed great interest in science and the joy to participate at this event.

We want to send our thanks to the organizers for their invitation so as we can be present at the Science Faire, for their involvement and interest in organizing educational events.



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Event on the eTwinning platform
eTwinning Live - LEGO MINDSTORMS Education EV3

December 18, 2019, 10:30-12:00

Gabriela-Brândușa Horlescu, teacher

<https://live.etwinning.net/events/event/99903>

On December 18, 2019 we took the first steps in LEGO MINDSTORMS EV3 and we created the first robot. I learned and explored with the students:

https://www.lego.com/cdn/cs/set/assets/bltbf4d6ce0f40363c/LMSUser_Guide_LEGO_MINDSTORMS_EV3_11_Tablet_ENUS.pdf

My students were very creative and used LEGO MINDSTORM EV3 software.

<https://www.lego.com/biassets/bi/6124045.pdf>

You can discover more:

- <https://education.lego.com/en-us/support/mindstorms-ev3/building-instructions>
- <https://le-www-live-s.legocdn.com/sc/media/lessons/mindstorms-ev3/building-instructions/ev3-model-core-set-color-sorter-c778563f88c986841453574495cb5ff1.pdf>
- <https://le-www-live-s.legocdn.com/sc/media/lessons/mindstorms-ev3/building-instructions/ev3-model-core-set-gyro-boy-f8a14d8e3d0e63fa23b87f798bf197f4.pdf>
- <https://le-www-live-s.legocdn.com/sc/media/lessons/mindstorms-ev3/building-instructions/ev3-model-core-set-puppy-7a316ae71b8ecdcd72ad4c4bcd15845d.pdf>
- <https://le-www-live-s.legocdn.com/sc/media/lessons/mindstorms-ev3/building-instructions/ev3-model-core-set-robot-arm-h25-56cdb22c1e3a02f1770bda72862ce2bd.pdf>

It's very funny, you build, learn and coding!

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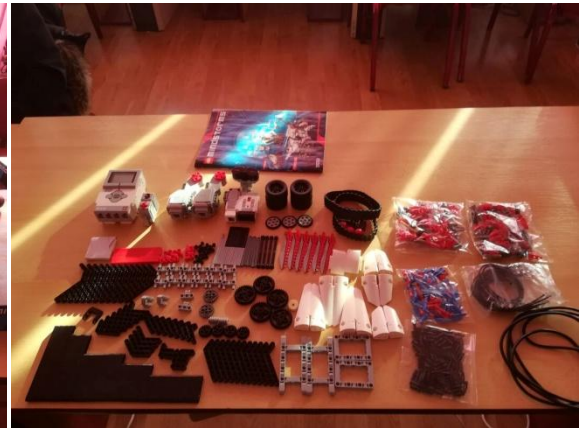


LEGO MINDSTORMS Education EV3

📅 Înscriș pe 18.12.2019 21:24

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ÎMI PLACE 0



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C.O.D.E in Maths – on the eTwinning platform

The screenshot shows the eTwinning project page for 'C.O.D.E in Maths'. The page is in Romanian and features a navigation bar with 'PORTAL', 'ETWINNING LIVE', 'GRUPURILE MELE', and 'TWinspace-URILE MELE'. The main header includes the eTwinningLive logo and navigation links: 'PERSOANE', 'EVENIMENTE', 'PROIECTE', 'GRUPURI', 'FORUMURI PARTENERI', and 'DEZVOLTARE PROFESIONALĂ'. The project title 'C.O.D.E in Maths' is displayed with a calendar icon indicating it was created on 04.10.2018 and is currently active. Below the title are tabs for 'DESPRE', 'MEMBRI', and 'FOTOGRAFII', along with a '# ÎMI PLACE' button showing 11 likes. An orange 'ACCES TWinspace' button is also visible. The project details section includes the ID (177927), language (English), age category (14-18), and a list of subjects: Artă, Educație fizică, Educație pentru mass-media, Fizică, Geografie, Informatică/TIC, Istoria culturii, Limbi străine, Lucru manual, Matematică/Geometrie, Tehnologie, and Științe naturale. The 'Despre proiect' section provides the Erasmus+ project details: 'Creative Opinions Differentiate Education In Maths, 2018-1-TR01-KA229-059796_3'. It lists the schools involved: Denizli Erbakir Fen Lisesi, Turkey; Technikum Informatiki Edukacji Innowacyjnej, Poland; ITI-Liceo Scientifico "Mattei", Italy; Integrado de Formación Profesional Medina Del Campo, Spain; and Technical College "Gheorghe Cartianu", Romania. It also states the project start date (01.09.2018) and end date (31.08.2020). The main idea of the project is to address the difficulty of studying mathematics for 14-18 year olds and to find solutions to improve the educational process.

<https://live.etwinning.net/projects/project/177927>

About the project

Erasmus + project: Creative Opinions Differentiate Education In Maths, 2018-1-TR01-KA229-059796_3

The schools involved in the project are: Denizli Erbakir Fen Lisesi, Turkey, project coordinator, Technikum Informatiki Edukacji Innowacyjnej, Poland, ITI-Liceo Scientifico "Mattei", Italy, Integrado de Formación Profesional Medina Del Campo, Spain, Technical College "Gheorghe Cartianu", Romania.

Project Start Date: 01.09.2018

Project End Date: 31.08.2020

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The main idea of our Project rises out on the analysis of the general requirements that European schools face recently. Our teaching experiences show that students aged 14-18 have difficulty studying mathematics.

Aims

We want to find solutions and new ways to improve the educational process.

We want to improve these competences and skills for our students:

- ICT - new technologies - digital competences
- Key Competences (incl. mathematics and literacy) - basic skills
- Creativity and culture

Work Process

We appreciate that we will use this platform every month. Each school will present the implemented activities. The platform offers many career development opportunities for students and teachers.

Teachers will use the new technologies to improve the educational process. The platform has a wide range of tools to help teachers improve their teaching methods. They will exchange of experience with peer teacher from European countries and transferring best practices. They will have higher knowledge of online educational resources.

Expected results

All activities in this project will be uploaded to Twinspace by each country.



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SHORT-TERM EXCHANGE OF PUPILS

C4. Maths and Coding in Engineering

13th-17th January 2020, Turkey

Gabriela-Brândușa Horlescu, teacher

Ana-Irina Secară, teacher

Program of activities

Days	Activities
Sunday 12th January 2020 - Arrivals	
Monday 13th January 2020	
08:30	Pick up from Hotel Leman Kültür
9:00-12:00	Welcome by the director of Erbakır fen lisesi in the conference hall All the participants introduce their schools and countries: Poland, Romania, Spain, Turkey and Italy Coffee break Action bound game with the Turkish project students
12:00	Lunch at school
13:00-17:00	Guided Visit to Pamukkale Free time for students in Leman Kültür Café.
17:00	Free Time
Tuesday 14th January 2020	
09:00-12:00	Introduction of current subjects code and engage students in an easy-entry into programming with short activities that help interest in coding, computer science and robotics. 'LINE FOLLOWING ROBOT CIRCUIT' is the challenge of the lesson. In this activity, students will find out by building a robot that can automatically follow a line around a homemade race course, while learning about the electromagnetic spectrum and electronic circuits. Teachers will go to Buldan(textile village)
12:00	Lunch for students at school Teachers will have lunch at a traditional kebab restaurant
13:00-17:00	Visiting Pamukkale Tecnokent which is an organized research and business center that integrates academic, economic and social structure and having lecture from dedicated people Visiting Cable car
18:00-22:00	Dinner in Koz Restaurant for teacher. Students will have time with students in Forum Camlık Shopping Mall (Bowling tournament).
Wednesday 15th January 2020	
06:00	Pick up from the hotel for day trip to Ephesus –Sirince-Kuşadası
13:00	Lunch in Ortaklar
18:00	Dinner in Kuşadası

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Days	Activities
19:00	Departure
Thursday 16th January 2020	
09:00-13:00	Structure and Function. Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. *The robot will be presented by the group spokesman and the products will be voted by the students the most appropriate to challenge and enjoyable. *At the end of the session students will be have the post test which has been given in before visit as pre-test. Teachers will go to Turkish delight factory.
12:00	Lunch at Hansalar.
13:00-14:00-17:00	Town hall: welcome address by the Mayor of Denizli Merkezefendi Mrs Şeniz Doğan. Visit Denizli town centre.
20:30	Farewell dinner
Friday 17th January 2020	
10:00-11:00	Presentation of works about cousine by each country
12:00	Closure
12:30	Lunch at school
14:00 16:00	Visiting Baklava factory
18th January 2019 - Departure	

13 January 2020, Wonder Day

The presentation of schools and partner countries - Poland, Romania, Spain, Turkey and Italy - from the first part of the day continued with the visit of Denizli province, a real dream destination.

The tourist objectives aimed at:

1.The ancient city of Hierapolis

The ancient city of Hierapolis, also called the City of Light, has ruins on the edge of the limestone terraces at Pamukkale.

2.Travertines from Pamukkale ("Cotton Castle"). This place is considered the eighth wonder of the world.

Here you can admire several natural thermal water pools. It is very rich in calcium carbonate. As the thermal water comes to the surface, calcium carbonate becomes more solid and thus forms the famous white terraces. Since 1988, Pamukkale, along with the ancient city of Hieropolis in the same region, has been on the UNESCO World Heritage list and belongs to both cultural and natural heritage. <https://www.youtube.com/watch?v=fvlCkP1tEaw>

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3.The amazing ruins of Laodikeia, founded by Antiochus II of Syria (261-246 BC), who named it after his wife, Laodicea. Laodikia was home to one of the oldest Christian communities of the Roman Empire.

After the conquest by the Seljuks at the end of the 11th century, the city began falling and in the 13th century, the remaining inhabitants abandoned the site and moved to Ladik (modern Denizli). <https://www.youtube.com/watch?v=oBJ5EIEilxQ>

The scientific, cultural and spiritual wealth acquired during this day has once again demonstrated us the importance and efficiency of the inter-school exchanges during the Erasmus + projects.



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14 January 2020, Challenge Day: Robotics and the Mountain

The agenda of today's activities included the following:

1. The first steps in programming using LEGO MINDSTORMS EV3

The practical activity stimulated the interest of the students in the fields of coding, computer science and robotics. Our students built a robot that can automatically follow a line.

2. Visit to the city of Buldan

Buldan is one of the important cities and textile centers of Denizli province, being known throughout Turkey due to the beautiful items of clothing made of cotton, wool and silk, using traditional methods.

<http://www.tourmakerturkey.com/buldan.html>

3. Visit to the center of Pamukkale Tecnokent, an organization that encourages the development of companies based on technology. It is an organized research and business center which integrates the academic, economic and social structure.

<http://www.pauteknokent.com.tr/>

4. Trip by gondola to the top of the mountain in Denizli: we were pleasantly surprised by the panorama of the region, but it also gave us the opportunity to enjoy the fresh mountain air, the snow and sledging. <https://www.denizliteleferik.com.tr/>



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15 January 2020, Cultural Discovery Day

On the third day of mobility we visited the following tourist attractions of great historical and cultural importance, most of them being in the UNESCO cultural heritage.

1.The House of the Virgin Mary - Mother of Jesus
The House of the Virgin Mary is an important historical site for all Christians around the world. Mary, the mother of Jesus, would have lived in this house after Jesus rose from the dead.

Since the 5th century, the House of the Virgin Mary, a domed cruciform chapel seven kilometres from Ephesus, became a major place of Christian pilgrimage. The Ancient City of Ephesus is an outstanding example of a Roman port city, with sea channel and harbour basin.

2.Ephesus - UNESCO World Heritage Centre

“Located within what was once the estuary of the River Kaystros, Ephesus comprises successive Hellenistic and Roman settlements founded on new locations, which followed the coastline as it retreated westward. Excavations have revealed

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grand monuments of the Roman Imperial period including the Library of Celsus and the Great Theatre. Little remains of the famous Temple of Artemis, one of the “Seven Wonders of the World,” which drew pilgrims from all around the Mediterranean.”
<https://whc.unesco.org/en/list/1018/>

3. Sirince Village

„This pretty old Orthodox village, 12 km away from Ephesus and 30 km from Kusadasi, was once Cirkince ("ugly"). Indeed its habitants gave this name on purpose as they did not want to be bothered by foreigners nor to share the beauty of their village.

Still after years, visitors understood that the village was not ugly at all and called it Sirince ("pretty"). As the village is located on the top of a mountain, anyone will enjoy the impressive wine yards' and peach trees' views on his way.

Today the village is a perfect synthesis of Turk-Greek culture as of the 1920's: after the Independence War, people exchange between Greek and Turks has occurred and all those typical Greek houses, though they kept their original outside characteristics, have received the local layout inside. The most beautiful specimens are open to visitors. And even in the courtyard of one of them, one will discover a nicely restored Orthodox church.

All the narrow streets of the village belong to the women, selling handcrafts of all kinds, olive oil. Another attraction of Sirince is its wine: try its taste in small cafés or in the former municipal school restored.

Though Sirince Village is developing its tourism very quickly, it has been able to preserve its authenticity and the meaning of its name.”
<https://www.ephesus.us/ephesus/sirince.htm>

4.Visit the Kuşadası city

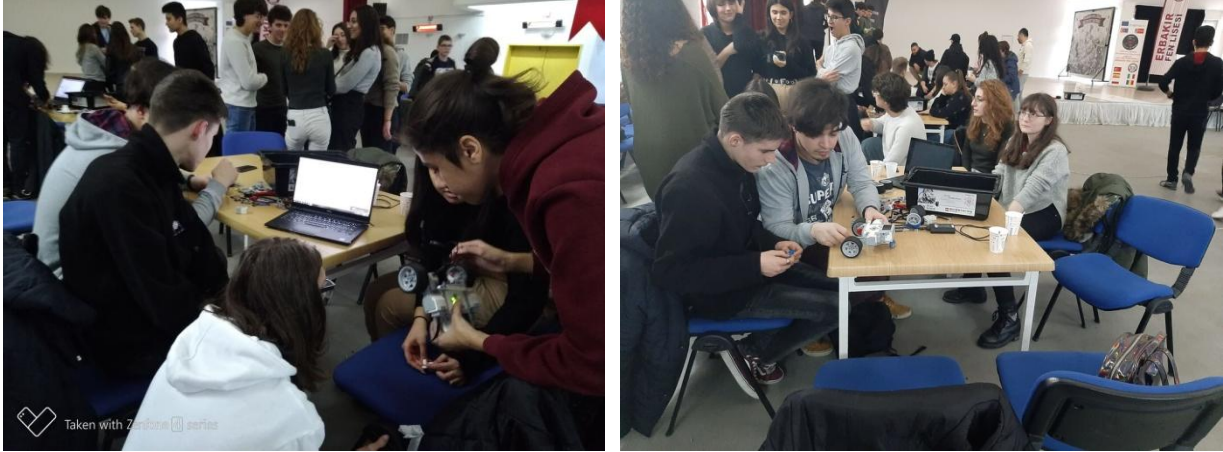
Kusadasi is a resort town on the Aegean coast of Turkey and the center of the coastal district of the same name in the province of Aydın. Kusadasi is 95 km south of Izmir and 71 km from Aydın. The primary industry of the municipality is tourism.
<https://kusadasi.bel.tr/en/homepage/>



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16 January 2020, Robotics Day

The students were trained in scientific, mathematical and applied robotics activities. In the second part of the day we were greeted by the mayor of Denizli, Şeniz Doğan, visited the city and in the evening gathered around a farewell dinner.



17 January 2020, Intercultural Cuisine Day

On the last day of mobility, each country presented the traditional cuisine, emphasizing the culinary specific of the region each participant comes.

The Turkish team came up with a concrete example of their cuisine giving us the opportunity to see the process of making baklava in a factory in Denizli.



At the end of our meeting students were awarded at the robotics competitions held during mobility. There followed the festivity of handing out the participation certificates to both students and teachers.

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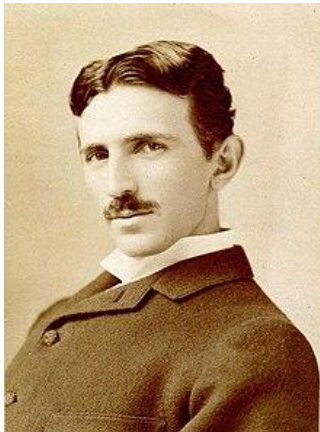
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What shows are we watching?

Carmen-Simona Stanciu, teacher

The *Discovery Channel* is a television station that, I really discovered many years ago. We learned that the great scientist *Nikola Tesla* (*Nicolae Teslea*) is considered to be one of the "100 Greatest Americans", the genius under which humanity's current development lies.

When you say *Nicolae Teslea* you think of the Istro-Romanian who became an American citizen, the scientist and the prolific inventor in the field of electro and radiotechnics, the discoverer of the spinning magnetic field. He is considered by American biographers to be a Serbian immigrant. In fact he was an Istro-Romanian, born on the night of July 9 to 10, 1856, as the son of Orthodox priest Milutin Teslea and of Gica Mandici. The father's family consisted of anti-Ottoman guards in the former Austro-Hungarian empire. The initial family name was Drăghici, but he was replaced in time, by the nickname *Teslea*, after the job transmitted to the family, by the carpenter (*teslari*).



Henri Coandă presents the great inventor *Tesla* as a Banat Romanian from the Serbian Banat. **We owe Tesla the first wireless communication system, the first robots, the first remote control, the idea of a vertical take-off vehicle. Tesla proposed a scheme that looked like a science-fiction: a global wireless communication system to send telephone messages across the ocean; to transmit news, music, stock market reports, private messages, secure military communications and image transmission in any corner of the world.** "When wireless communication is widely applied, the earth will be transformed into a huge brain, capable of responding in any corner of it." His vision was not realized today, more than 75 years after his death. Even its great achievements regarding the transmission of electricity without wires have not been put into practice.

This millennium is undoubtedly the *Tesla Millennium*, the Istro-Romanian that arrived in America, with only a letter of recommendation from a friend of Edison's from Europe.

The physicist *Nikola Tesla* saw with brilliant scientific clarity and contributed to the creation of our future.

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Homo Biograficus Or Fertil Indiscretion
Ion Barbu (Dan Barbilian) - poet and mathematician

Raluca Orza, teacher

Motto: *The artist's myth claims his biography.* (A. Malraux)

*Mathematics puts into play spiritual powers not very different
from those required by poetry and art.* (Ion Barbu/Dan Barbilian)

Dedicating himself to the complex study of the text and the reading act, literary criticism and theory sometimes tend to ignore and even challenge the autobiographical implications of literature. The author's profile is deliberately blurred, placed in biographical brackets considered irrelevant in receiving his creation. The biography fell into disuse, the author's dismissal occurring to clear the way for an intrinsic approach to literature. Moreover, Roland Barthes demands the death of the author, in the context in which the literature is mainly focused on authorship. The reduction of the author to a linguistic body, his physical disappearance from the imaginary established by the literary text have, according to the Barthesian theory, a very important purpose: the birth of the reader.

Indeed, an approach to the relationship between the biography and the work or that of the author's spiritual/characterological profile and the literary text may be subject to the risk of speculation or the common place, but not when we refer to a certain degree of aesthetic value. In the author's return, the literary critic Eugen Simion observed that the work claims and creates the author it needs, because in the great creators, this second birth occurs almost invariably: the work creates a myth of the author after the author created an opera which, through her force, entered the myth. Thus, strictly anecdotal curiosity takes the place of the effort to read in documents the evidence of a destiny transformed into creative fact. Here is the perspective from which the indiscretion of the documentary can act in a fertile way, the ever-evolving homo biograficus dispute existing in every literary consciousness.

This is also the case of the poet Ion Barbu (the pseudonym of Dan Barbilian) - a prominent figure in Romanian inter-war literature - whose career announced, from the beginning, the vocation for ... mathematics! By browsing the few biographical sequences gathered under the title *Under the constellation of numbers*, we discover not only a beautiful evocation of his high school mathematics teacher, Ion Banciu, but also a clear assumption of his mathematician structure, from the adolescence years: *For me, who I have embraced mathematics [...] Banciu was [...] the teacher,*

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the man who trained me, from whom I learned the essentials. The other mathematics teachers, including those at the University, did not teach me, they informed me. But Banciu passed me his sense of rigor, he planted my mathematical affect, the emotion in front of the beauty of a theorem and the passion of the research, without which you cannot be a mathematician.

As the initiation into the adventure of the spirit is mathematically signified, as he himself asserted, it is not surprising that later poetry also appeals to the mathematical process of substitution, thus being within the sphere of literary hermitism. Suggestive, in this sense, is the poem *Oul dogmatic (The Dogma)* here, in Liviu Georgescu's translation: *And the Spirit of God/ Moved above the face of the waters */ It's given to these gloomy folks/The sterile egg for daily meal,/ But lively egg with seed on top/ It's born in our sight as sunny seal!/ As ancient world, in crystal time,/ Is swimming in a thinly lime,/ The new and pure egg – a gift/ For wedding, a palace or a crypt./ Three sheets of silk coiled in a row,/ The white sleeps in such bed of snow/ So languid, and enclosed, serene,/ Like loved-one tumbled in a dream./ The human seed?/ From very high/ From the plus pole of his own sky/ Where lump of earth/ Has never touched a bit./ He offers smoothly/ His bursting kiss/ So masculine/ To the white/ With its cold lips of hyaline.[...] (The Dogma)*

Going from high school to college, Dan Barbilian/Ion Barbu finds that mathematics is an increasingly indulgent food and the interest in literature is waking up, but the war years are coming, and the young plutonary is mobilized in Moldova. Even so, in his recruitment box he has, among other things, two mathematical works which, later, arouse the attention of Professor Gheorghe Țițăica, one of the most important Romanian mathematicians of all times. Among them, it is also the first enterprise of axiomization of algebraic geometry, a problem which was then at the center of scientific concerns and which received a complete solution, regarding Abel's fundamental theorem. The means of solving it constituted certain congruencies relative to an abelian group, in additive transcription. At the same time, he asserts himself as a poet, the literary critic Eugen Lovinescu noting, in the magazine "Sburătorul" (The Flyer), the appearance of a new Poet. However, the critical reception of the moment was not entirely favorable to Barbu, recognizing his talent, but reproaching him with the lack of feeling and artistic emotion. In this context, Lovinescu also defends Barbu, claiming that his poetry arouses ... emotional emotions. Rarer and less accessible. For example, here is poem *Joc secund (A Hidden Game)*, in Liviu Georgescu's translation: *From time, abstracted the depth of*

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this peaceful crest,/ Gone through the mirror into redeemed azure/ Engraving on the sinking flocks of rustic fest/ Out of the water groups, a second game, more pure./ Latent Nadir! The poet elevates summation/ Of spread out harps you lose in a reverted flight/ And painfully distils a song: hidden, as only sea's cremation/ Sways its Medusas under the greenish bells of light. (A Hidden Game)

After receiving his degree in mathematics, he is sent to doctoral studies in Goettingen and from this moment on, his existence will unfold on two incompatible planes, from the perspective of many: mathematics and poetry. However, the poet-mathematician demonstrated (again!) the opposite by stating his belief: *through my work, the major mathematical research receives an organization and orientation close to that of the poetic function, which, by metaphor approaching the disjoint elements, develops the identical structure of the sensitive universe.*

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Web sources:

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Mathematician Dan Barbilian - Poet Ion Barbu

Airinei Oana-Mihaela, teacher

Dan Barbilian was born on March 19, 1895 in Câmpulung-Muscel, Argeş county, having as parents Constantin Barbilian - judge in Rucăr and Smaranda, the daughter of prosecutor Şoiculescu from Câmpulung.

His father, Constantin Barbu, was the son of Ion Barbu, a mason in a Bucharest neighborhood. He enrolled at the "Nifon" Theological Seminary in Bucharest, but the form teacher, who was a Latin teacher, saw that there were several students in that group who bore the name of Barbu and decided to write it in the class register with the name of Constantin Barbilian. With this name the father of the future mathematician and poet graduated his studies, got married and registered his only son.

In memory of his grandfather, Ion Barbu, the mathematician Barbilian chose as literary pseudonym the name of Ion Barbu.

In high school Ion Banciu had as a Mathematics teacher, the person who influenced his future, as the former student himself stated: He was the teacher, the man who trained me, from whom I learned the essence. The other Mathematics teachers, including those at the University, did not teach me, they informed me. But Banciu passed me his sense of rigor, he planted my mathematical affect, the emotion in front of the beauty of a theorem and the passion of the research, without which you cannot be a mathematician. [...] Banciu was the providential man of my adolescence.

Ever since high school, student Barbilian published outstanding contributions in the journal *Gazeta matematică (Mathematics Gazette)*. At the same time, Barbilian developed his passion for poetry. Between 1914-1921, he studied Mathematics at the Faculty of Sciences in Bucharest, his studies being interrupted by the period when he fulfilled his military service during the First World War. His teachers were Gheorghe Țițeica, David Emmanuel, Traian Lalescu, Anton Davidoglu and Dimitrie Pompeiu.

Between 1921 and 1924, he continued his studies in Göttingen, Tübingen and Berlin. He had friends, among others, the mathematicians: Wilhelm Blaschke, Heinrich Grell, Helmut Hasse, Emil Artin and others. His mathematical career continued with the support of his doctoral thesis in 1929. In the following years he participated in various international conferences in the field of Mathematics, such as the International Mathematical Congresses in Hamburg (1936), Göttingen and Vienna (1938), Oslo (1936), Prague (1934).

His scientific work (over 100 memoirs and articles and over 30 conferences) is of great importance and gathers interests and admirable results in the field of Geometry, especially Geometric Algebra, modern algebra, or the axiomatization of deductive sciences. His numerous and remarkable studies on the metrics of sets (which he called oscillating geometries) led to the introduction of spaces later called Barbilian Spaces or Barbilian Geometry.

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The theory of Barbilian spaces was extensively analyzed in four works: *On a Principle of Mastery*, Mathematics Research Study 10 (1959), *The Foundations of the Abstract Metrics of Poincaré and Carathéodory as an Application of a General Principle of Metrization* (paper presented at the Institute of Mathematics on June 4, 1959), appeared in *Mathematical Studies and Research*, vol. 10 (1959), *J-the Finite Natural Metrics*, published in the same magazine in vol. 11 (1960), *J-the Finite Natural Metrics and the Function of Representation of Riemann*, a paper written together with Nicolae Radu and published posthumously, also published in *Mathematical Studies and Research*, vol. 12 (1962). The well-known mathematician also gave for the first time a system of seven axioms consistent and categorical for Hilbert-Lendemann geometries and generalized the concept of nilpotent and many other algebraic ideas and concepts. His concerns in the field of Mathematics influenced the times and left many issues open, many Romanian and foreign mathematicians starting their studies in the fields opened by Dan Barbilian.

The remarkable mathematician did many valuable works such as: *Course in General Mathematics*, *Course in Axiomatic Algebra*, *Arithmetic Theory of Ideals in Non-Commutative Rings*, *Galois Theory of Equations in Steinitz's Axiomatization*, *Axiomatization of Classical Mechanics*, *Groups with Operators (decomposition theorems of algebra)* etc.

Dan Barbilian also held various teaching functions. In 1925 he was appointed secondary substitute teacher of the high school in Giurgiu. In 1926 he was appointed assistant to the chair of Gheorghe Țițăica where he would work until 1932, at the same time being secondary teacher at the high schools "Spiru Haret" and "Dimitrie Cantemir".

In 1929 he became a Ph.D., Mathematics professor, at the Faculty of Sciences of Bucharest with the main thesis *The Canonical Representation of the Functions of the Hyperelliptical Assembly* and with the secondary thesis *Interrupted Finite Groups*, then climbed all the steps of the university hierarchy.

In 1932 he became an associate professor, Department of General Mathematics and Descriptive Geometry, tenured in 1935 and in 1938 he became a full professor at the department of Elementary and Axiomatic Mathematics. As a university professor he worked at the Faculty of Sciences until 1959 when he became ill.

As a teacher, Barbilian was distinguished by high academic standing and scientific rigor. His large mathematical culture allowed him to teach several disciplines: *The Course on Motion Geometry*, *The Basis of Projective Geometry*, *Descriptive Geometry in Invariant - Theoretical Formation*, *Congruences of Straight Lines in the Hyperbolic Space*; *Course on Geometry and Function Theory*, *Theory of Uniformization*, *Klein-Clifford Shapes of Space*, *Axiomatics of Classical Mechanics*.

Along with his passion for Mathematics, the young Barbilian was also interested in literature. He made his debut in 1918, with the poem *Ființa (The Human Being)*, in Alexandru Macedonski's literary magazine *Literaturorul*. A year later, he

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began his collaboration with the cenacle and the magazine *Sburătorul (The Flier)*, where he was noticed by the literature critic Eugen Lovinescu.

The young Barbilian owned his passion for poetry to the literary critic Tudor Vianu. Barbilian promised the critic that he would write a book of poems, being convinced that the artistic imagination was being present inside each person. The ambition led him to discover his talent and he concluded that his two great 'loves' - Mathematics and Poetry - are complementary to his life.

The appearance of the platelet *După melci (Looking for snails)* (1921), inadequately illustrated, is followed by the publication of a single volume *Joc secund (Second Game)* (1930) which made him famous. Ion Barbu himself stated: *As in geometry, I understand by poetry a certain symbolism for the representation of possible shapes of existence ... For me poetry is an extension of geometry, so, being a poet, I have never left the divine domain of geometry.* After this date, he wrote poetry only occasionally, because he dedicated himself to Mathematics.

For many people, the path up to the knowledge of mathematician Dan Barbilian is long and not always full. By the praise and appreciation brought to the poet Ion Barbu, it is understood the even greater fulfillment of Barbilian for the remarkable achievements in Mathematics. The resistance of his work and the celebrity acquired in the other field in which Barbilian manifested himself, give us a deep sense of admiration for one of Romania's greatest mathematicians.

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The most famous people in IT & Tech

Constanța Șalaru, teacher

Technology is changing the world. The companies of the most famous people in Tech have transformed our lives. Their owners are the richest people in the world.

Jeff Bezos (\$123.9 billion)



Jeff Bezos (age 56) launched Amazon.com Inc. (AMZN).

We wouldn't have ecommerce without Amazon! E-commerce has evolved in the last 20 years. Amazon starting as a simple online bookseller in 1994, and today is the biggest multi-platform e-commerce and technology. Amazon did more than make it easier and faster to buy things; it changed the nature of commerce.

Bill Gates (\$110 Billion)



Bill Gates (age 64) is the co-founder and mastermind of Microsoft (MSFT).

He founded Microsoft with Paul Allen in 1975 and since then the company is the largest software producer in the world.

Microsoft it develops, manufactures, licenses, supports, and sells computer software, consumer electronics, personal computers, and related services. Its best known software products are the Microsoft Windows line of operating systems, the Microsoft Office suite, and the Internet Explorer and Edge web browsers.

Gates was the richest man in the world for many years. His charitable giving is a big reason why he has lost ground among the world's richest. He has donated more than \$35 billion to the charitable foundation Bill and Melinda Gates (BMGF),

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Mark Zuckerberg (\$74,8 Billion)



Mark Zuckerberg (age 35) is the Facebook, Inc. (FB) co-founder. Facebook is the most popular and valuable company in social media.

Zuckerberg signed the "Giving Pledge", promising to donate at least 50 percent of his wealth to charity over the course of his lifetime.

Larry Ellison (\$65.7 Billion)



Larry Ellison (age 75) is the founder of Oracle Corp (ORCL).

Oracle has become a tech company with incredible success. The company sells database software and technology, cloud engineered systems, and enterprise software products—particularly its own brands of database management systems. In 2019, Oracle was the second-largest software company by revenue and market capitalization

Ellison is famous for his extravagant lifestyle. He owns yachts and 98% of a Hawaiian island, but he is also a tremendous philanthropist.

Larry Page (\$64.5 Billion)



Larry Page (age 46) is the other and the co-founders of Google Inc. (GOOG), that started development in 1996.

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Google is the most successful search engine in the world and has made numerous acquisitions, including You Tube.

Sergey Brin (\$62,2 Billion)



Sergey Brin (age 46) is one of the co-founders of Google (GOOG), now synonymous with online search itself. Brin was born Moscow, Russia, Soviet Union. He is a computer scientist, internet entrepreneur and philanthropist. Together with Larry Page, they founded the giant Google search engine. Today, he is president of Google's parent company, Alphabet Inc.

Steve Ballmer (\$60.9 Billion)



Steve Ballmer (age 63) is the former CEO of Microsoft, running the tech company from 2000 to 2014.

He has ramped up his philanthropy since 2014. In 2018, he invested \$59 million in Social Solutions, which makes software for nonprofits and government agencies.

Ma Huateng (\$42.2 Billion)



Ma Huateng (age 48) is the CEO of Tencent Holdings, a chinese conglomerate that he co-founded in 1998 and that has grown into the world's largest gaming

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company. Tencent is the owner of the popular messaging app, WeChat, which has a billion users.

Jack Ma (\$42.2 Billion)



Jack Ma (age 55) is the richest man in China. In 1999, Ma and a group of friends launched Alibaba Group (BABA) to address the lack of e-commerce presence in China.

In September 2019, Jack Ma stepped down as Alibaba's executive chairman.

Michael Dell (\$30.5 Billion)



Michael Dell (age 54), businessman and philanthropist, is the founder and CEO of Dell Technologies, one of the world's largest technology infrastructure companies.

In May 2017 Dell donated \$1 billion to his foundation, which focuses on child poverty; it makes both impact investments and charitable donations.

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Methods of solving mathematical problems

Pavel Daniela, teacher

The use of concepts and theorems in solving mathematical problems represents the main way by which one verifies the way and the degree in which the theoretical notions have been assimilated. The ability to solve problems is, most of the times, the criterion according to which the students are evaluated in an exam (national tests, baccalaureate, admission to college) or in class.

The main rules to be known and followed by a problem solver are:

1. The correct reading of the problem statement and the exact construction of the figure (in geometry), essential in avoiding errors of reasoning. The reading of the statement several times should not be considered a "waste of time" because it provides certain information that the student must use to solve the problem.

2. The characteristic of the statement of the problem consists in the clear knowledge of the data of the hypothesis, of the conclusion and the connection between them, of the theorems and notions related to the given problem.

3. Knowledge of some methods and methods for solving problems that establish "steps in the thinking of solving" (Have I used the whole hypothesis? Do I know a similar problem?).

4. Constructing new reasonings based on the axioms, definitions, theorems and other previously learned reasonings. For each problem, a brief analysis of the statement must be made, the choice of the method of solving, the way of thinking in the process of solving and, possibly, several variants of the solution must be motivated.

5. Discussion of the problem. Often, solving a problem does not end with finding the solution; there are situations in which they must be examined and the conditions that show the existence of other solutions, specifying, as appropriate their number; different particular cases are studied that may arise or generalize the problem.

6. Check the solutions of the problem. During solving some equations (for example containing radicals), transformations are applied to the initial equation that do not always lead to equations equivalent to the original one.

Methods used for solving problems

Method is a working process, a word that comes from the Greek *methodos* (meta = after and odos = way, which translated, means "by the way" or "by the way"). In mathematics, method means the rational path that must be followed to prove or solve a problem.

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1.The method of synthesis

This method applies both to computational problems, but also to the demonstration of certain theorems and logical reasonings. . There is a connection between the known data, and with it a problem is formulated that gives us the possibility to calculate the value of a third size that becomes known. In this way, the procedure is repeated, until all unknown quantities are found.

2.The method of analysis

The analytical method is to examine the problem first by looking at it as a whole, then, starting from the question, break it down into simple problems from which it is composed and arrange these simple problems in a logical sequence, so that their solution leads to the formulation. of the answer the question asks of the problem.

3.The analytical - synthetic method

In practice it is very rare for a problem to be solved only by the synthesis method or only by the analytical method. Usually both methods are applied to solve a problem. If we cannot start with the synthesis method, then we call for analysis until we find two data that can determine a size, and to find out, the calculations come in a synthetic order.

4. Demonstration by reduction to the absurd

Practically in mathematics it is done as follows: it is assumed that what we have to prove is not true, that is, the conclusion of the given problem is denied. Then, based on the assumption made, a series of logical deductions are made, which highlight that the assumption made leads to a false proposition. It follows that the assumption made is false and remains the true conclusion of the given problem.

Synthetic method

1.Solve the inequalities: a) $\sqrt{5x - x^2} \leq 3 - x$; b) $\sqrt[3]{x^2 + x} > 1+x$.

Solution

a) By putting the conditions of existence we obtain: $\begin{cases} 5x - x^2 \geq 0 \\ 3 - x \geq 0 \end{cases} \Leftrightarrow x \in [0, 3]$

We consider the function $f: [0, 3] \rightarrow \mathbb{R}$, $f(x) = \sqrt{5x - x^2} + x - 3$.

$$f(x) = 0 \Leftrightarrow \sqrt{5x - x^2} = 3 - x \Leftrightarrow 5x - x^2 = 9 - 6x + x^2 \Leftrightarrow$$

$$2x^2 - 11x + 9 = 0 \Leftrightarrow x_1 = 1 \in [0, 3], \quad x_2 = \frac{9}{2} \notin [0, 3].$$

Since the function f is continuous it follows that f has a constant sign on each of the intervals: [0,1] and (1,3].

$$f(0) = -3 < 0 \Rightarrow f(x) < 0, \forall x \in [0, 1);$$

$$f(3) = \sqrt{6} > 0 \Rightarrow f(x) > 0, \forall x \in (1, 3].$$

The solution of the inequation is $S = [0, 1]$.

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b) The given inequation is equivalent to inequation $\sqrt[3]{x^2 + x} - x - 1 > 0$.

Be the function $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = \sqrt[3]{x^2 + x} - x - 1$.

$$f(x) = 0 \Leftrightarrow \sqrt[3]{x^2 + x} = x + 1 \Leftrightarrow x^2 + x = x^3 + 3x^2 + 3x + 1 \Leftrightarrow x^3 + 2x^2 + 2x + 1 \Leftrightarrow (x+1)(x^2 + x + 1) = 0 \Leftrightarrow x = -1.$$

As the function f is continuous it follows that f has a constant sign on each of the intervals: $(-\infty, -1), (-1, \infty)$.

$$f(-2) = \sqrt[3]{2} + 1 > 0 \Rightarrow f(x) > 0, \forall x \in (-\infty, -1);$$

$$f(0) = -1 \Rightarrow f(x) < 0, \forall x \in (-1, \infty).$$

The solution of the inequation is $(-\infty, -1)$.

2. Determine the extreme points of the function

$$f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \begin{cases} x^2 + 2x, & \text{if } x > 0 \\ x^2 e^{-x}, & \text{if } x \leq 0 \end{cases}$$

Solution

$$f'(x) = \begin{cases} 2x + 2, & \text{if } x > 0 \\ (2x - x^2)e^{-x}, & \text{if } x < 0 \end{cases}$$

Notice that $f'_s(0) = 2$ si $f'_d(0) = 0 \Rightarrow$ the abscissa point $x = 0$ is an angular point for f . The function variation table is:

x	$-\infty$	-1	0	2	∞	
$f'(x)$	- - -	0	+	+	0 - - -	
$f(x)$	\searrow	\searrow	-1	\nearrow	0 \nearrow \nearrow $\frac{4}{e^2}$	\searrow \searrow

It follows that $x = -1$ is a minimum point and $x = 2$ a maximum point for f .

The method of analysis

3. Determine a, b, c so that the function $f(x) = ax + \sqrt{bx^2 + cx + 4}$ admits an asymptote parallel to the right $y = 4x - 2$ la $+\infty$ and the right $y = -1$ to be asymptotic to $-\infty$.

Solution

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Because $\lim_{x \rightarrow \infty} \frac{f(x)}{x} = \lim_{x \rightarrow \infty} \frac{ax + \sqrt{bx^2 + cx + 4}}{x} = a + \sqrt{b} \Rightarrow a + \sqrt{b} = 4$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} x \left(a - \sqrt{b + \frac{c}{x} + \frac{4}{x^2}} \right) =$$

$$-\infty(a - \sqrt{b}) = \begin{cases} -\infty, & \text{if } a - \sqrt{b} > 0 \\ \infty \cdot 0, & \text{if } a - \sqrt{b} = 0 \\ \infty, & \text{if } a - \sqrt{b} < 0 \end{cases} \Rightarrow$$

$\Rightarrow a - \sqrt{b} = 0$. There is the system $\begin{cases} a + \sqrt{b} = 4 \\ a - \sqrt{b} = 0 \end{cases} \Leftrightarrow \begin{cases} a = 2 \\ b = 4 \end{cases}$.

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} \left(\sqrt{4x^2 + cx + 4} + 2x \right) = \lim_{x \rightarrow -\infty} \frac{cx + \beta}{\sqrt{4x^2 + cx + 4} - 2x} = \frac{c}{-4}$$

$\Rightarrow -\frac{c}{4} = -1 \Leftrightarrow c = 4$. Consequently $a=2$, $b=4$ and $c=4$.

4. Determine the value of the real parameter a for which the curve $y = \frac{x^2 - 9}{x^2 + ax + a}$ has a single vertical asymptote.

Solution We have three situations:

- the fraction is simplified by $x-3 \Rightarrow 9+3a+a=0 \Leftrightarrow a = -\frac{9}{4}$ si $y = \frac{4(x+3)}{4x+3}$
- the fraction is simplified by $x-3 \Rightarrow 9-3a+a=0 \Leftrightarrow a = \frac{9}{2}$ and $y = \frac{2(x-3)}{2x+3}$
- the denominator has a double root, ie $a^2-4a=0 \Leftrightarrow a=0$ sau $a=4$, where we get

$$y = \frac{x^2 - 9}{x^2}$$

or $y = \frac{x^2 - 9}{(x+2)^2}$.

So, if $a \in \{-9/4, 9/2, 0, 4\}$ the curve has a single vertical asymptote.

The analytical-synthetic method

Prove that there is only one real number a , $a > 0$, with the property

$$a^x \geq x^a, \forall x > 0.$$

Solution. Let the function $f : (0, \infty) \rightarrow \mathbb{R}$, $f(x) = a^x - x^a$. If we have $f(x) \geq 0$, $\forall x > 0$ and since $f(a) = 0$, it turns out that $f(x) \geq f(a)$, $\forall x > 0 \Rightarrow$ is the local minimum point $\Rightarrow f'(a) = 0$.

$$f'(x) = a^x \ln a - ax^{a-1} \Rightarrow f'(a) = a^a \ln a - aa^{a-1} = 0 \Rightarrow \ln a = 1 \Leftrightarrow a = e.$$

We prove that $e^x \geq x^e$, $\forall x > 0$, which by logarithm is equivalent to

$$x \geq e \ln x, \forall x > 0 \Leftrightarrow x - e \ln x \geq 0, \forall x > 0.$$

Let $g: \mathbb{R}_+^* \rightarrow \mathbb{R}$, $g(x) = x - e \ln x \Rightarrow g'(x) = \frac{x-e}{x}$, $\forall x > 0$ and $g'(x) = 0 \Leftrightarrow x = e$.

x	0	e	∞
$g'(x)$	- - -	0	+ + + + +
$g(x)$	$\searrow \searrow$	0	$\nearrow \nearrow \nearrow$

From the variation table of the function it follows that $x = e$ is the minimum point for $g \Rightarrow g(x) \geq g(e)$, $\forall x > 0 \Rightarrow g(x) \geq 0$, $\forall x > 0 \Rightarrow x \geq e \ln x \Rightarrow e^x \geq x^e$, $\forall x > 0$.

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Second degree and reducible to second degree equations, solved in the set of real numbers

Tudorița Zavaliche, teacher

1) Second degree equations

The equation: $ax^2 + bx + c = 0$, unde $a, b, c \in \mathbf{R}$, $a \neq 0$, x variable, is called the second degree equation (square equation).

The numbers a , b and c are called coefficients of the equation of the second degree, and the number $\Delta = b^2 - 4ac$ is called discriminant of the equation of the second degree.

a) If the discriminant of the equation is positive, then the equation has two distinct real roots:

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a} \quad \text{and} \quad x_2 = \frac{-b + \sqrt{\Delta}}{2a}$$

b) If the discriminant of the equation is equal to zero, then the equation has two real roots equal (one root of multiplicity two):

$$x_1 = x_2 = -\frac{b}{2a}$$

c) If the discriminant of the equation is negative, then the equation has no real roots.

2) Two-quadratic equations

The equation: $ax^4 + bx^2 + c = 0$, where $a, b, c \in \mathbf{R}$, $a \neq 0$, x - variable, is called a two-quadratic equation. By substituting $x^2 = t$ (then $x^4 = t^2$) the two-quadratic equation is reduced to a second degree equation.

3) Fourth degree symmetric equations

The equations: $ax^4 + bx^3 + cx^2 + bx + a = 0$, where $a, b, c \in \mathbf{R}$, $a \neq 0$, x are called symmetrical equations of the fourth degree.

By substitution: $t = x + \frac{1}{x}$, this type of equations are reduced to second degree equations. In fact, since $x = 0$ is not a solution of the equation ($a \neq 0$), by multiplying with $\frac{1}{x^2}$ both members of the equation, the equivalent equation is obtained:

$$ax^2 + bx + c + \frac{b}{x} + \frac{a}{x^2} = 0 \quad \text{or} \quad a\left(x^2 + \frac{1}{x^2}\right) + b\left(x + \frac{1}{x}\right) + c = 0$$

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It is noted $x + \frac{1}{x} = t$ then $|t| \geq 2$ and since $x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2 = t^2 - 2$, the equation becomes: $a(t^2 - 2) + bt + c = 0$, that is, an equation of the second degree, the solution of which has no difficulties.

Note: The equation $bx^3 + cx^2 + bx + a = 0$, is reduced to a second degree equation using substitution $t = x - \frac{1}{x}$.

4) Reversible equations

The equation: $ax^4 + bx^3 + cx^2 + dx + e = 0$, where $\{a, b, c, d\} \in \mathbf{R}$, $a \neq 0$, $b \neq 0$ and $\frac{e}{a} = \left(\frac{d}{b}\right)^2$ is called the fourth degree reversible equation.

This type of equation is reduced to a second degree equation using substitution:

$$t = x + \frac{d}{bx}$$

5) Equations of the form $(x + a)^4 + (x + b)^4 = c$

Substitution is used $t = x + \frac{a+b}{2}$ and reduced to a two-quadratic equation with respect to t .

6) Equations of the form $(x + a)(x + b)(x + c)(x + d) = m$, where $a + b = c + d$

This type of equation is reduced to a second degree equation using essentially the condition

$$a + b = c + d. \text{ Indeed: } (x + a)(x + b) = x^2 + (a + b)x + ab$$

$$(x + c)(x + d) = x^2 + (c + d)x + cd = x^2 + (a + b)x + cd$$

and noting $x^2 + (a + b)x = t$ (or $x^2 + (a + b)x + ab = t$) $(t + ab)(t + cd) = m$ (respectively $t(t + cd - ab) = m$).

7) Equations containing mutually inverse expressions

The equations $a \cdot \frac{f(x)}{g(x)} + b \cdot \frac{g(x)}{f(x)} + c = 0, (ab \neq 0)$, are reduced to square equations

by the substitution: $t = \frac{f(x)}{g(x)}$ then $\frac{g(x)}{f(x)} = \frac{1}{t}$ and the equation is written $at^2 + ct + b = 0$.

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