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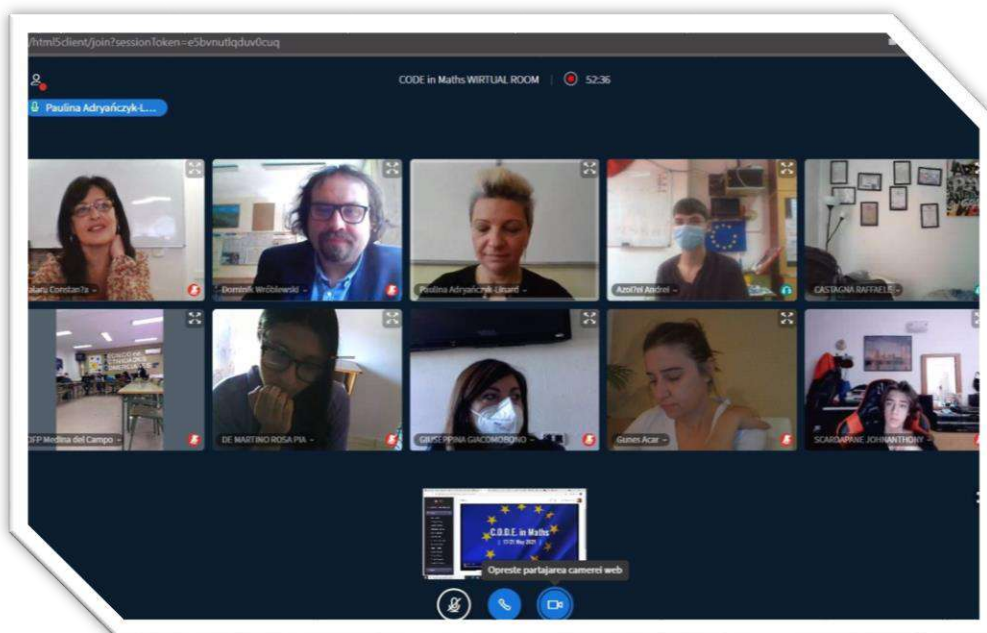


COD E in MATHS

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: 31-08-2021

Project Total Duration: 36 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

SHORT-TERM EXCHANGES OF GROUPS OF STUDENTS

C5.Maths and Robotics+Coding in STEM

17th-21st May 2021, Poland

Day	Activities	
Monday 17th May	<p>11.00 am - on school platform – integration meeting (welcoming, socialization, presentations of schools, Łódź – our city)</p> <p>13.00 pm - meeting with comics artist, illustrator</p>	<p>All students and teachers together, logged at school platform (they received information with logins and passwords on their emails). There was a special course CODE IN MATHS with room for online meetings (big blue button).</p> <p>On school platform – 30 students logged (others as observers).</p> <p>After – short meeting – only teachers/coordinators-organizational matters.</p>
Tuesday 18th May	<p>Computer graphics workshops.</p> <p>9.30 – 11.00</p> <p>11.30 – 13.00</p> <p>13.30. – 15.00</p>	<p>On school platform. Students had to be divided into 3 groups. Each group at different hour.</p>
Wednesday 19th May	<p>Art Museum in Łódź - one of the oldest museums of modern art in the world.</p> <p>Workshops – Avant-garde art.</p> <p>9.30. – 11.00.</p> <p>11.30.-13.00.</p>	<p>Students got zoom link for the workshops. They were divided into 3 groups. Each group at different hour. They needed paper, crayons, ink or paint</p>

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	<p>13.30. – 15.00.</p> <p>12.30-14.00 workshops with comics artist.</p>	<p>Max. 10 students logged. It was a workshop for students who were really interested in drawing.</p> <p>This group of students attended art workshops at 9.30.</p> <p>This activity took place on school platform.</p>
Thursday 20th May	<p>9.30.-10.30 joint meeting – presentations about scientists</p> <p>Royal Castle in Warsaw. Museum Lesson – At the Royal Court.</p> <p>11.00 12.00 13.00</p>	<p>On school platform.</p> <p>Students got zoom link for the lesson.</p> <p>They were divided into 3 groups. Each group at different hour.</p>
Friday 21st May	<p>EC1 – science centre in Łódź.</p> <p>Workshops – Extreme weather phenomena.</p> <p>10.00 11.00 12.00</p> <p>13.00 – final joint meeting</p>	<p>Students got zoom link for the workshops.</p> <p>They were divided into 3 groups. Each group at different hour.</p> <p>On school platform.</p>

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Practical Work - Assembly of CNC Milling Cutters

Student: Andrei Azoitei

Teachers: Gabriela-Brândușa Horlescu, Eleonora Dragomir

Execution stages

1.1. Mounting

- Drew lines on a 12 mm wooden board;
- Cut the wood respecting the markings;
- Assembling the resulting plates;
- Drilling the places where the clamps were to be mounted;
- Mark the holes for the guide bars and bearings.

1.2. Mounting the cutter and its support

- The components of the cutter support are printed on a 3D printer;
- For this cutter we use a 24V 5A motor (for engraving);
- Its support is fixed with M3 screws;
- We must install limitators for automatic adjustment.



1.3. Testing

We tested the cutter support mounted on the CNC base to see the big picture.

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1.4.General assembly

- assembly of all components;
- connecting the motor supply (milling cutter and stepper motors);
- connecting the limiters to the control board;
- connecting the stepper motors to the control board.



1.5.Final testing



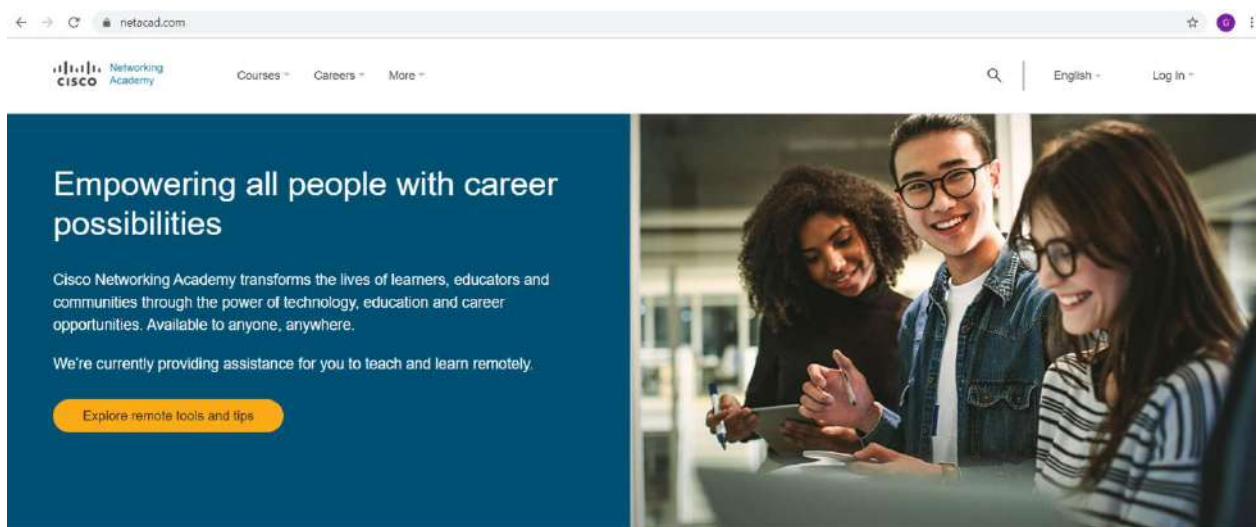
<https://youtu.be/oA6gv5VmaB0>

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Cisco Networking Academy Educational Platform for Vocational Training

Gabriela-BrândușaHorlescu, teacher

Through the power of new technology and education, Cisco Networking Academy is transforming the lives of students, educators, and communities. Packet Tracer is a powerful computer network simulation tool built by Cisco. Simple and complex computer networks can be built, the software program having a variety of communication devices. Packet Tracer can be used as a learning tool for training, distance learning, vocational training.



<https://www.netacad.com/>

Cisco Networking Academy transforms the lives of students, educators, and communities around the world through the power of technology, education, and career opportunities.

The platform offers a diverse range of training courses in the field of IT, electronics and automation, for a successful career.

All courses are updated, complete information can be found in the section <https://www.netacad.com/courses/all-courses>.

Networking Essentials	Introduction to Cybersecurity
Cybersecurity Essentials	CyberOps Associate
CCNA Security	Introduction to IoT
IoT Fundamentals: Connecting Things	IoT Fundamentals: Big Data & Analytics

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IoT Fundamentals: Hackathon Playbook	Get Connected
IT Essentials	NDG Linux Unhatched
NDG Linux Essentials	NDG Linux I
NDG Linux II	PCAP: Programming Essentials In Python
CLA: Programming Essentials in C	CPA: Programming Essentials in C++
CPP: Advanced Programming in C++	Entrepreneurship
Intro to Packet Tracer	CCNA: Introduction to Networks
CCNA: Switching, Routing, and Wireless Essentials	DevNet Associate
IoT Fundamentals: IoT Security	Workshop: Model-Driven Programmability
Workshop: REST APIs using Webex Teams	CCNA: Enterprise Networking, Security, and Automation
CCNP Enterprise: Advanced Routing	CCNP Enterprise: Core Networking CLP: Advanced Programming in C

During February-March 2021, a number of 3 teachers and 11 students from the technical profile, electronic field and automation, specialization Technical operator computer technician attended the course **Introduction to Packet Tracer** within the Authorized Center of the "Gheorghe Cartianu "Technical High School.

The course is extremely useful for students in this specialization, and can be taken during the practical training stage, in the specialized module Local computer networks.

Since 2016, I have been coordinating the Cisco Authorized Center at my school.

Both students and teachers in the school have the opportunity to attend these courses for free.

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COURSE ID	COURSE NAME	START DATE	END DATE	INSTRUCTORS	STATUS	FACILITATING
Cartianu12	Introduction to Packet...	26 Feb 2021	26 May 2021	Gabriela Brandusa Ho...	Recently Ended	Course Details










Introduction to Packet Tracer
Cisco



Instructor 5 Years of Service
Cisco

Introduction to Packet Tracer

-  Length: 10 hours
-  Cost: Free*
-  Level: Beginning
-  Learning Type: Online self-paced
-  Achievements: Badge
-  Languages: English, Українська



Online self-paced

Intro to Packet Tracer

Enroll to download your free copy of Packet Tracer and learn basic skills with the tool.

Beginning

[Learn More](#)

This course is free and is designed for beginners, with no prior knowledge of computer networks, best practices are offered for using the innovative virtual simulation tool, Cisco Packet Tracer.

Discover the basic operations of the Packet Tracer simulator with several practical activities that help you visualize a network of computers, using examples from everyday life, including the Internet of Things (IoT).

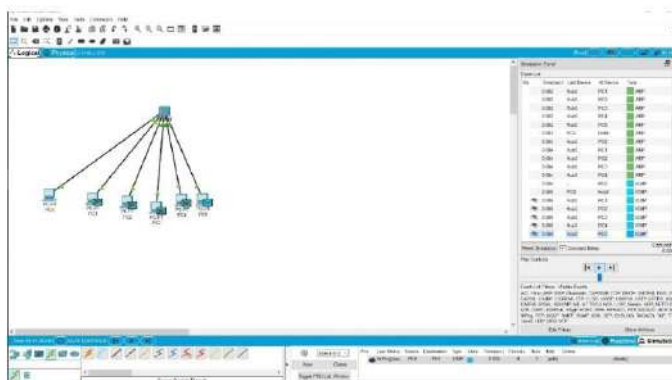
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This introductory course is extremely useful for anyone intending to pursue a career in IT, focusing on developing professional skills and deepening knowledge in the field of computer networks:

- Simulation of a computer network;
- Visualizing a network in logical and physical mode;
- Practical applications, using Cisco Packet Tracer labs and activities.
- Developing critical thinking and problem solving skills.

Cisco Packet Tracer is a visual simulation tool developed by Cisco that provides users with the ability to create network topologies and simulate modern computer networks.

This technology is a new and interesting way to extend teaching and learning experiences beyond the confines of a traditional laboratory. Packet Tracer helps you solve some common challenges that network administrators face on a daily basis, while helping us explore new frontiers in networking education. Packet Tracer provides multiple ways to demonstrate network design and configuration concepts.



Useful Links:

Basics of Cisco Packet Tracer (Part 1)	https://youtu.be/frUQMhXhNvs
Basics of Cisco Packet Tracer (Part 2) Hub	https://youtu.be/FZ8hRDakHvI
Basics of Cisco Packet Tracer (Part 3) Switch	https://youtu.be/eFY6mi3lmRQ
Basics of Cisco Packet Tracer (Part 4) Router	https://youtu.be/FnH1XUQsoD8

Bibliography: <https://www.netacad.com/courses/packet-tracer>

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Mathematical Induction

Daniela Pavál, teacher

The reasoning by which a particular sentence is obtained from several general sentences is called *induction*. The method of reasoning by which the conclusion is obtained after analyzing a finite number of cases and not all possible cases is called incomplete induction. The reasoning by which the conclusion is obtained after analyzing all possible cases is called complete induction.

By incomplete induction, true sentences are not always obtained. Incomplete induction has a limited field of applicability in mathematics, because mathematical sentences refer to an infinite set of elements (the set of natural numbers, the set of prime numbers, the set of polyhedra, etc.).

The principle of mathematical induction is an important means of proving sentences (statements) that depend on a natural argument.

The principle of mathematical induction

Let $m \in \mathbb{N}$ be a fixed natural number and $P(n)$ a mathematical proposition that depends on n , $n \in \mathbb{N}$, $n \geq m$.

If $P(m)$ is true and for any natural number $k \geq m$ we have $P(k) \text{ true} \Rightarrow P(k+1)$ true, then $P(n)$ is true for any natural number $n \geq m$.

Mathematical induction method

Let m be a fixed natural number and $P(n)$ a mathematical sentence that depends on n , $n \in \mathbb{N}$, $n \geq m$. The mathematical induction proof that $P(n)$ is true $\forall n$, $n \in \mathbb{N}$, $n \geq m$ consists of two steps:

- I) Verification stage - check if $P(m)$ is true.
- II) Demonstration stage - prove the implication $P(k) \Rightarrow P(k+1)$, $\forall k$, $k \in \mathbb{N}$, $k \geq m$.

In some cases the method of mathematical induction is used in the following form:

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Let $m \in \mathbb{N}$ be a fixed natural number and $P(n)$ a mathematical sentence that depends on n , $n \in \mathbb{N}$, $n \geq m$.

I) Verification stage

Check if $P(m)$ is true.

II) Demonstration stage

Prove the implication $P(m), P(m+1), \dots, P(k) \Rightarrow P(k+1), \forall k, k \in \mathbb{N}, k \geq m$.

Although it does not always lead to true conclusions, incomplete induction is useful because it allows an assumption to be made, which can then be proved by mathematical induction.

Examples

1. Determining the general term of a string in the lesson **Arithmetic Progress** it is good to present the way of obtaining the formula of the general term and the demonstration of the formula.

Let $(a_n)_{n \geq 1}$ be an arithmetic progression. The relation $a_n = a_{n-1} + r, n \geq 2$,

$$\left. \begin{array}{l} a_2 = a_1 + r \\ a_3 = a_2 + r \end{array} \right\} \Rightarrow \left. \begin{array}{l} a_3 = a_1 + 2 \cdot r \\ a_4 = a_3 + r \end{array} \right\} \Rightarrow \left. \begin{array}{l} a_4 = a_1 + 3 \cdot r \\ a_5 = a_4 + r \end{array} \right\} \Rightarrow a_n = a_1 + (n-1) \cdot r, n \geq 1.$$

The formula found is proved by mathematical induction.

We denote $P(n): (a_n)_{n \geq 1}$ be an arithmetic progression.

$$\Rightarrow a_n = a_1 + (n-1) \cdot r, n \in \mathbb{N}, n \geq 1.$$

I. $P(1)$ true

$$P(1): a_1 = a_1 + 0 \cdot r \Leftrightarrow a_1 = a_1 \text{ true}$$

II. $P(k) \Rightarrow P(k+1), \forall k, k \in \mathbb{N}^*$

$$P(k): a_k = a_1 + (k-1) \cdot r \Rightarrow P(k+1): a_{k+1} = a_1 + k \cdot r, \forall k, k \in \mathbb{N}, k \geq 1$$

$$a_{k+1} = a_k + r \xrightarrow{P(k)(A)} a_{k+1} = a_1 + k \cdot r, \forall k, k \in \mathbb{N}, k \geq 1 \Rightarrow P(k+1) (A).$$

From I. and II. $\Rightarrow P(n)$ (true), $\forall n, n \in \mathbb{N}^*$.

2. Raising the matrices to power

Let the matrix $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 2 \end{pmatrix}$. To be calculated A^n , $n \in \mathbb{N}^*$.

$$\text{Compute } A^2 = \begin{pmatrix} 4 & 3 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{pmatrix}, A^3 = \begin{pmatrix} 8 & 7 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 8 \end{pmatrix}.$$

$$\text{By induction we obtain } A^n = \begin{pmatrix} 2^n & 2^n - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^n \end{pmatrix}, n \in \mathbb{N}^*.$$

$$A^n = \begin{pmatrix} 2^n & 2^n - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^n \end{pmatrix}, n \in \mathbb{N}^*.$$

$$\text{Notăm } P(n): A^n = \begin{pmatrix} 2^n & 2^n - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^n \end{pmatrix}, n \in \mathbb{N}^* \text{ and we proved the relation by}$$

mathematical induction.

I. $P(1)$ (true)

$$P(1): A^1 = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix} \text{ true}$$

II. $P(k) \Rightarrow P(k+1)$, $\forall k, k \in \mathbb{N}^*$

$$P(k): A^k = \begin{pmatrix} 2^k & 2^k - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^k \end{pmatrix} \Rightarrow A^{k+1} = \begin{pmatrix} 2^{k+1} & 2^{k+1} - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^{k+1} \end{pmatrix}, \forall k, k \in \mathbb{N}^*$$

$$A^{k+1} = A^k \cdot A \xrightarrow{P(k)(A)} A^{k+1} = \begin{pmatrix} 2^k & 2^k - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^k \end{pmatrix} \cdot \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$

$$= \begin{pmatrix} 2^{k+1} & 2^k + 2^k - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^{k+1} \end{pmatrix} \Rightarrow$$

$$A^{k+1} = \begin{pmatrix} 2^{k+1} & 2^{k+1} - 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2^{k+1} \end{pmatrix} \forall k, k \in \mathbb{N}^* \Rightarrow P(k+1) \text{ true}$$

From I. and II. $\Rightarrow P(n)(A)$, $\forall n, n \in \mathbb{N}^*$

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3.The laws of composition

On \mathbb{R} is considered the law of composition “*”, $x * y = 3xy + 3x + 3y + 2$, $x, y \in \mathbb{R}$. Knowing that the law of composition “*” it is associative to calculate $x_1 * x_2 * \dots * x_n$, $n \in \mathbb{N}^*$, $x_1, x_2, \dots, x_n \in \mathbb{R}$.

Solution. We show that $x * y = 3(x + 1)(y + 1) - 1$, $\forall x, y \in \mathbb{R} \Rightarrow x_1 * x_2 = 3(x_1 + 1)(x_2 + 1) - 1$, $x_1, x_2 \in \mathbb{R}$, $x_1 * x_2 * x_3 = 3^2(x_1 + 1)(x_2 + 1)(x_3 + 1) - 1$, $x_1, x_2, x_3 \in \mathbb{R}$.

Inductive is obtained $x_1 * x_2 * \dots * x_n = 3^{n-1}(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_n + 1) - 1$, $x_1, x_2, \dots, x_n \in \mathbb{R}$.

Note P(n): $x_1 * x_2 * \dots * x_n = 3^{n-1}(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_n + 1) - 1$, $\forall x_1, x_2, \dots, x_n \in \mathbb{R}, \forall n \in \mathbb{N}^*$

\mathbb{N}^* and we proved the relation by mathematical induction.

I.P(1) (A); P(1): $x_1 = 3^0(x_1 + 1) - 1$, true

II.P(k) \Rightarrow P(k+1), $\forall k, k \in \mathbb{N}^*$

P(k): $x_1 * x_2 * \dots * x_k = 3^{k-1}(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_k + 1) - 1$

\Rightarrow P(k+1): $x_1 * x_2 * \dots * x_{k+1} = 3^k(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_{k+1} + 1) - 1$,

$\forall x_1, x_2, \dots, x_n \in \mathbb{R}, \quad \forall k \in \mathbb{N}^*$

$$\begin{aligned} x_1 * x_2 * \dots * x_{k+1} &= (x_1 * x_2 * \dots * x_k) * x_{k+1} \\ &= [3^{k-1}(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_k + 1) - 1] * x_{k+1} = \\ &= 3[3^{k-1}(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_k + 1) - 1 + 1] \cdot (x_{k+1} + 1) - 1 \Rightarrow \\ &\Rightarrow x_1 * x_2 * \dots * x_{k+1} = 3^k(x_1 + 1)(x_2 + 1) \cdot \dots \cdot (x_{k+1} + 1) - 1, \forall x_1, x_2, \dots, x_n \in \mathbb{R}, \forall k \in \mathbb{N}^* \Rightarrow P(k + 1) \text{ true.} \end{aligned}$$

From I .and II. \Rightarrow P(n) (true), $\forall n, n \in \mathbb{N}^*$.

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Introduction to Python. Linear Structure Algorithms

Gabriela-BrândușaHorlescu, teacher

Python is a perfect language for beginners, extremely used nowadays, with a relatively easy syntax. Python has become one of the most popular programming languages in the open source world.

Program testing can be done online: <https://www.programiz.com/python-programming/online-compiler/>.

1. Two positive numbers are known ($a > 0$, $b > 0$). Calculate the sum, the product, the difference and the result of dividing the 2 numbers.

```
a=float(input(" a="))
b=float(input(" b="))
s=a+b
d=a-b
p=a*b
i=a/b
print("a=",a)
print("b=",b)
print("s=",s)
print("d=", d)
print("p=",p)
print("i=",i)
```

2. The values of 3 floats x , y and z are known. To calculate:

-Sum $s = x + y + z$

-expression $E1 = x^2 + y^2 + z^2$ $e1 = x * x + y * y + z * z$

-expression $E2 = x^3 + y^3 + z^3$ $e2 = x ** 3 + y ** 3 + z ** 3$

-arithmetic mean $ma = (x + y + z) / 3$

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```

import math
x= float(input("x= "))
y= float(input("y= "))
z= float(input("z= "))
s=x+y+z
e1=x ** 2+y ** 2+z ** 2
e2=x ** 3+y ** 3+z ** 3
ma=(x+y+z)/3
print("x =",x)
print("y =",y)
print("z =",z)
print("s =",s)
print("e1 =",e1)
print("e2 =",e2)
print("ma =",ma)

```

3. The side of a square is known. To calculate:diagonal, area and perimeter.

```

import math
l= float(input("l= "))
diag= l*math.sqrt(2)
a=l ** 2
p=l * 4
print("l =",l)
print("diag =",diag)
print("a =",a)
print("p =",p)

```

4.The sides of a rectangle - length x, width - y are known. To calculate:diagonal, area and perimeter.

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```

import math
l= float(input("l= "))
L= float(input("L= "))
diag=L ** 2 +l ** 2
diagresult=math.sqrt(diag)
a=l*L
p=2*(L+l)
print("l =",l)
print("L =",L)
print("d =",diagresult)
print("a =",a)
print("p =",p)

```

5.The side of an equilateral triangle is known. Calculate:perimeter, area and height.

```

import math
l= float(input("l= "))
p=l * 3
a= (l**2*math.sqrt(3))/4
h= (l*math.sqrt(3))/2
print("l =",l)
print("a =",a)
print("p =",p)
print("h =",h)

```

6.The coordinates of two points in the plane P1 (x1, y1) and P2 (x2, y2) are known. Calculate the distance between the 2 points and the coordinates of the middle of the segment P1P2.

```

import math
x1= float(input("x1= "))
y1= float(input("y1= "))

```

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```

x2= float(input("x2= "))
y2= float(input("y2= "))
p= (x2-x1)**2 + (y2-y1)**2
presult= math.sqrt(p)
xmij= (x1+x2)/2
ymij= (y1+y2)/2
print("x1 =",x1)
print("x2 =",x2)
print("y1 =",y1)
print("y2 =",y2)
print("d =", presult)
print("MiddleX =", xmij)
print("Middle Y =", ymij)

```

7.The diagonals d_1 and d_2 of a rhombus are known. To calculate:side, perimeter and area.

```

import math
d1= float(input("d1= "))
d2= float(input("d2= "))
l=(d1/2)**2 + (d2/2)**2
lresult=math.sqrt(l)
p=lresult*4
a=(d1*d2)/2
print("d1 =",d1)
print("d2 =",d2)
print("l =",lresult)
print("p=", p)
print("a=", a)

```

8.Know the values of two integers x and y . Change the values of the two numbers.

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```
x= float(input("x= "))
y= float(input("y= "))
aux=x
x=y
y=aux
print("x =",x)
print("y =",y)
```

9. In the triangle ABC, the angle $A = 55^\circ$, $B = 75^\circ$. Calculate the value of the angle C.

```
a= int(55)
y= int(75)
d= int(180)
c= d-a-y
print(c)
```

STEAM Education **(Science, Technology, Engineering, Arts and Mathematics)**

Eleonora Dragomir, teacher

Today's education aims at training students' skills so that they can integrate into the labor market and be socio-professionally efficient.

Socio-professional integration often involves both the existence of hard skills related to the chosen profession (computer use, knowledge of mother tongue, foreign languages and correct expression, use of professional equipment and procedures specific to each trade) and the existence of soft skills that do not belong to the profession but to the personality (perseverance, collaboration, critical thinking, persuasion, emotional self-control, patience, empathy, nonverbal communication skills (para-verbal, etc.)). Soft skills, we will see later in this guide, can be educated by integrating art in the area of formal training of students. Therefore, integrated education, STEAM becomes increasingly necessary for the integration of graduates in modern society.

Student-centered education and the acquisition of hard competences is quite theorized today, the aim is to obtain skills from the standard of professional training and evaluate them according to performance criteria that refer to what the graduate can perform at work but do not refer to his will, motivation and in general to his emotional state, these elements being in the field of soft skills.

There are not many studies and researches on the training of soft skills. The concept is new and is perceived more as related to non-formal and informal education than to formal education. These competencies cannot be acquired theoretically but through concrete experiences felt and lived by students under the eyes of their guiding teachers.

Training standards do not refer to soft skills, although they are very important in the evolution and efficiency of the employee in his workplace and are consequently assessed by employers (Goleman 2001). In technical and vocational high schools there are no subjects in the curriculum for arts (drawing, painting, music, dance, theater) but non-formal education such as extracurricular, after-school

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or additional to formal education activities offers us a wide range of examples of good practices and experiences from which we can draw encouraging conclusions.

Here are some examples

The "Art Education Club" is an educational approach that comes to support formal education through non-formal activities in addition to formal ones. The activity of such a club takes place within "Gheorghe Cartianu" Technical High School after the school classes but the results of training and expansion of communication channels are integrated into formal education activities and support the prevention of school dropout, marginalization of disadvantaged students, increased attractiveness of the school environment and last but not least the training of soft skills in students.

In the "Art Education Club" organized in the "Gheorghe Cartianu" Technical High School through the contribution of ASCETIS associations led by Eleonora Dragomir, led by artists Ciprian Istrate and Cristian Bistriceanu, members of UAPR and the Association of Regional Aesthetic Education Association led by Ph. Dr. Gheorghe Cuciureanu UAPR member developed students' soft skills through after-school training activities followed by evaluation through concerts, exhibitions and participation in publications dedicated to students' free expression and creativity. The experience of this educational approach proves that for students preparing in technical colleges and vocational schools the study of arts is an essential factor in enlivening the teacher-student relationship and leads to the development of young people's emotional competence with all its components: self-awareness, self-control, adaptability, innovative spirit, desire to succeed, involvement, initiative, empathy, ability to capitalize on ethnic and racial diversity, political discernment, influence, assertive communication, including paraverbal and nonverbal, optimism, bonding, collaboration and cooperation, creative teamwork.

These soft skills are assessed in detail and rigorously by recruitment firms because they are essential for the employee's progress in the new job but they do not have performance criteria mentioned in the training standards. By creating Art Education Clubs in technological and vocational high schools, a gap can be filled and surprising results can be achieved in integrating students with special educational needs, students from ethnic minority groups, combating school dropout and youth inactivity.

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For the Art Education Club established in “Gheorghe Cartianu” Technical High School, providing sound equipment and musical software, musical instruments, creation of a specific space for painting with the related endowments were necessary, and they were created with the support of ASCETIS associations led by teacher Eleonora Dragomir and ERA Association led by the outstanding visual artist, Ciprian Istrate so that students could observe good practices and it was possible to stimulate their creativity according to skills and options. The Association Regional Center for Aesthetic Education led by Ph.Dr. Gheorghe Cuciureanu facilitated the participation of students from “Gheorghe Cartianu” Technical High School in cultural events, concerts, exhibitions and competitions, which stimulated students' interest to be educated through art and offered them the emotional experience through which their individual creation was exposed to a social audience which increased their motivation for education and personal development.

Through this educational experience we have noticed that art shapes behaviors, offers an elevation of personal feelings through their aesthetic analysis in the context of the community, stimulates the development of emotional intelligence to control their own feelings, empathy and communication skills, gives students the opportunity to empathize the deepest feelings in a way that makes them understandable and admirable in front of others, strengthens their self-esteem, wills and self-confidence. Artistically expressed and communicated emotion enriches communication, strengthens interpersonal relationships and brings pleasure and joy, value students' interaction with their peers and adults and helps them develop personally and professionally. Art shapes students' behavior, thinking and feeling.

In training students' soft skills, it is important to offer them the conditions for practice and self-assessment in relation to an audience belonging to the communities they belong to and objective assessment in relation to an aesthetic ideal specific to each field in which they create. That is why we created for the students participating in the Art Education Club the possibility of evaluation and formative self-evaluation by participating in cultural events within the school but also at the level of local communities, exhibitions, competition festivals, international projects.

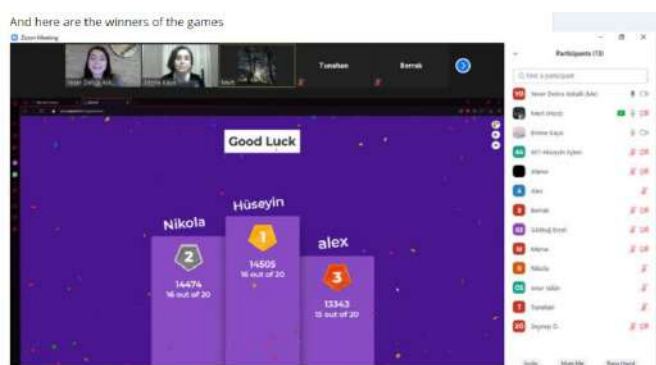
In the school year 2020-2021, the club's activity was carried out exclusively online using the eTwinning platform. We enjoyed the presence of a large number of foreign students in the club. They collaborated with Romanian students in building

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an Art Center with workshops, conferences and exhibitions inside a virtual city created by students through the Erasmus + e-Twinning project "The Break Out City".

eTwinning project "The Break Out City" took place virtually from January 5 to July 5, 2021. In this project the students of the Art Education Club coordinated by teachers Eleonora Dragomir and Văideanu Claudia from Romania, Selen Ezer and Nezarat Barbaros from Turkey actively contributed to the construction of the Music Center and the Art Center in the virtual city "The Break Out City" which hosted concerts, workshops and exhibitions.

The activity of creation and international collaboration was possible by using the didactic tools digitized from the web2.0 range. Among them I can mention in order of utility the Padlet tools to bring together the individual works of students, Zumpad to facilitate the writing of texts through the collective contribution of students with the possibility of identifying the contribution of each, Wordart to illustrate articles, posters, lessons with words, Kahoot for the organization of general culture competitions in the form of a millionaire game.



Canva web 2.0 is useful for creation of presentations , posters, invitations.

We created our works by using this application a calendar illustrated with student's works.

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The Google forms tools were useful for finding students' preferences, for assessing the impact of the project on the participating students but also for the process of evaluating students' work.

Zoom and Meet applications were needed to organize games, contests, workshops and concerts.

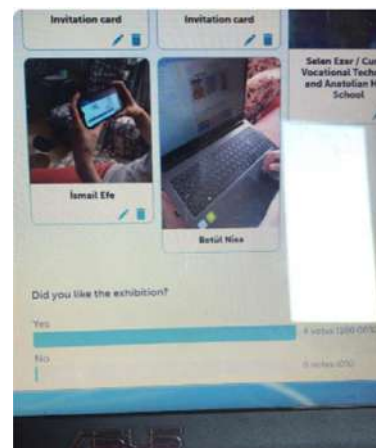
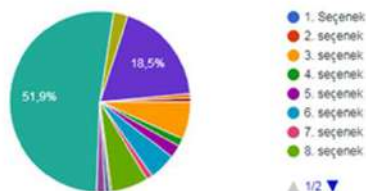
Popplet is useful for creating mind maps, Jigsawplanet for creating puzzles from various images, Voky for protecting the identity of students and teachers participating in publicly exposed online activities, also useful for illustrating comic dialogues, Emaze for creating of virtual presentations, films and exhibitions.

Art Center traditional drawing competition

271 de răspunsuri

Which traditional drawing do you like most?

270 de răspunsuri



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Below there are some images from the virtual workshop of the students which built this amazing city that housed their dreams during Covid 19 pandemic.



We made contribution with their creative works the students Dilara Erdel İnebey, Yusuf Emre Türhan, Meryem Çakır, Hümeysra Koca, Zeynep Sude Bakırlı, İlanur Çapan, Cennet Keser, Nehir Bulgan, Risale Tekin din Havran Anadolu Lisesi (TR), Betül Nisa Çatal din İstanbulluoğlu Social Sciences High School (TR), Ayşe Işık, Seher Şafak din GMK Meslek ve Teknik Anadolu Lisesi (MTAL) (TR), Kayra Ekmekçi, Serhat Bilir din Cunda MTAL (TR), Zuhal Zümrütler şi Eda İşçi Necip din Fazıl Kısakürek Anadolu Lisesi (TR), Uğur Doğruç din Mirciler Anadolu Lisesi (TR), Eli Adelina din Technical Highschool “Simeon the Great” (BG), Alma Groapa, Cojoc Otilia Yarina, Filimon Maria, din Scoala Generală Elena Cuza (RO), Cristina Avădaniei, Radu Ceraseala Petronela, Lupoi Carla, Nicoleta Daniela Grădinaru şi Cristina Avădaniei din Colegiul Tehnic “Gheorghe Cartianu” (RO) şi Cristiana Chiarrochi din IISS Dante Alighieri.

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Creative Recycling of Metallic Waste by Plasma-Cutting

Eleonora Dragomir, teacher

Waste is not only an environmental issue, but also an economic loss. On the average, Europeans produce 481 kilograms of municipal waste per year.

The amount of waste we generate is closely linked to our consumption and production patterns. The very large number of products entering the market is another challenge. Demographic changes, such as the increase in the number of single-person households, also affect the amount of waste we generate (for example, the packaging of products in smaller packages).

The wide range of types of waste and complex waste treatment routes (including illegal ones) make it difficult to get a complete picture of the waste generated and where it is located.

According to data for 2019 for 29 European countries (ie EU 28 and Norway), about 60% of the waste generated was mineral and soil waste, largely due to construction and demolition activities and mining. With regard to scrap metal, paper and board, wood, chemical and medical waste and animal and vegetable waste, each type of waste accounted for between 2% and 4% of the total.

About 10% of all waste generated in Europe is what is called "municipal waste" - waste generated mainly by households and, to a lesser extent, by small businesses and public buildings such as schools and hospitals.

An increasing part of this amount is recycled or turned into compost, while a smaller part ends up in landfills.

Metal waste holds a percentage of 2% of the total amount of waste but the waste of energy is much higher because the production of metals is done with an energy consumption 10 times higher than for any other material.

How can we change this situation so that we produce less and less waste while using all waste as a resource?

Well, we need to creatively reuse waste, that is, not throw away what's left after using a product, but find a new use for it. In this way we avoid energy

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consumption to make the new product and to bring the old product back to the raw material stage.

Regarding metal waste, an effective solution for its reuse for new purposes without the need for remelting is thermal cutting.

We chose plasma cutting as a thermal cutting process because it is the most economical process in terms of material and energy consumption.

Plasma cutting was invented by researchers at Union Carbide, the Linde division.

The plasma arc cutting process materialized when scientists were able to direct the electric arc formed between a tungsten electrode and the cutting part to increase the energy density, forming a stronger cutting arc than the welding arc and more concentrated.

The current construction of the cutting gun does not differ significantly from the first model of the 50's but many changes were needed that optimized its operation and made the work of the operator easier.

Plasma is actually an ionized gas that is a good conductor of electricity with a high temperature. It contains positively and negatively charged particles, as well as neutral atoms and molecules. Plasma is a quasi-neutral physical system (or body) from an electrical point of view, its composition includes positive, negative, neutral particles and photons. Positive particles are always atomic or molecular ions, and negative particles are usually electrons. Negative ions, formed by attaching electrons to atoms or molecules, are less common and of secondary importance. Neutral particles are atoms or molecules that can either be in a ground state (equilibrium) or are in different excited states. To produce plasma, ie to ionize the gas, it is necessary to heat the gas to a high temperature with the help of a heat source or an electric field is needed. Plasma cutting is a thermal cutting process in which a directed electric arc is used.

There are two options:

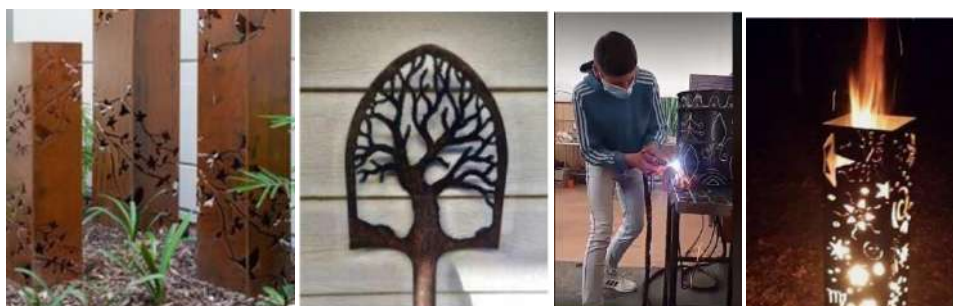
- plasma jet cutting, when the electric arc is made inside the gun and is thrown towards the piece by the blow of a gas

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- plasma arc cutting when the electric arc is between the tungsten electrode inside the gun and the surface of the cutting part. The workpiece to be cut and conducting the electric current is connected to the negative pole of the current source (anode). The energy required to melt the workpiece is provided on the one hand by the plasma jet and on the other hand by the electric arc. Under the influence of the electric arc, the plasma gases decompose and ionize partially, becoming conductors of electricity. The plasma jet has a high energy density and a very high temperature, so it goes at a much higher speed than the sound to the workpiece. When the plasma arc touches the surface of the workpiece, the energy stored in the spring is released and melts the workpiece. This technology can be used to cut thick plates of steel and aluminum alloys up to a thickness of 160 mm.

The popularity of this technology is primarily due to the profitability of cutting. Mechanized cutting can take place at a high speed (even 9 m / min) and does not require preheating. However, in the case of thin plates with small holes or in the case of exact contours, the laser may be a more advantageous solution, but this happens very rarely. For example, in the case of steels with a thickness of more than 3 mm, plasma cutting is cheaper, and in the case of aluminum or alloy steel plates with a thickness of more than 8 mm, the costs can be even five times lower if the cutting takes place. with plasma.

We developed a project to use plasma cutting to make garden decorations from scrap metal. We can use as raw material empty boxes of paint or buds, plates from bodies or boxes of broken appliances. Plasma cutting is possible even if the material is painted, rusted or enameled.



These newly produced objects would also be useful because they withstand the temperatures of a fire that could be achieved inside them and by the fact that they can withstand frost if they were filled with earth.

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The best cutting quality and the longest service life are usually obtained at an amperage set at 95% of the nozzle rating. If the amperage is too low, the cut will be inappropriate. If the amperage is too high, the nozzle service life will be affected. Proper gun assembly is also important for quality cutting. Assemble the gun so that the parts are properly aligned and firmly fixed. This ensures good electrical contact and the correct flow of gas and coolant through the gun. When changing consumables, place them on a clean cloth to prevent dust or metal from entering the gun. Cleaning during gun assembly is very important and often neglected. When we lubricate the O-ring, we use a small amount of lubricant, a larger amount of lubricant can cause clogging and penetration of metal dust into the gun, leading to an uncontrolled arc in the plasma chamber and eventually damage to the gun. We should never use Vaseline. This destroys the bow and burns inside the gun.

Here is an application of the “Little Prince” method, the compositional variant in practicing the students' abilities to prime the electric arc.



These are students' works representing a story in each wasted box .



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Creative Recycling in Electronics and ICT

Gabriela-Brândușa Horlescu, teacher

Electrical and electronic devices, personal computers have become an integral part of our lives.

Their collection and recycling of e-waste is important to prevent environmental pollution.

In technical education, we can carry out actions that will produce behaviors of students to protect the environment through creative recycling.

Thus, from defective electrical and electronic devices, such as: monitors, personal computers, peripherals, measuring and control devices, we can use some of the components to create decorative objects.

During the specialized modules, with the students from the technical profile electronics and automation we created, with the occasion of the spring holidays, martisor's using creative recycling. The students improved both their technical and artistic skills.

Materials used to make "martisoare" (i.e. March symbols, tokens, which people offer to each other at the beginning of spring):

- faulty keys from faulty personal computer keyboards;
- resistors from defective power supplies;
- LEDs from defective electronic devices;
- connecting wires in faulty computer network cables.

Acquired practical knowledge and skills:

- students have improved their knowledge in gluing / detaching electronic components;
- learned to calculate the value of resistance using color coding;
- what the LED is and how it works;

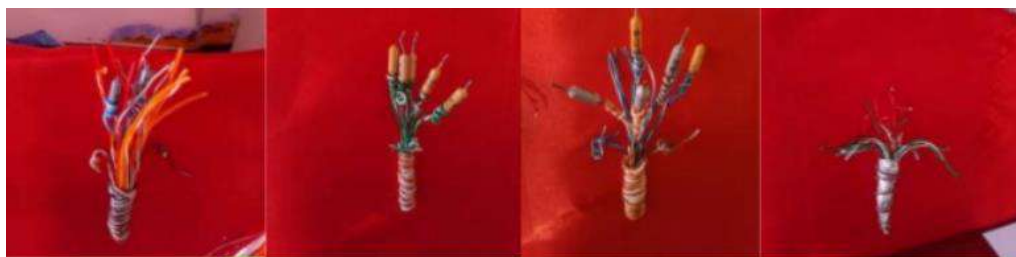
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- types of cables used in computer networks.

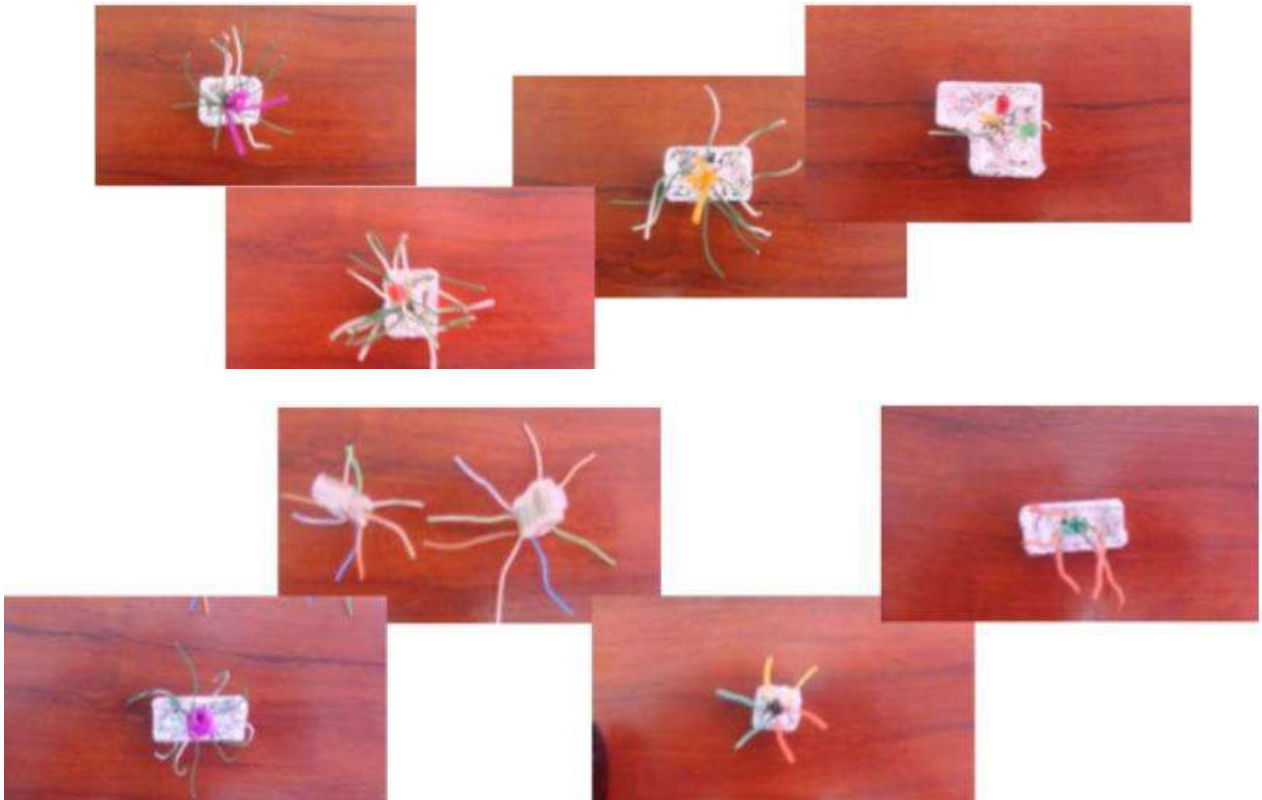
Mărțișor made from used keyboards



„Mărțișor” created from electronic components: resistors, capacitors, LEDs.



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The resistor is a component part of electrical and electronic circuits whose main property is electrical resistance. The resistor is a passive circuit element that opposes the passage of electric current if an electrical voltage is applied to its terminals. The resistor is made of different conductive materials. The unit of measurement of electrical resistance, in SI, is the Ohm, denoted by Ω .

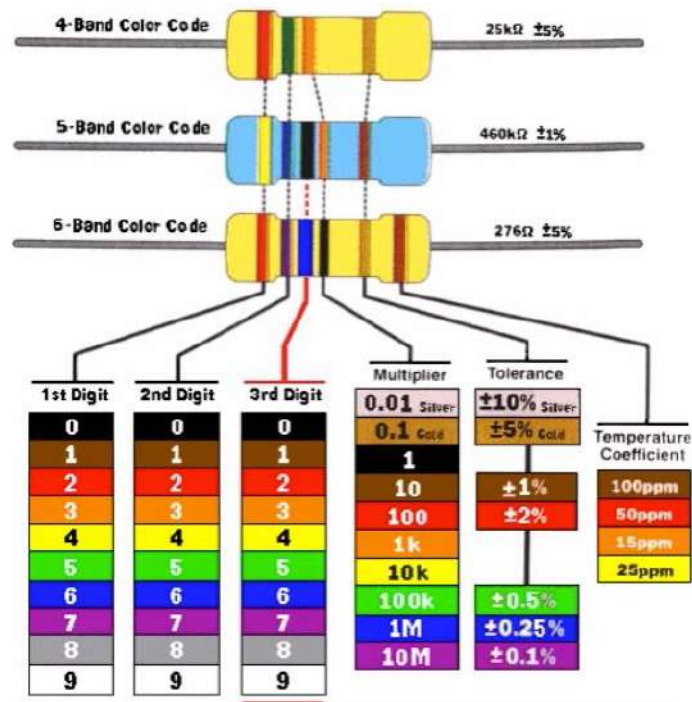
A capacitor is a passive electrical device that stores energy in the form of an electric field between two armatures charged with an equal but opposite electrical charge. The physical quantity associated with a capacitor is the electrical capacity. The unit of measurement, in the international system, for the electric capacity is Faradul, denoted by F.

The LED - the light emitting diode allows the current to pass in a direct direction, but blocks the current flow in the reverse direction.

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Resistors. The colors code

Students used the colors code to calculate electric resistance.



<https://www.instructables.com/Resistor-Color-Code-Guide/>

and they used internet - <https://epofu.ro/cc/cc.html>-to check resistance

Resistors with 4 colors

band 1 - the first significant number
band 2 - the second significant number
band 3 - the multiplication order
band 4 - tolerance



Resistors with 5 colors

band 1 - the first significant number
band 2 - the second significant number
band 3 - the third significant number
band 4 - the multiplication order
band 5 - tolerance



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Erasmus + Accreditation, the Passport to Organizational Development

Gabriela-Brândușa Horlescu, teacher

“Erasmus+ is the EU's programme to support education, training, youth and sport in Europe. This program offers mobility and cooperation opportunities in: higher education, vocational education and training, school education, adult education, youth and sport.

Erasmus accreditation is a tool for education and training organisations in adult education, vocational education and training (VET), and school education that want to open up to cross-border exchange and cooperation. Award of the Erasmus accreditation confirms that the applicant has set up a plan to implement high quality mobility activities as part of a wider effort to develop their organisation.“

Erasmus + accreditation is a tool for organizations in the sectors of adult education, vocational training (VET) and school education that want to get involved in exchange projects and activities and cross-border cooperation.

Accredited institutions will have simplified access to funding opportunities under the future 2021-2027 Program.

Obtaining Erasmus accreditation confirms that the applicant has developed a plan for the implementation of high quality mobility activities as part of the wider development and internationalization effort of the organization.

Our school submitted the Erasmus + plan by October 29, 2020 and obtained Erasmus + accreditation, the field of school education.

Nr. Crt.	Domeniu	Cod proiect	Submission ID	Cod OID	Denumire organizatie aplicanta	Localitate	Judet	Eligibilitate DA/NU	Punctaj	Observatii	Statut
312	Educatia Scolara	2020-1-RO01-KA120-SCH-095740	1687872	E10175875	Colegiul National Octav Onicescu	Bucuresti	Bucuresti	DA	72.50		Aprobat
313	Educatia Scolara	2020-1-RO01-KA120-SCH-095767	1688463	E10173591	SCOALA PRIMARA LORELAY	Iasi	Iasi	DA	72.50		Aprobat
314	Educatia Scolara	2020-1-RO01-KA120-SCH-095214	1676084	E10091007	COLEGIUL TEHNIC GHEORGHE CARTIANU	Plata-Neamt	Neamt	DA	72.00		Aprobat

Erasmus +, School Education

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- Provides opportunities for professional development, exchange of experience and transfer of good practices.
- Contributes to the development and acquisition of knowledge and skills, including language learning or deepening IT skills for students and teachers.
- Erasmus + allows the development of teaching staff skills by participating in educational activities that take place in a country other than the country of origin. Activities that can be carried out: teaching activities and continuous training (structured course and or job-shadowing activities).

Erasmus + projects that are implemented in our school:

<p>1. Technology - Addiction and Internet Dependency Syndrome, 2019-1-TR01-KA229-076936_5</p>	<p>-Identifying Internet technology and addiction in education, discovering the methods of correct use of the Internet. -International cooperation and finding solutions to reduce aggression and cyber aggression in schools. http://www.taidsproject.org/</p>
<p>2. Maker Education, 2019-1-RO01-KA229-063086_1</p>	<p>Development of professional skills in the fields of STEM, computer science, robotics, mathematics, physics and ICT. https://makereducation6.weebly.com/</p>
<p>3. Future language is robotic coding, 2019-1-TR01-KA201-077586</p>	<p>Developing the technical and scientific spirit, stimulating creativity, continuous professional training of students and teachers in the field of robotics and computer science in order to increase the quality of the educational system. https://www.facebook.com/groups/2291848674476667</p>
<p>4. VOCATIONAL- WEB-LEAP: An Open Source eLearning Platform for Training Vocational Students, Apprentices and Graduates on Web Design and</p>	<p>-Innovation, design and development of the Moodle platform on "Web Design & Development", for high school students, as follows: • "Web design and development for beginners"; • "Advanced topics for web design and development"; • "More advanced subjects in web design and development", 12th grade students. http://vocwebleap.org/</p>

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<p>Development 2019-1-TR01-KA202-076828</p>	
<p>5.Creative Opinions Differentiated Education In Maths, 2018-1-TR01-KA229-059796_3</p>	<p>-Improving students' results in mathematics, physics and technical disciplines. https://codeinmaths.weebly.com/</p>
<p>6.International Robotic Coding Festival, 2019-2-TR01-KA105-078424</p>	<p>-Developing creativity and skills in robotics and computer science using non-formal education methods.</p>

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- <https://www.erasmusplus.ro/stire/vrs/IDstire/857>
- https://www.erasmusplus.ro/library/2021/Rezultate%20Acreditare_AE_VET_SE.pdf
- <https://www.erasmusplus.ro/educatie-scolara-mobilitati>
- https://ec.europa.eu/programmes/erasmus-plus/calls/2020-erasmus-accreditation_en

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“We Can” Project. “Towards the Inclusive Education” Course

Project reference number: 2019-1-RO01-KA101-062736

Action KA1 Mobility projects

Beneficiary: Liceul Tehnologic “Dimitrie Leonida”, Piatra Neamț

Augustina Ciocîrlan, teacher

Between 2019-2021, I participated in the activities of the ERASMUS+ project „We can” where I attended the course with the topic „Towards the Inclusive Classroom: Best Practice”.

Thus, between 05 - 11.07.2020, I participated in the mobility program held in Kalamata-Greece, in which the course provider Areadne Lifelong Learning Center, presented modern techniques and international best practices related to the following topics: inclusion people with special needs, problematic behavior and learning difficulties, addressing the issue of Roma students and other nomadic communities, facilitating gifted students.



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The activities I participated in during the training program included structured study visits to local schools, giving me the opportunity to exchange experience and good practices, to discuss ideas and working methods applied at local and European level in regarding the theme of school inclusion. The study visits were carried out at a school for students with special educational needs and at a school for adults from disadvantaged backgrounds. Each study visit was structured on activities of debate and consolidation of the observed methods and techniques.

Outdoor learning activities included a gamified tour of the city, discovering in a playful way the city's attractions, stimulating the motivation and performance of learning and a local visit to a historic site.

Outdoor learning activities were accompanied by non-formal work tasks of learning European history and creating a connection between history and the subject of the course taken. Inclusive education is defined as a learning environment that promotes the complete personal, academic and professional development of all learners, regardless of race, class, color, gender, disability, sexual preferences, learning styles and language.

The purpose and objectives of inclusive education in the mobility program were:

- Education for all;
- Protecting human rights;
- Identifying skills;
- Development of social consciousness;
- Preparing for new challenges
- Improving the quality of education.

Participating in this training offered me the opportunity to support the improvement of problems identified by "Dimitrie Leonida" Technological High School, which require intervention to increase the quality of education on the integration of students with special needs, problematic behavior and from nomadic communities.

The training internship provided me with the opportunity to get involved in achieving the strategic priorities of the school through continuous training that

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supports the modernization of teaching in order to ensure a quality educational instructional process, by using peer learning methods and collaborative learning. , conducted in a safe and attractive environment.

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