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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: 31-08-2020

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

The Origami Technique

Teacher: Gabriela-Brândușa Horlescu

Origami is a word of Japanese origin (or "folding, bending" + kami "paper") meaning traditional Japanese art that starts from folding a square piece of paper to represent elements of the environment or imaginary characters.

If originally origami was an occupation of members of the imperial courts in the Far East, today the technique has expanded in the field of education.

In Japan, Germany, origami is study discipline in schools.

In our country as well the origami technique has begun to expand more and more as a method of non-formal education.

Origami can be used for didactic purposes in the education of young people, developing their imagination, creativity and inventiveness. With passion and patience students can build true works of art.

Through the creative recycling of paper in the workshop, we also wanted to encourage environmental education among students.


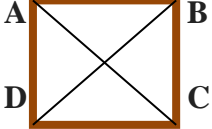
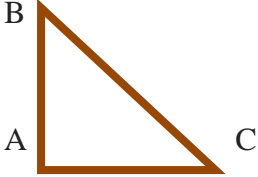
In March 2019 "Gheorghe Cartianu" Technical High School held the Origami Local Contest.

Objectives:

- forming skills to create objects using the Origami technique;
- improving, capitalizing and consolidating the knowledge of geometry;
- stimulating and harnessing students'creative potential.

The relationship between origami, math and science.

I also revised some mathematical formulas during the practical works.Origami can be integrated both in math classes and in other technical modules that use the geometric figures shown in the plan.

<p>Rectangle</p> 	<p>Lengths: $AB=DC=L$ Widths: $AD=BC=l$ Area: $L \cdot l$ Perimeter: $2 \cdot (L+l)$ Diagonal: $AC = DB = \sqrt{L^2 + l^2}$</p>
<p>Square</p> 	<p>Side: $AB=BC=CD=DA=l$ Area: l^2 Perimeter: $4 \cdot l$ Diagonal: $AC = DB = l\sqrt{2}$</p>
<p>Right triangle</p> 	<p>Legs: AB, AC Hypotenuse: BC Perimeter: $AB+BC+AC$ Area: $\frac{AB \cdot AC}{2}$ Pythagoras' Theorem: $AB^2+AC^2=BC^2$</p>

The awarding of the works took place on 25 March 2019 at the "Geometry through Origami" workshop.



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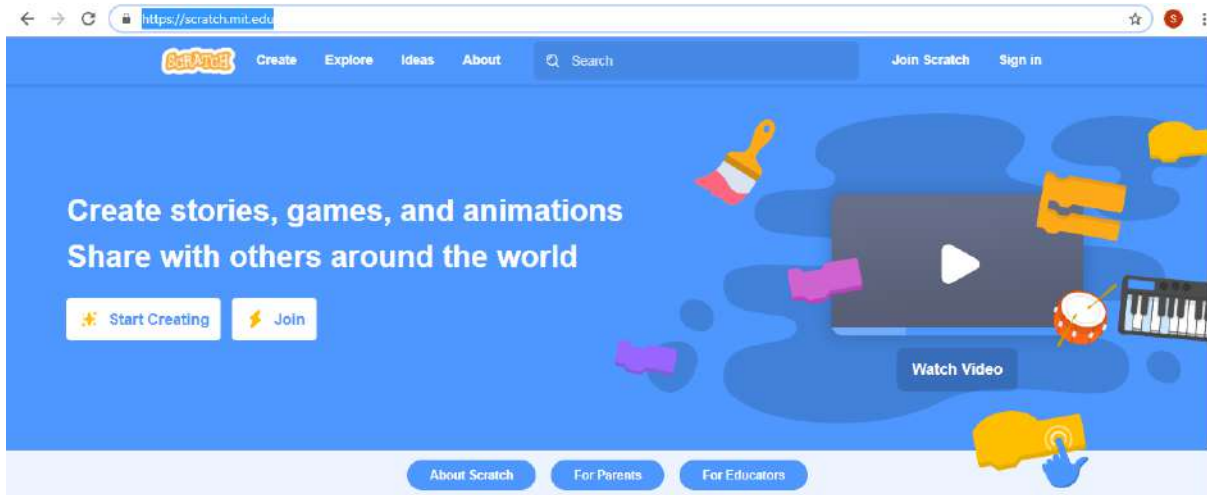
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Creating Games in Scratch

Teacher: Gabriela-Brândușa Horlescu



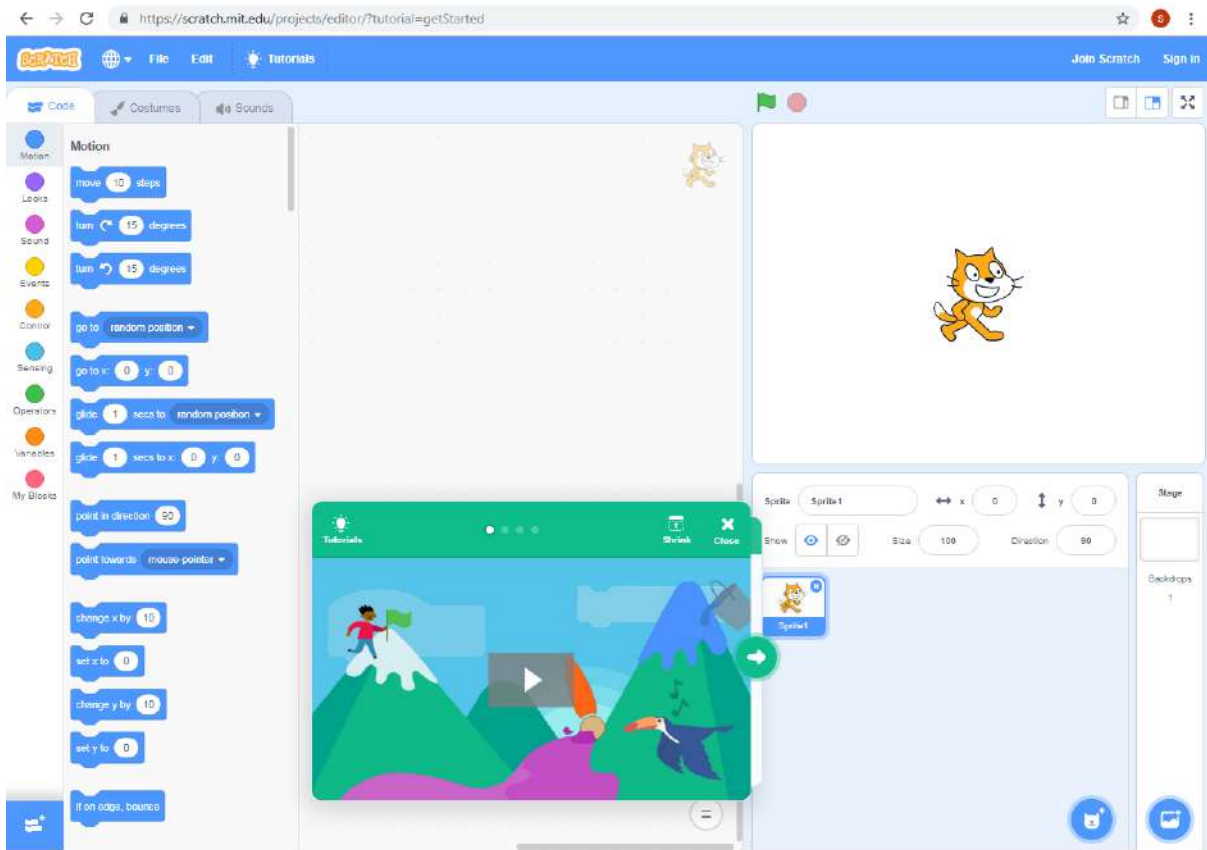
With Scratch, you can schedule your own interactive stories, games and animations to share creations made with other users in the online community.






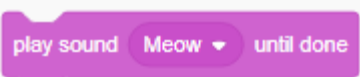






Scratch helps young people learn to think creatively and systematically, to collaborate coherently, essential skills for life in the 21st century.

In this graphical programming environment, instructions, expressions, and operators are represented by blocks. There are several blocks of blocks, located on the left side of the application window, grouped by the type of action you have performed.






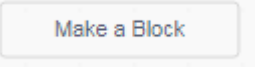
Students can create the applications online by accessing the link: <https://scratch.mit.edu/projects/editor/?tutorial=getStarted>.

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 Motion		To move, rotate and move characters.
 Looks		Displaying messages, changing the costume of a character.
 Sound		Playing sounds, changing the effects and heights of musical notes.
 Events		Setting up events.
 Control		Control blocks for alternative and repetitive structures.
 Sensing		Detect user interaction operations.

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		<p>Arithmetic, relational, logic and operators work with strings.</p>
		<p>To set variables.</p>
		<p>To create a new block.</p>

In March 2019 students did some applications in Scratch.



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**Questionnaire - STEM - Maths and Coding in Art
Preparation for mobility in Spain
(May 2019)**

Teacher: Buccione Marco

The link to access: <https://bit.ly/2GfHvEh>

You are submitting your responses to marcobuccione@outlook.it. Do not provide personal or sensitive information.

1

What country are you from?

- Italy
- Poland
- Romania
- Spain
- Turkey

2

Have you ever done any activity of Origami? Which one?

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3

What kind of angles can you do by folding paper?

4

Do you know any application of Origami? Which one?

5

Do you know how to make a paper polygon? Which one?

6

Can you make any paper polyhedron? Which one?

7

What is a circumference?

- A set of points in a circular motion
- A curved line, flat and closed
- A line joined by their radii or diameters
- A circular line

8

Which one of these triangles has two equal angles and the other one unequal?

- Isosceles triangle
- Equilateral triangle
- Right triangle
- Scalene triangle

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9

The point where the three altitudes of a triangle intersect is called:

- Incentro
- Centre of gravity
- Circumcenter
- Orthocenter

10

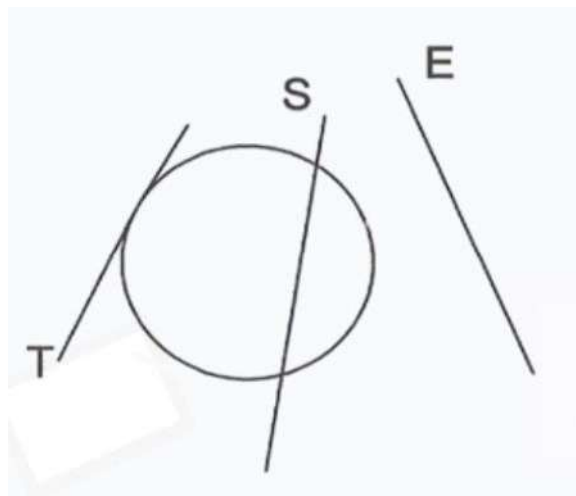
If the diameter of a circle is 10 cm, how much is its length?

- 3.14 cm
- 314 cm
- 31.4 cm
- 31.4 cm²

11

Fill in the names of the straight lines: T is a _____ S is a _____ E is a _____

- Secant, tangent, exterior
- Tangent, secant, exterior
- Exterior, secant, tangent
- Exterior, tangent, secant



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12

What is programming?

- Not performing any action
- Executing orders
- Giving instructions
- Following instructions

13

Scratch is a programming environment

- Block-based
- Text-based
- It is not a programming environment

14

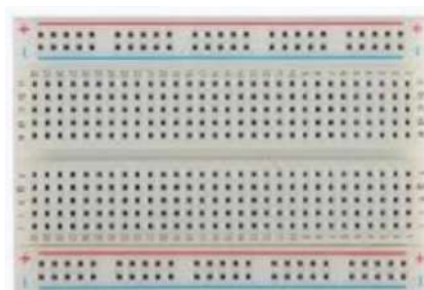
What is a LED?

- A photoelectric cell
- An insulating material
- A superconductor
- A light emitting diode

15

The device in the picture is:

- A breadboard (or test board)
- An integrated board circuit
- A printed circuit



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SHORT-TERM EXCHANGES OF GROUPS OF PUPILS

C2.Maths and Coding in Art

6th-10th May 2019, Spain

Days	Activity
May5, 2019	Arrival
May 6,2019	Culture Fest Each partner school made a presentation about their educational system and how the informal education aiming at 14-18 year old students takes place in their countries according to legislative rules and administration. Presentations about school and country. Origami workshop Visit to Valladolid
May 7, 2019	Geometry workshop - From Geogebra to CAD Teachers had a parallel activity, they visited a wine cellar in Rueda. We took a visit around the Medina, the 15th century castle and the Museo de las Ferias.
May 8, 2019	Coding workshop. From SCRATCH to M-BLOCK Visit to Salamanca.
May 9, 2019	Reception at Medina Town Hall. European day. KAHOOT activity. Teachers tasted cheese and wine. Lunch: cooking paella. Sports Centre activities.
May10, 2019	Presentation of traditional games by each country. Farewell lunch. Visit to Olmedo, Mudejar Park, Almenara, Caballero's House. Evaluation Departure
May 11,2019	Departure

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C2.Maths and Coding in Art Culture fest

On May 6, 2019 each partner school made a presentation about their educational system and how the informal education aiming at 14-18 year old students takes place in their countries according to legislative rules and administration. Presentations about school and country.



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C2.Maths and Coding in Art Origami workshop



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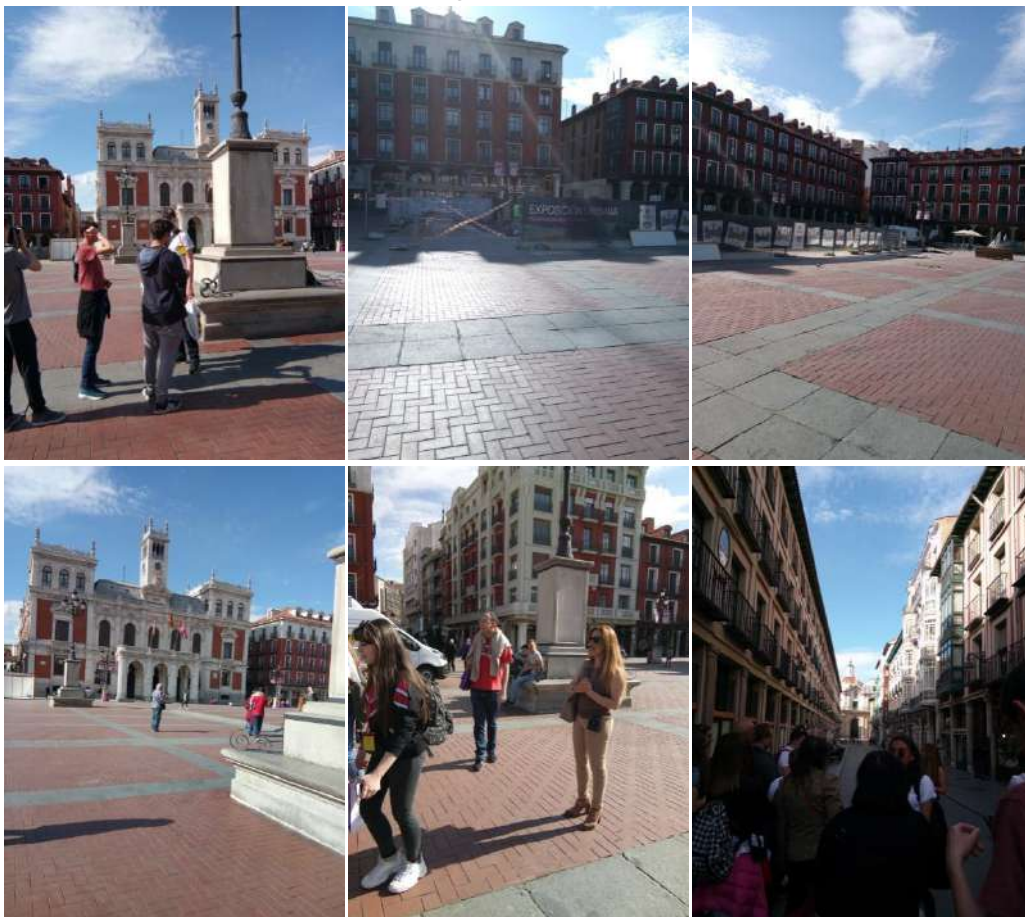
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C2.Maths and Coding in Art Visit to Valladolid

Valladolid is the capital of the region of Castilla y León from Spain. The old part of the city has an architectural ensemble consisting of churches, palaces, statues, squares and historic houses. More information about the Valladolid can be obtained by accessing the link:

<https://en.wikipedia.org/wiki/Valladolid>

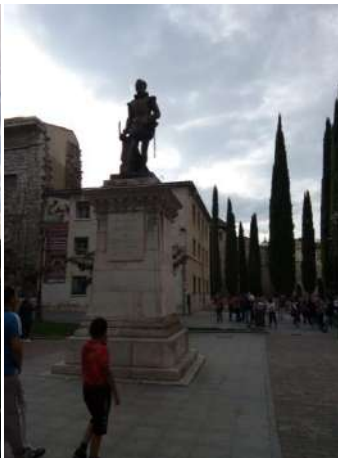
A short walk through the city allowed us to admire the architecture of the buildings and the beauty of the place: Valladolid City Hall in Plaza Mayor, Cathedral of Valladolid and Iglesia conventual de San Pablo.



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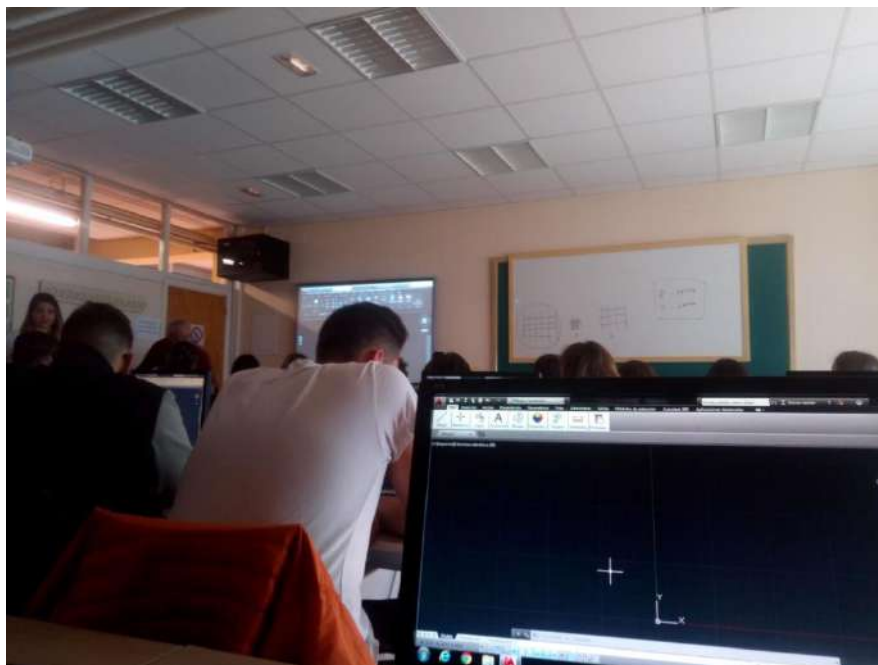
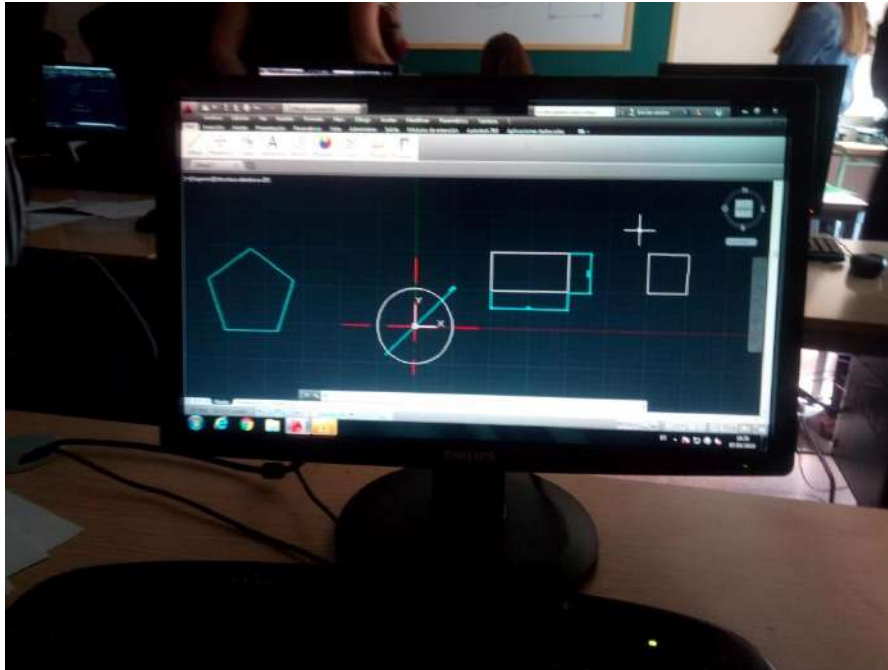
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C2.Maths and Coding in Art Geometry workshop - From Geogebra to CAD

On May 7, 2019 students improved their Computer Aided Design skills and discovered Geogebra.



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They visited the school's technical workshops and laboratories.



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C2.Maths and Coding in Art

Visit to Tordesillas and a wine cellar in Rueda

On the same day the teachers had a parallel activity: they visited Tordesillas and a wine cellar in Rueda.

Here, in Tordesillas, the Treaty of Tordesillas was signed.

The **Treaty of Tordesillas** was concluded on 7 June 1494 between Spain and Portugal, establishing the colonial zone of influence of the two maritime powers of the time. (https://en.wikipedia.org/wiki/Treaty_of_Tordesillas)



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Mocen Winery - where Art is born from Talent.

<http://www.bodegasmocen.es/en/content/sections/visit.html>



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C2.Maths and Coding in Art Visit to Medina del Campo



In the afternoon students and teachers visited:

- La Mota Castle - <http://www.medinadelcampo.es/en/castle-of-mota>
- Villa de las Ferias Museum - <http://medinadelcampo.es/museo-de-las-ferias>
- the surroundings of Medina del Campo.

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La Mota Castle



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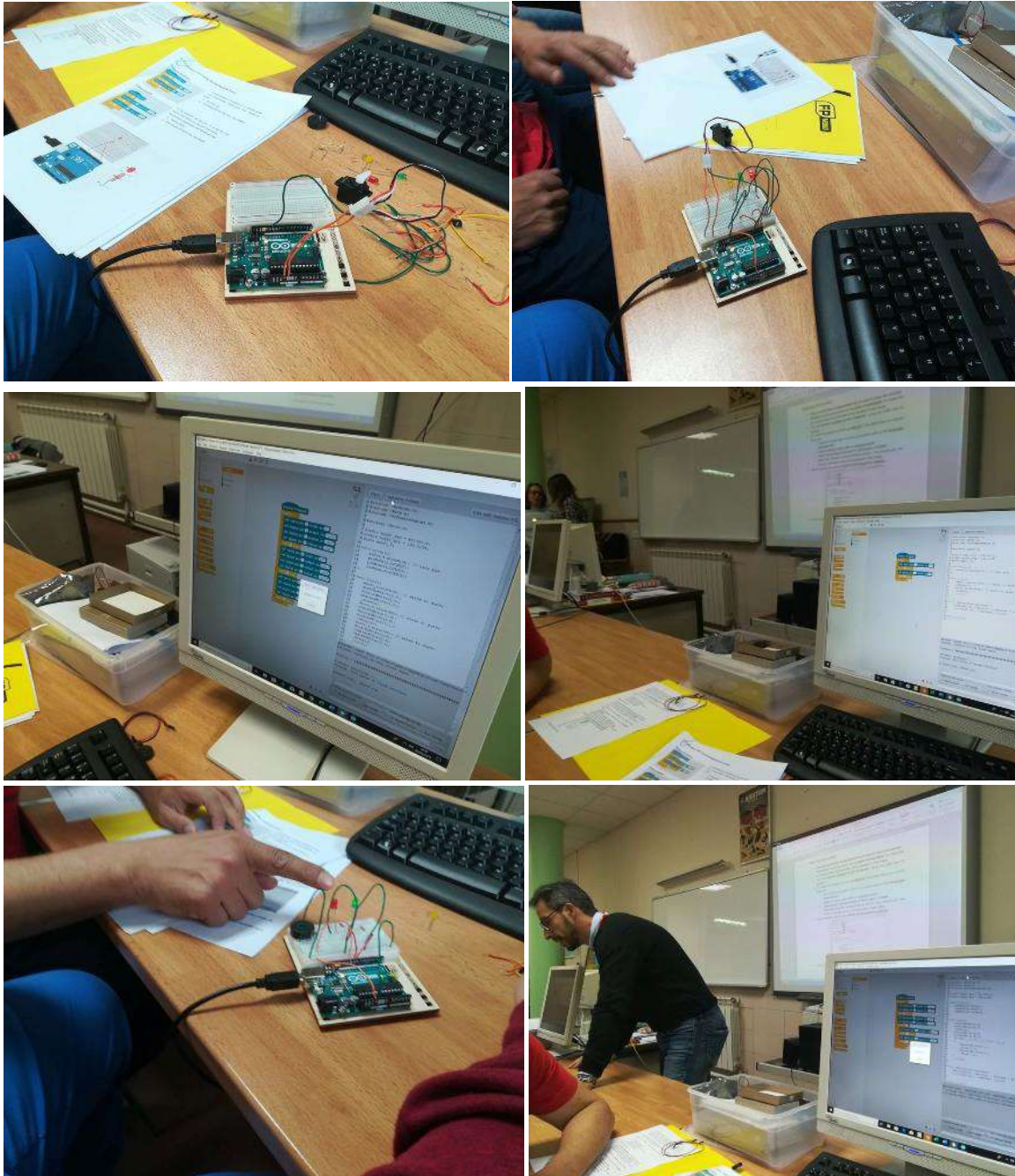
Villa de las Ferias Museum



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C2.Maths and Coding in Art Coding workshop. From SCRATCH to M-BLOCK

May 8, 2019



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C2.Maths and Coding in Art Visit to Salamanca

Salamanca is called "The golden city of Spain".

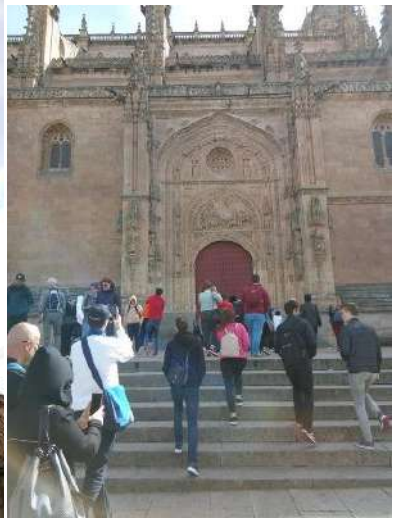
<https://en.wikipedia.org/wiki/Salamanca>



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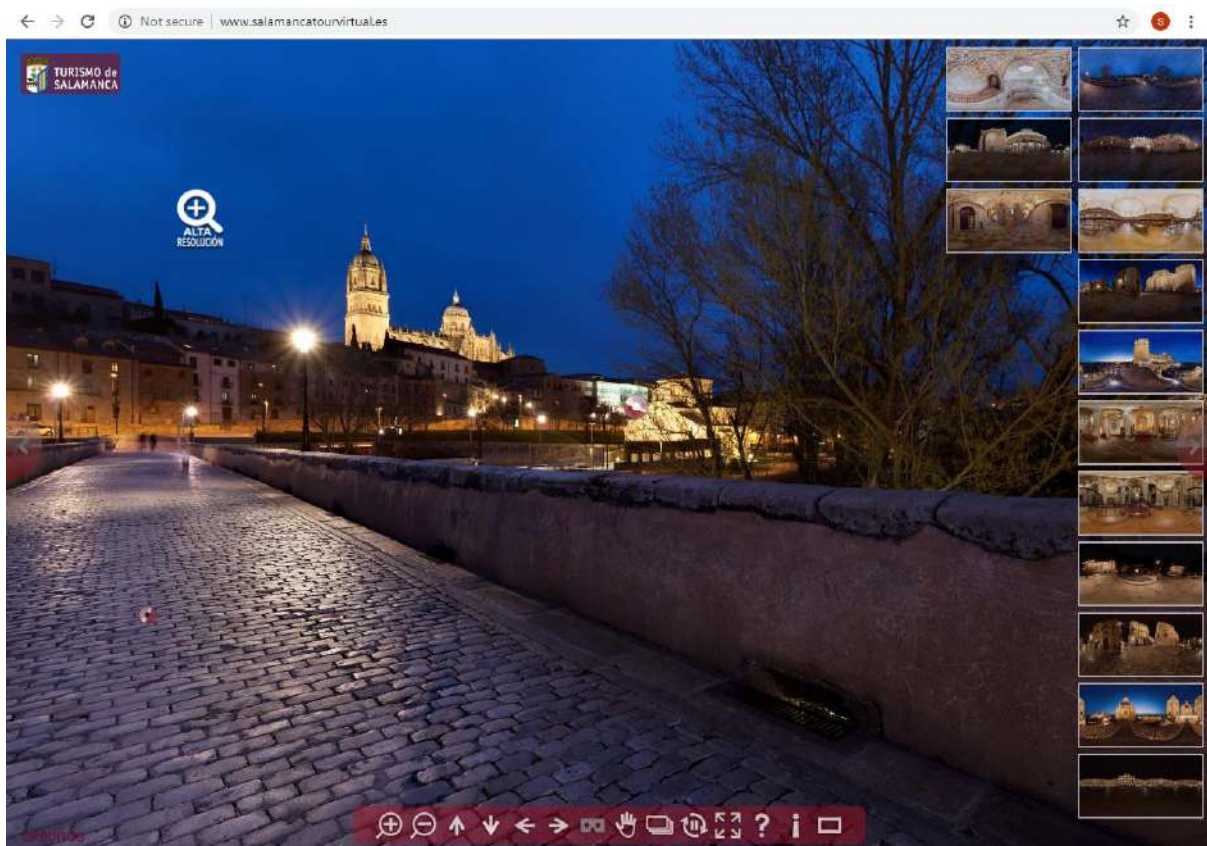
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We can take a virtual tour of the city!

<http://www.salamancatourvirtual.es/>



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C2.Maths and Coding in Art Celebrating Europe Day 2019

On 9 May 2019 we celebrated Europe Day through numerous activities:

- Reception at Medina Town Hall;
- European day -KAHOOT activity;
- Teachers tasting of cheese and wine;
- Lunch: cooking paella;
- Sports Centre activities.



In the morning we were welcomed by city officials at Medina Del Campo City Hall.



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A general culture contest about European Union followed, using the **KAHOOT digital application**. The programme can be installed and accessed from mobile phones.

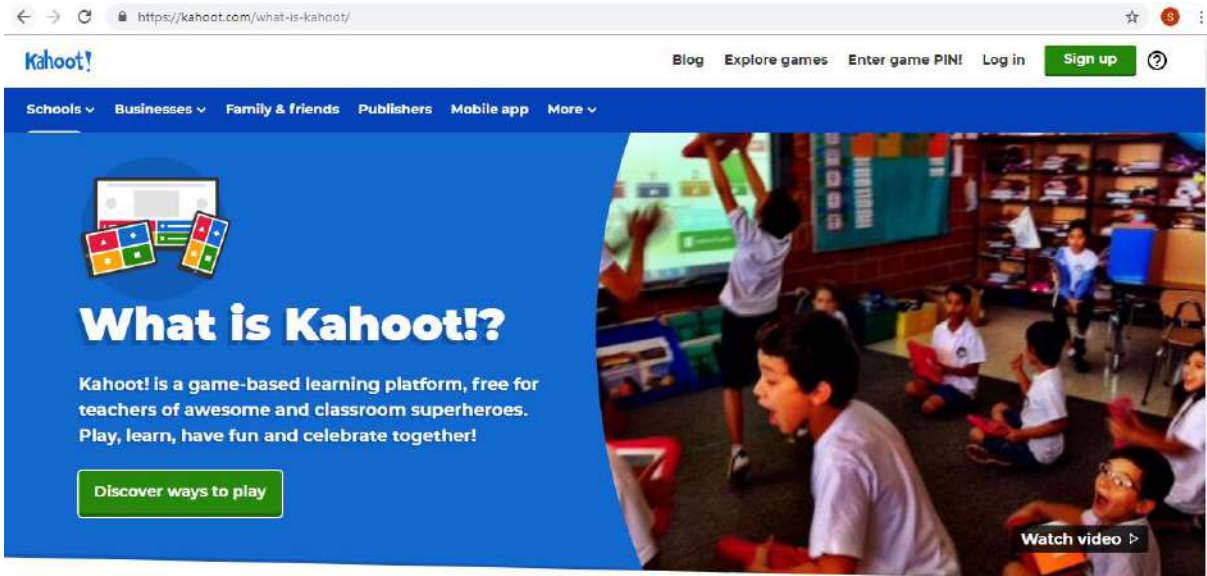


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„Kahoot! is a game-based learning platform, free for teachers of awesome and classroom superheroes. Play, learn, have fun and celebrate together!”
<https://kahoot.com/what-is-kahoot/>

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In the afternoon we enjoyed **traditional Paella food.**



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Teachers tasted cheese and wine!



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The day ended with the participation of students at sports activities.



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C2.Maths and Coding in Art Activities on May 10, 2019

On the last day of mobility, the following events took place:

- Presentation of traditional games by each country.
- Farewell lunch.
- Visit to Olmedo, Mudejar Park, Almenara, Caballero's House.
- Evaluation

Presentation of traditional games by each country



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Visit to Olmedo

The Mudéjar theme park, (Parque Temático del Mudéjar)
<http://www.olmedo.es/pasionmudejar/>

Mudéjar Theme Park is a miniature park located in Olmedo, Valladolid. It contains 21 scale models of buildings of Castile and Leon, including castles and churches that were constructed in the Mudéjar style.



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MVR- Museo de Las Villas Romanas

The Museum of Roman Villas offers a vision of Roman rustic life. Its contents explain how the life of the time was in the countryside through the most characteristic rural constructions: the villas.

Museum sections:

- A Roman Villa type and types of villas
- Economic activity in the Villas
- Villas and nature
- Leisure
- Religion
- The brightness of sunset

<http://www.provinciadevalladolid.com/es/centros-turisticos-provinciales/museo-villas-romanas>



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Evaluation



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Evaluation of the activity after the mobility in Spain STEM - Maths and Coding in Arts: final test

Author: Teacher Buccione Marco

24 Responses	10 Average Score	Closed Status
------------------------	----------------------------	-------------------------

1. How many exact angles can you make by folding paper? (1 point)

8% of respondents (2 of 24) answered this question correctly.

- Between 1 and 3 6
- Between 4 and 6 14 ✓
- Between 7 and 9 8 ✓



2. What kind of special characteristic does the Moebius tape have? (1 point)

63% of respondents (15 of 24) answered this question correctly.

- It has two sides 9
- It has one side 15 ✓
- It has no sides 0



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3. What kind of regular polygons can you make by folding paper? (1 point)

71% of respondents (17 of 24) answered this question correctly.

● Triangle	2
● Triangle and hexagon	5
● Triangle, pentagon and hexag...	17 ✓



4. What will you get if you cut a Moebius tape to one-third of the way from the edge? (1 point)

54% of respondents (13 of 24) answered this question correctly.

● Two Moebius tapes joined	13 ✓
● One Moebius tape	6
● Two separate Moebius tapes	5



5. How many triangles do you need to fold on a strip of paper to form a tetrahedron? (1 point)

42% of respondents (10 of 24) answered this question correctly.

● 8	12
● 9	10 ✓
● 10	2



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6. What is the proportion between the sides of a rectangle to get the folding tetrahedron? (1 point)

50% of respondents (12 of 24) answered this question correctly.

● 3 x 5	10
● 4 x 7	12 ✓
● 5 x 9	2



7. How many different sides can you get with your flexagon? (1 point)

33% of respondents (8 of 24) answered this question correctly.

● 2	5
● 3	8 ✓
● 4	11



8. In AUTOCAD, how many panels are shown in the home screen? (1 point)

71% of respondents (17 of 24) answered this question correctly.

● 1	4
● 2	3
● 3	17 ✓

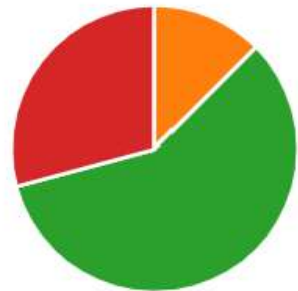


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9. The following AUTOCAD icons allows to draw, respectively: (1 point)

58% of respondents (14 of 24) answered this question correctly.

- Arc, circle, straight lines, regul... 0
- Arc, circle, polygon, regular, co... 3
- Consecutive lines, arc, circle, el... 14 ✓
- Consecutive lines, circle, arc, r... 7



10. Drawing a mechanical part in AUTOCAD, it is useful to have five layers in different colours. Each layer may have the following objects (mark the wrong answer): (1 point)

42% of respondents (10 of 24) answered this question correctly.

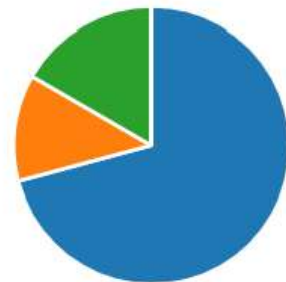
- One layer for the main picture... 8
- Another layer for axes of the p... 0
- Another layer to identify hidd... 4
- Another layer to the stage dir... 2
- Another layer for pieces of wo... 10 ✓



11. What do the following AUTOCAD symbols indicate, respectively? (1 point)

71% of respondents (17 of 24) answered this question correctly.




- Center, line, medium point, pe... 17 ✓
- Endpoint, midpoint, center, pe... 3
- Midpoint, center, endpoint, int... 4
- Perpendicular, center, end poi... 0
- Intersection, center, end point,... 0

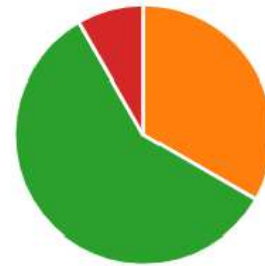


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12. When you're learning AUTOCAD, what you should pay special attention to? (1 point)

58% of respondents (14 of 24) answered this question correctly.

	The status bar	0
	Tools buttons	8
	Command-line	14 ✓
	Title bar	2



13. When we draw in 2D, which axis is/are not used? (1 point)




79% of respondents (19 of 24) answered this question correctly.

	Y	1
	Z	19 ✓
	X and Y	4
	X	0



14. On an Arduino board, what does GND represent? (1 point)

67% of respondents (16 of 24) answered this question correctly.

	Ground	16 ✓
	Positive PIN	3
	Digital PIN	5
	RESET button	0

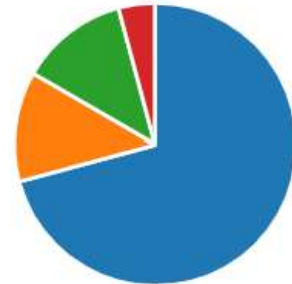


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15. Which one of the following components is an output device? (1 point)

71% of respondents (17 of 24) answered this question correctly.

LED	17 ✓
Button	3
Resistor	3
Sensor	1



16. Which one of the following components can be programmed by setting an angle through a digital PIN? (1 point)

75% of respondents (18 of 24) answered this question correctly.

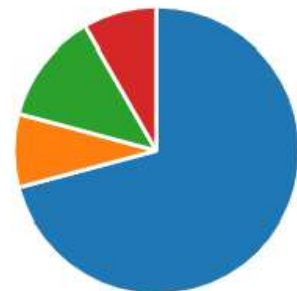
LED	2
Sensor	4
Servo	18 ✓
Button	0



17. What behavior is achieved by the program shown in figure? (1 point)

71% of respondents (17 of 24) answered this question correctly.

If we press the button, the LE...	17 ✓
If we press the button, the LE...	2
LED will always be on, regardl...	3
LED will remain shut off, regar...	2



Irrigation System

Student: Cosmin-ValentinIrimia

Teacher: Gabriela-Brândușa Horlescu, Carmen-SimonaStanciu

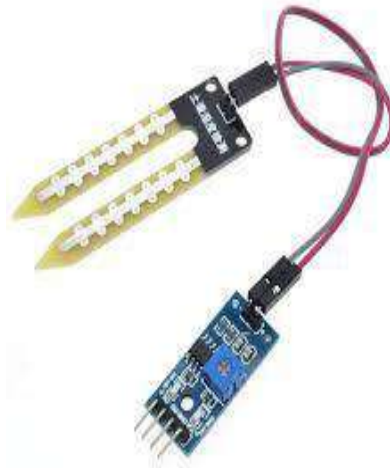
This presentation is about an irrigation system which was built by using the Arduino platform.

Components:

- 1 Arduino Uno Board;



- 1 Humidity Sensor;



- 1 Electric relay



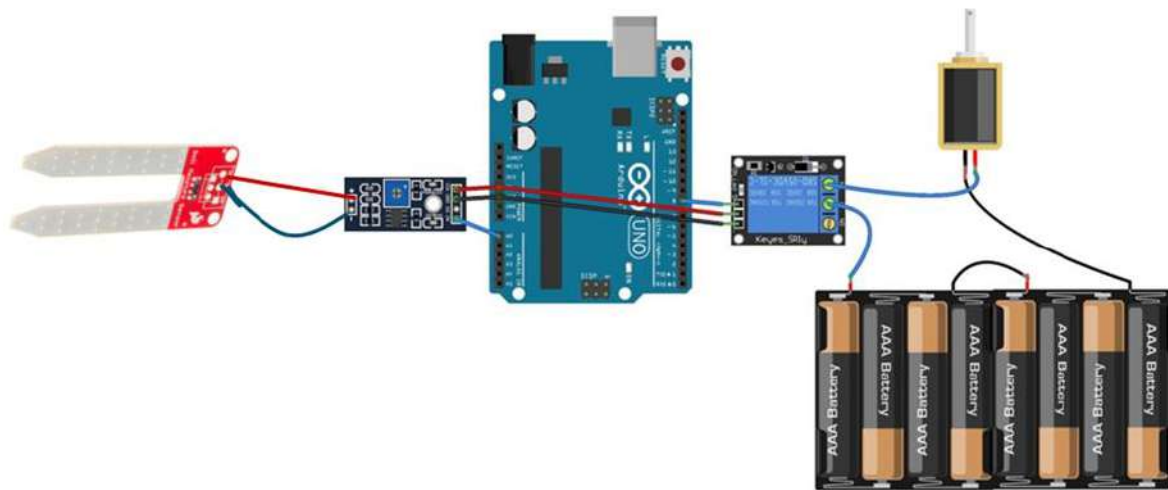
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- 1 Water Pump



- Jumper Wires
- Batteries

Wiring diagram:

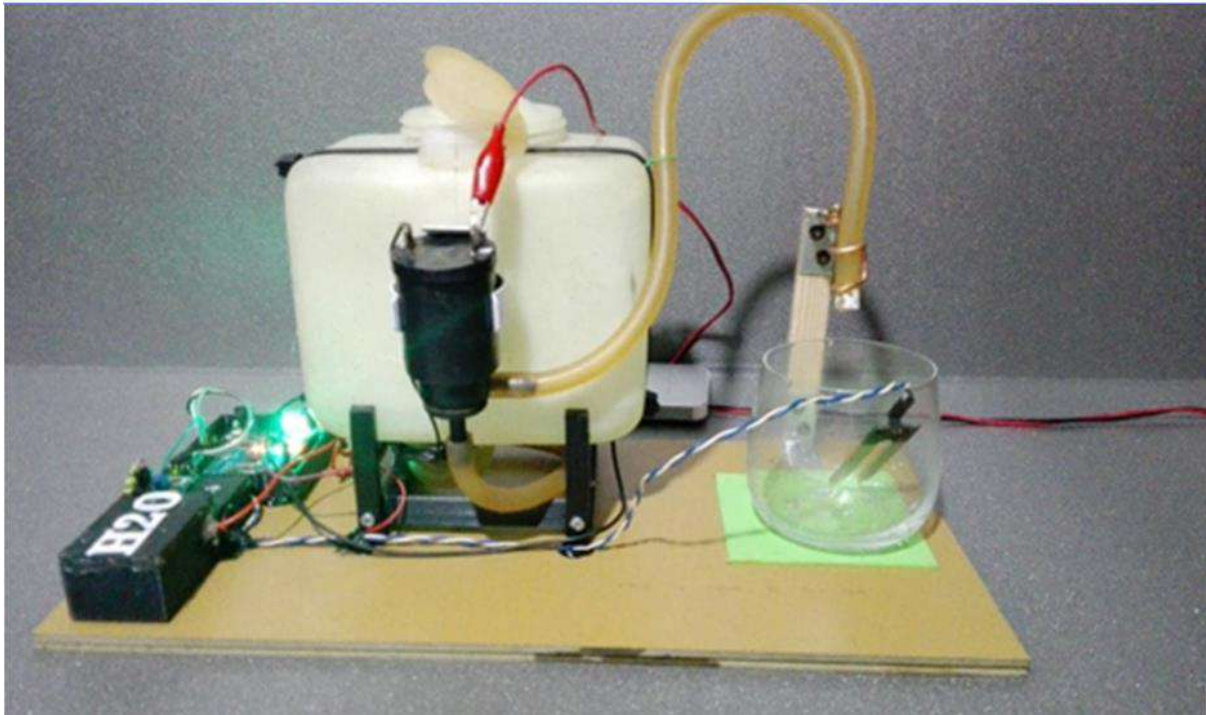


Functioning:

The humidity sensor sends a signal to the Arduino board when water is needed. The board receives the signal and starts the water pump. When the soil reaches 70% humidity, the sensor sends a “STOP” command to the Arduino, stopping the pump.

Photo Gallery:

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Bibliography:

- Bill of material (Amazon affiliate links):
- Water pump (Link: <https://amzn.to/2ROBYrK>)
- 12V adapter (Link: <https://amzn.to/2QPed1s>)
- Arduino Uno R3 (Link: <https://amzn.to/2yFCyiK>)

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- or Elegoo Uno R3 (Link: <https://amzn.to/2OmpxFI>)
- Relay Module (Link: <https://amzn.to/2IVaNH0>)
- Tube (Link: <https://amzn.to/2ORQQHx>)
- Electrical isolating tape (Link: <https://amzn.to/2CKTeu3>)
- Soil moisture sensors (Link: <https://amzn.to/2IVbzVe>)
- Jumper wires set (Link: <https://amzn.to/2QNZbZT>)
- Soldering kit (Link: <https://amzn.to/2OWrI21>)

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Power Energy

Students: Nicoleta-Daniela Grădinaru, Alexandru-Nicolae Badîngă

Teacher: Gabriela-Brândușa Horlescu, Carmen-Simona Stanciu

People have been using various forms of renewable energy for a very long time:

- solar power for heat;
- eolian power for windmills and ships.

Today, we cannot really imagine how different our lives would be without ENERGY. Because we want to live in a clean environment, we currently use many renewable energy resources:

- biomass
- the sun
- the wind
- geothermal energy

That is why our idea is to develop a company that capitalizes on the opportunities offered by ENERGY.

The main activities of the company will focus on:

- production of electricity through photovoltaic panels;
- water heating from the solar power;
- supplying energy in isolated areas which are not connected to the national electricity grid;
- charging cars via photovoltaic panels;
- creating "green" powered commercial pannels.

The company's mission is to capitalize on the potential of energy and to provide high quality products and services to our clients.

Management team:

- Alexandru-Nicolae - administrator
- Nicoleta Daniela - partner 1

Our team has members with good knowledge of electronics and automation.

Clients:

● Most customers will be homeowners in rural and urban areas that want to install photovoltaic and solar panels.

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• Nicoleta is already using solar and photovoltaic energy in her countryside house - Permanent light during all seasons and warm water from spring to autumn. - Monthly Power Bill = ZERO

Production of energy using photovoltaic panels:



Heating water using solar panels:



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Headquarters:

The company will have its headquarters in one of the associates' homes. No extra bills/rent.

We have already built a miniature "home" that presents our services for further development and for showing our products to other people. We used recyclable materials for furniture and walls.

We hope to convince you of the quality of our products and the experience of our team.

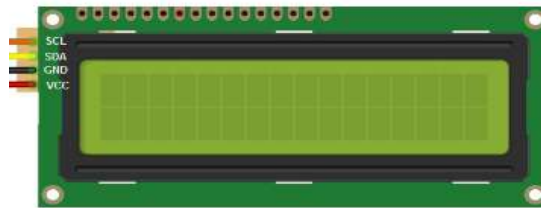
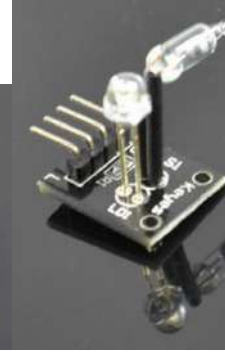
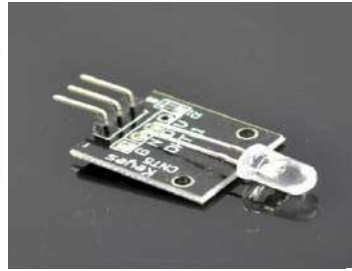


Using energy to create commercials.

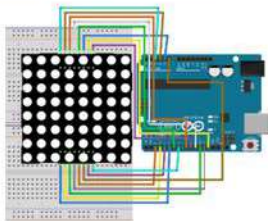
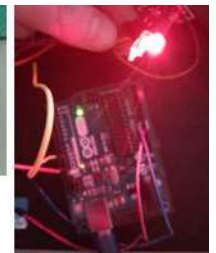
Components:

- 2 Arduino Uno boards
- 1 RGB LED
- 1 Color sensor
- 1 Magic light cup module
- 1 LCD Display
- 1 8x8 LED Matrix
- Jumper wires
- Arduino sensors
- Batteries

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Our Projects

1. Modern house with solar panels



2. Christmas decorations

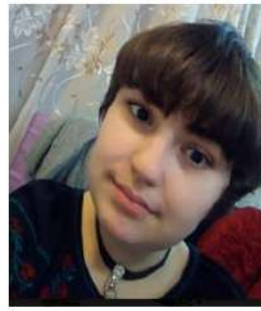


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Contact:



Alexandru
<https://www.facebook.com/alexandrucsf>



Nicoleta
<https://www.facebook.com/otaku.nicole>

**Get filled with POSITIVE ENERGY!
Hope we'll see you at our HQ!**

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Robotic Arm

Student: Adelin-Gabriel Catană

Teachers: Gabriela-Brândușa Horlescu, Carmen-Simona Stanciu

This presentation is about a robotic arm built using the Arduino platform.

Hardware components:

- 1 Arduino Uno Board;



- 4 SG90 Servomotors



- 1 HC-06 Bluetooth Module



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- Jumper wires



Wiring diagram:

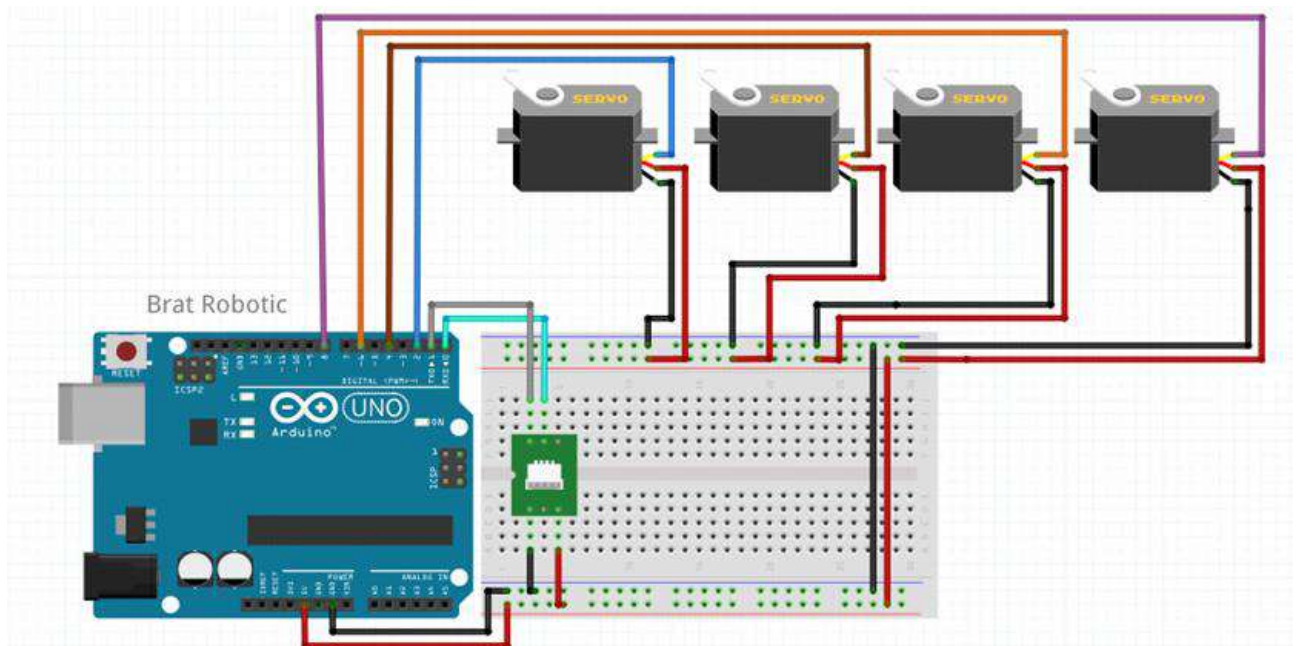
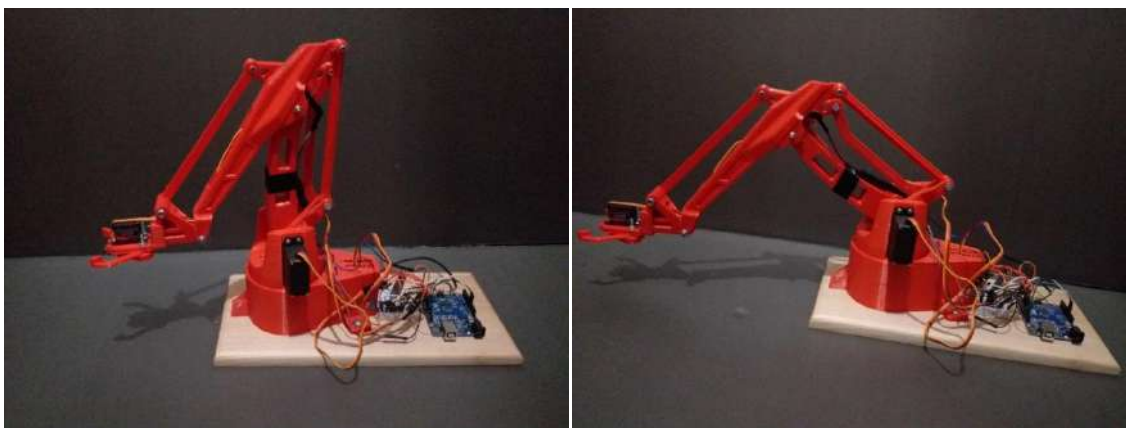


Photo Gallery:



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Smart House

Student: Adelin-Gabriel Catană

Teachers: Gabriela-Brândușa Horlescu, Carmen-Simona Stanciu

This presentation is about a smart house built by using the Arduino platform.

Components:

- 1 Arduino UNO board
- 1 Proximity sensor
- 5 LEDs
- 1 breadboard
- 1 HC-05 Bluetooth module
- Jumper wires
- 2 Solar panels

The Arduino Uno board:



- Connection to a PC can be made by using the USB cable received in the Arduino kit.
- Powered by an external battery or USB port (PC or Laptop).
- The input current is between 5- 9V DC.

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The proximity sensor (PIR HC-SR501):



- Color: White and green
- Dimensions: 3.2cm x 2.4cm x 1.8cm
- IR sensor with the control circuit included
- Adjustable sensibility and action time
- DC 4.5V- 20V
- Power consumption:< 60 μ A
- Output: High/Low level signal:3.3V TTL output
- Detection distance : 3 - 7m (adjustable)
- Detection angle: < 140°
- A proximity sensor that detects the movement of virtually any warm object that generates infrared light (objects that do not generate IR are “invisible” to the sensor).
 - For example, an “invisible” object is glass, making the sensor ifor indoor use.
 - The output is digital and has two operating modes, adjustable in the "Retrigger" jumper:
 - H (default): When the sensor detects movement, the output becomes High and remains as such while motion is present.
 - L: The output becomes High for a few seconds when the sensor detects movement then it becomes Low. If the movement persists, the output repeats the High - Low cycle.
 - The "Delay Time Adjust" trimmer adjusts how long the sensor will keep High state when it detects movement.

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- The “Sensitivity Adjust” option adjusts sensor sensitivity. It must be adjusted in such a way that it does not activate for extremely small movement.

The HC-06 Bluetooth module

The HC-06 chip module can only be used as a slave (it can not actively engage with another Bluetooth device).

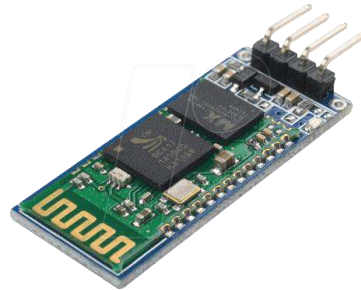
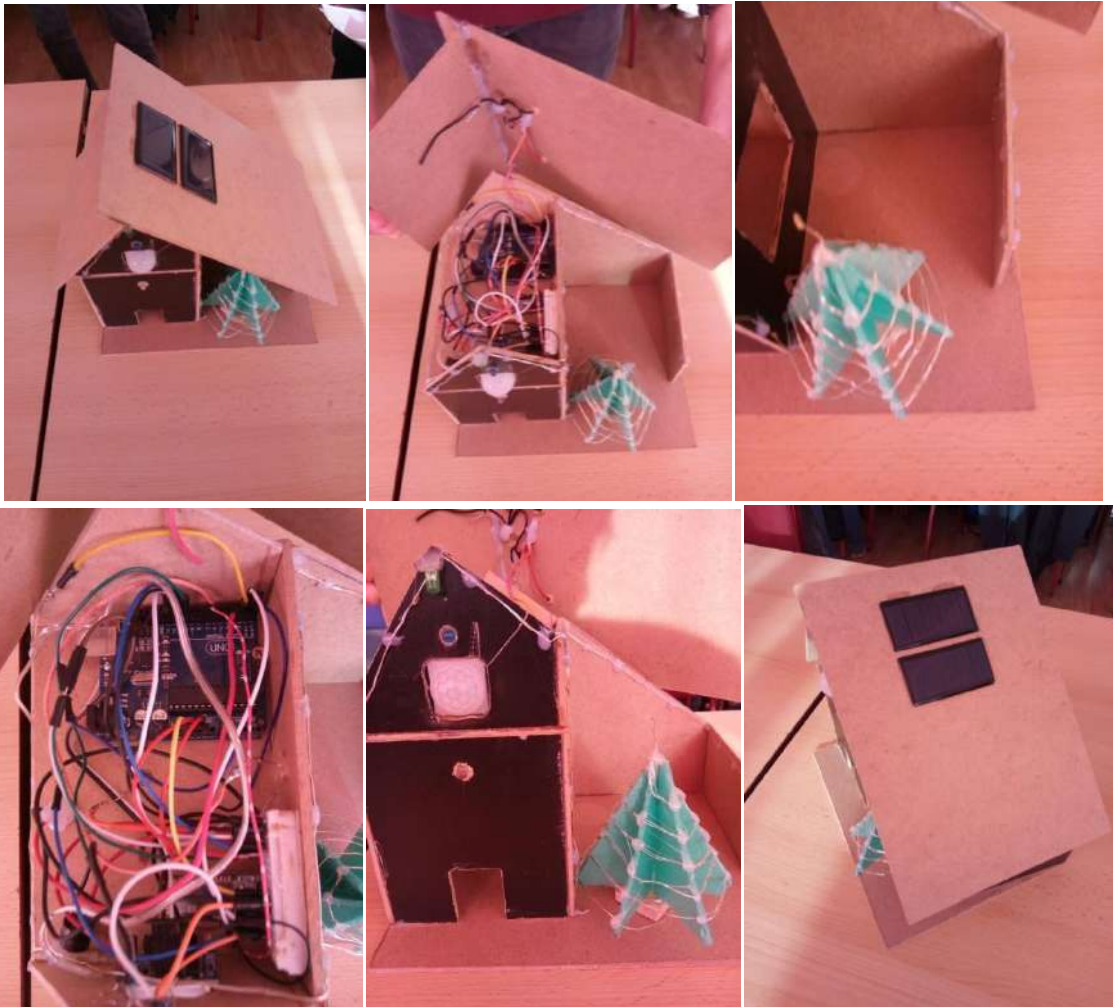


Photo gallery:



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Geogebra - Applications

Teacher: Gabriela-Brândușa Horlescu

Geogebra is a free-of-charge programme used to solve mathematics problems for all education levels. By means of this programme one can make applications from geogebra, algebra and calculus.

The programme can be easily accessed online:
<https://www.geogebra.org/>.

The screenshot shows the GeoGebra website homepage. At the top, there is a navigation bar with the GeoGebra logo, a search bar for "Classroom Resources", and a "SIGN IN" button. A left sidebar contains a menu with options: Home, News Feed, Resources, Profile, People, Groups, and App Downloads. The main content area features a "GeoGebra Math Apps" section with a "START GRAPHING" button and a "CLASSROOM RESOURCES" button. Below this, there are three columns of app categories: "New Math Apps" (Graphing Calculator, Geometry, 3D Calculator, Scientific Calculator), "Classic Apps" (GeoGebra Classic, Spreadsheet, Probability, CAS), and "Offline Apps" (Augmented Reality, App Store, Google Play, Microsoft Store). A "Classroom Resources" section at the bottom displays four activity cards: "Number line for", "Can you fit the", "Four Blues and", and "Four colors". The footer includes contact information, language settings, and social media links.

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1. Plotting the graph of the first degree function

Example 1

Plot the graph of the function $f(x)=2x+3$.

Step 1. $a=2>0$, the function is ascending.

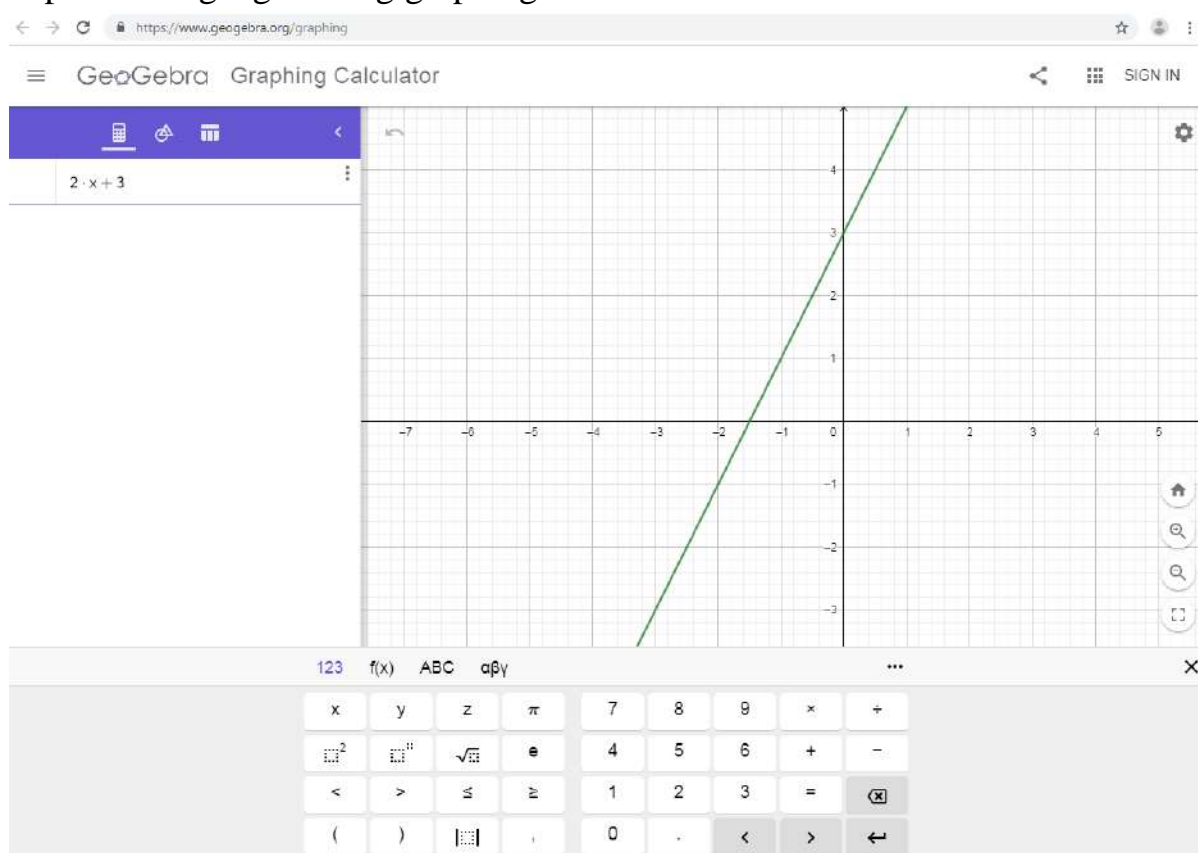
Step 2. Junction with axes of coordinates.

Junction with axis Oy, $y=0 \Rightarrow 2x+3=0 \Rightarrow x = -\frac{3}{2} \Rightarrow P_1(-\frac{3}{2}, 0)$.

Junction with axis Ox, $x=0 \Rightarrow y=2 \cdot 0+3=3 \Rightarrow P_2(0,3)$.

The results can be checked online:

<https://www.geogebra.org/graphing>



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Example 2

Plot the graph of the function $f(x)=-2x+3$.

Step 1. $a=-2<0$, the function is descending.

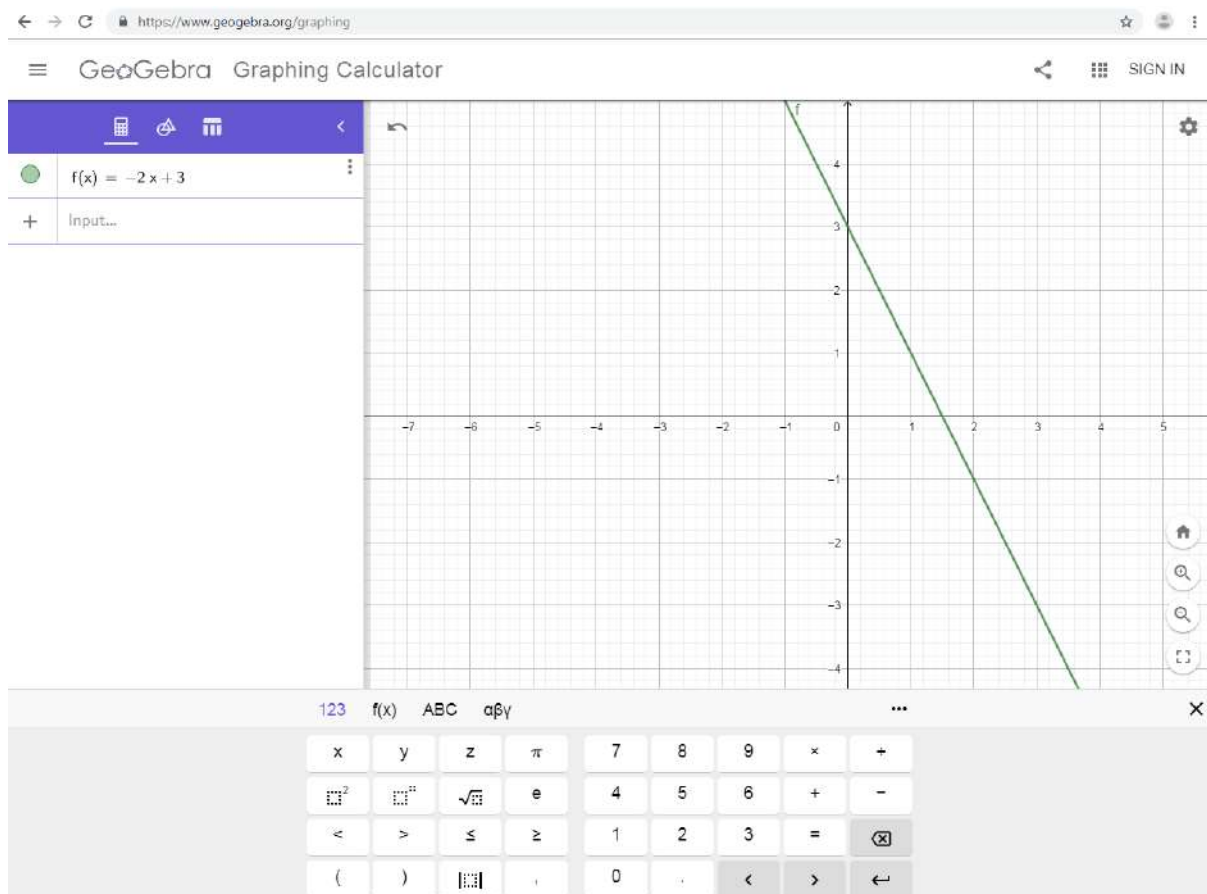
Step 2. Junction with axes of coordinates.

Junction with axis Ox, $y=0 \Rightarrow -2x+3=0 \Rightarrow x = \frac{3}{2} \Rightarrow P_1(\frac{3}{2}, 0)$.

Junction with axis Oy, $x=0 \Rightarrow y=-2 \cdot 0+3=3 \Rightarrow P_2(0,3)$.

The results can be checked online:

<https://www.geogebra.org/graphing>



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Additional Applications

Plot the graph of the following first degree functions:

$$f(x)=x+3$$

$$f(x)=3x-2$$

$$f(x)=10x+1$$

$$f(x)=+7x-5$$

2.Geogebra – graphical representation of a second degree function

Teacher: Gabriela-Brândușa Horlescu

Example 1

Plot the graph of the function $f(x)=x^2+6x+8$.

Step 1. $a=1>0$, the function has a minimum, the peak of the parabola $V\left(-\frac{b}{2a}, -\frac{\Delta}{4a}\right)$.

$$a=1, b=6, c=9$$

$$\Delta=b^2-4\cdot a\cdot c=6^2-4\cdot 1\cdot 8=36-32=4$$

$$-\frac{b}{2a} = -\frac{6}{2\cdot 1} = -3$$

$$-\frac{\Delta}{4a} = -\frac{4}{4\cdot 1} = -1$$

$$V(-3, -1)$$

Step 2. Junction with axes of coordinates.

$$\text{Junction with axis Ox, } y=0 \Rightarrow x^2+6x+8=0$$

$$\Delta=4>0$$

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{-6 + 2}{2\cdot 1} = \frac{-4}{2} = -2$$

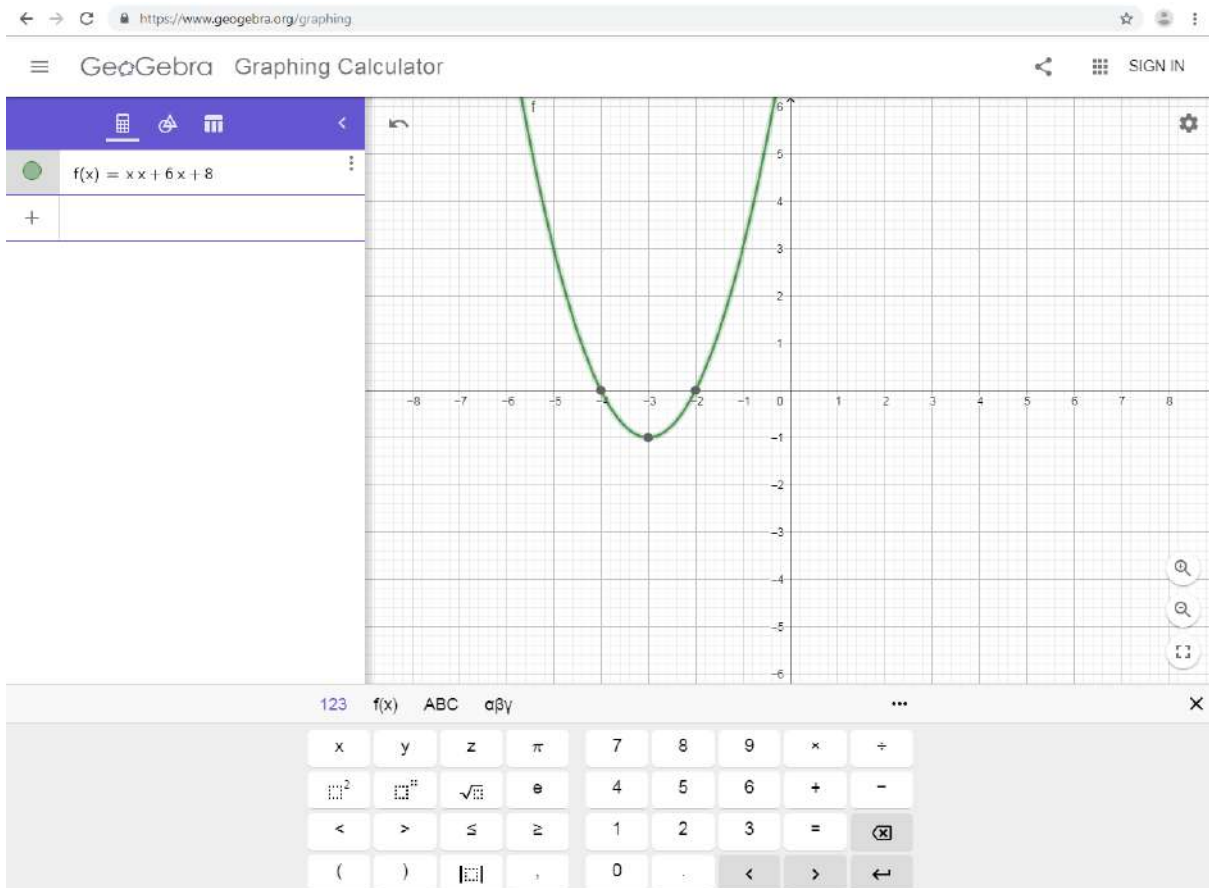
$$x_2 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-6 - 2}{2\cdot 1} = \frac{-8}{2} = -4$$

$$\Rightarrow P_1(-2,0)$$

$$\Rightarrow P_2(-4,0)$$

$$\text{Junction with axis Oy, } x=0 \Rightarrow y=0^2+6\cdot 0+8=8 \Rightarrow P_3(0,8).$$

The results can be checked online: <https://www.geogebra.org/graphing>.



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Example 2

Plot the graph of the function $f(x)=-x^2+6x-8$.

Step 1. $a=-1<0$, the function has a maximum, the peak of the parabola

$$V\left(-\frac{b}{2a}, -\frac{\Delta}{4a}\right).$$

$$a=-1, b=6, c=-8$$

$$\Delta=b^2-4\cdot a\cdot c=6^2-4\cdot(-1)\cdot(-8)=36-32=4$$

$$-\frac{b}{2a} = -\frac{6}{2\cdot(-1)} = 3$$

$$-\frac{\Delta}{4a} = -\frac{4}{4\cdot(-1)} = 1$$

$$V(3,1)$$

Step 2. Junction with axes of coordinates.

$$\text{Junction with axis } \mathbf{Ox}, \mathbf{y=0} \Rightarrow -x^2+6x-8=0$$

$$\Delta=4>0$$

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{-6 + 2}{2\cdot(-1)} = \frac{-4}{-2} = 2$$

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-6 - 2}{2\cdot(-1)} = \frac{-8}{-2} = 4$$

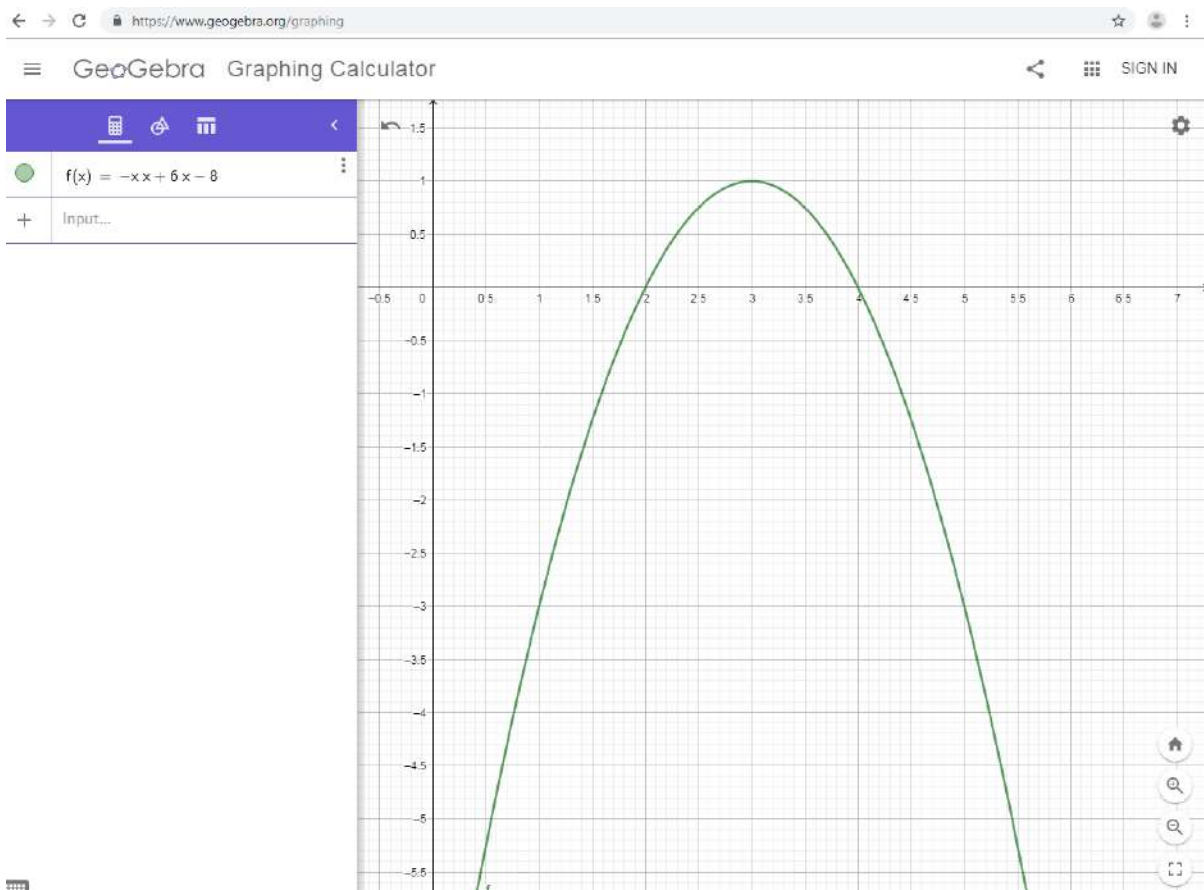
$$\Rightarrow P_1(2,0)$$

$$\Rightarrow P_2(4,0)$$

$$\text{Junction with axis } \mathbf{Oy}, x=0 \Rightarrow y=-0^2+6\cdot 0-8=-8 \Rightarrow P_3(0, -8).$$

The results can be checked online:

<https://www.geogebra.org/graphing>



Additional Applications

Plot the graph of the following second degree functions:

$$f(x) = x^2 + 6x + 8$$

$$f(x) = x^2 + 9x + 2$$

$$f(x) = x^2 - 6x + 8$$

$$f(x) = x^2 + 2x + 1$$

$$f(x) = -x^2 + 16x + 8$$

$$f(x) = -2x^2 + 3x + 6$$

$$f(x) = -x^2 - 8x + 5$$

$$f(x) = -3x^2 + 2x + 1$$

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3.Geogebra – Distance between 2 points in the plan

Teacher: Gabriela-Brândușa Horlescu

Example 1

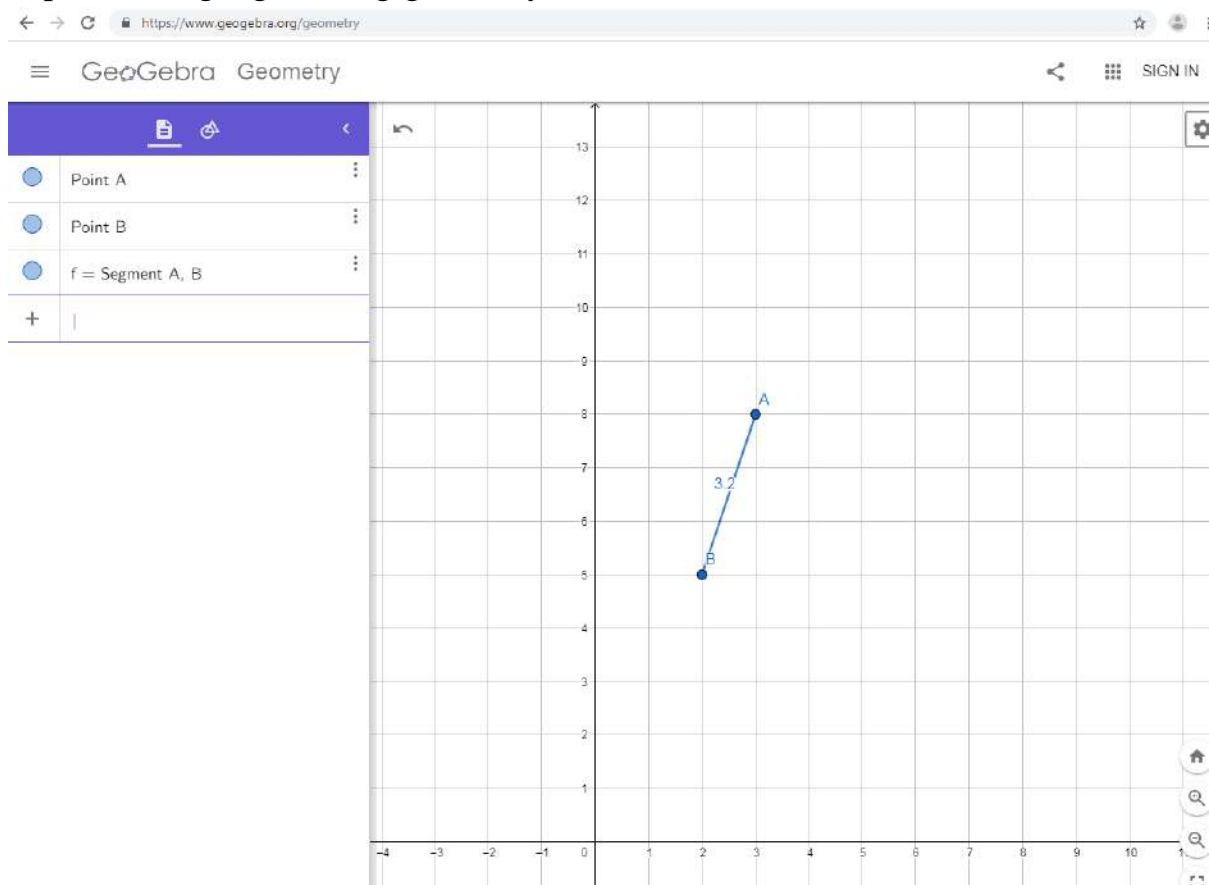
Calculate the distance between the coordinate points $P_1(3, 8)$ and $P_2(2, 5)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(2 - 3)^2 + (5 - 8)^2} = \sqrt{1 + 9} = \sqrt{10} = 3,2$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Example 2

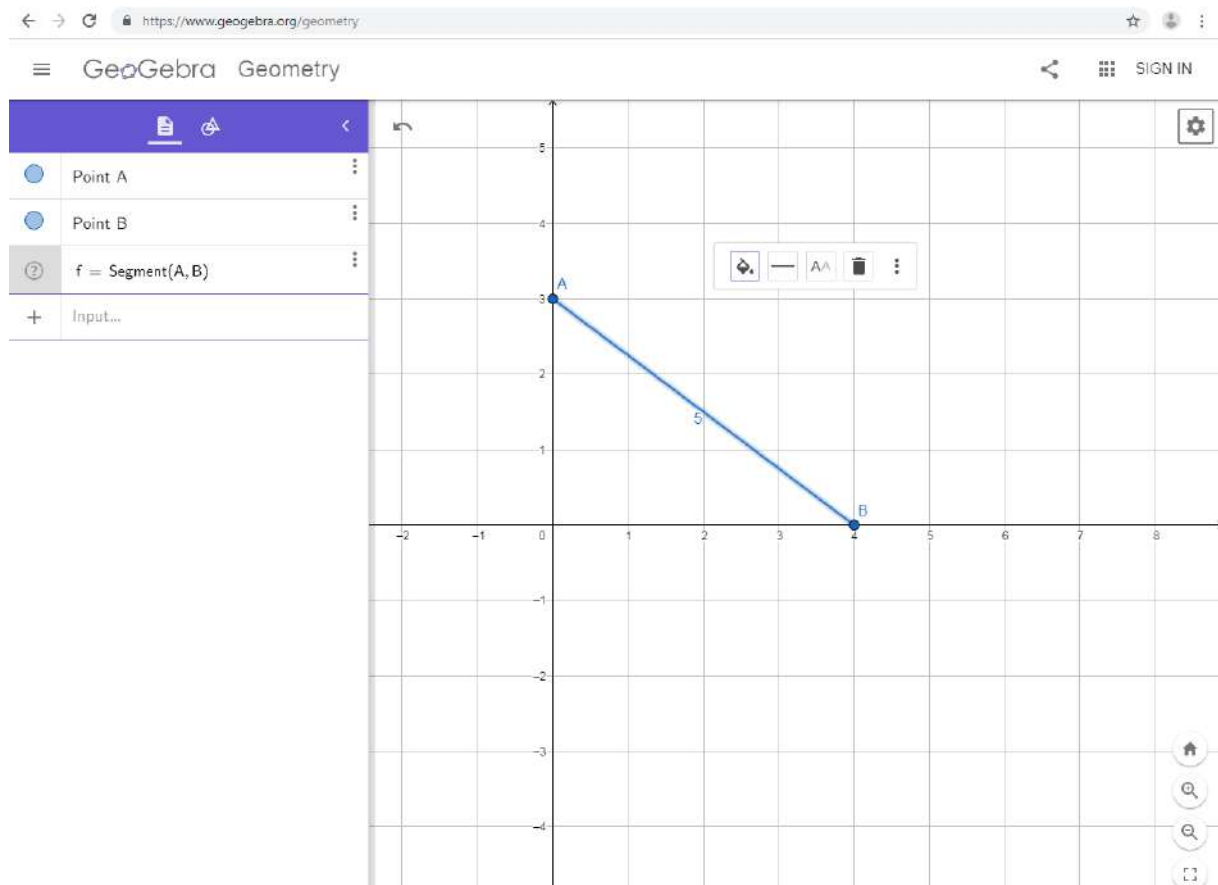
Calculate the distance between the coordinate points $P_1(0, 3)$ and $P_2(4, 0)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(4 - 0)^2 + (0 - 3)^2} = \sqrt{16 + 9} = \sqrt{25} = 5$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Additional Applications

Calculate the distance between the coordinate points:

- $P_1(3, 8)$ and $P_2(4, 0)$
- $P_1(0, 8)$ and $P_2(-2, 0)$
- $P_1(1, 18)$ and $P_2(6, -3)$
- $P_1(25, 4)$ and $P_2(2, 2)$
- $P_1(4, 5)$ and $P_2(5, 4)$
- $P_1(30, 30)$ and $P_2(40, 40)$
- $P_1(-3, 0)$ and $P_2(0, 0)$
- $P_1(33, -8)$ and $P_2(44, 2)$

4.Geogebra – Coordinates of the middle of a segment

Teacher: Gabriela-Brândușa Horlescu

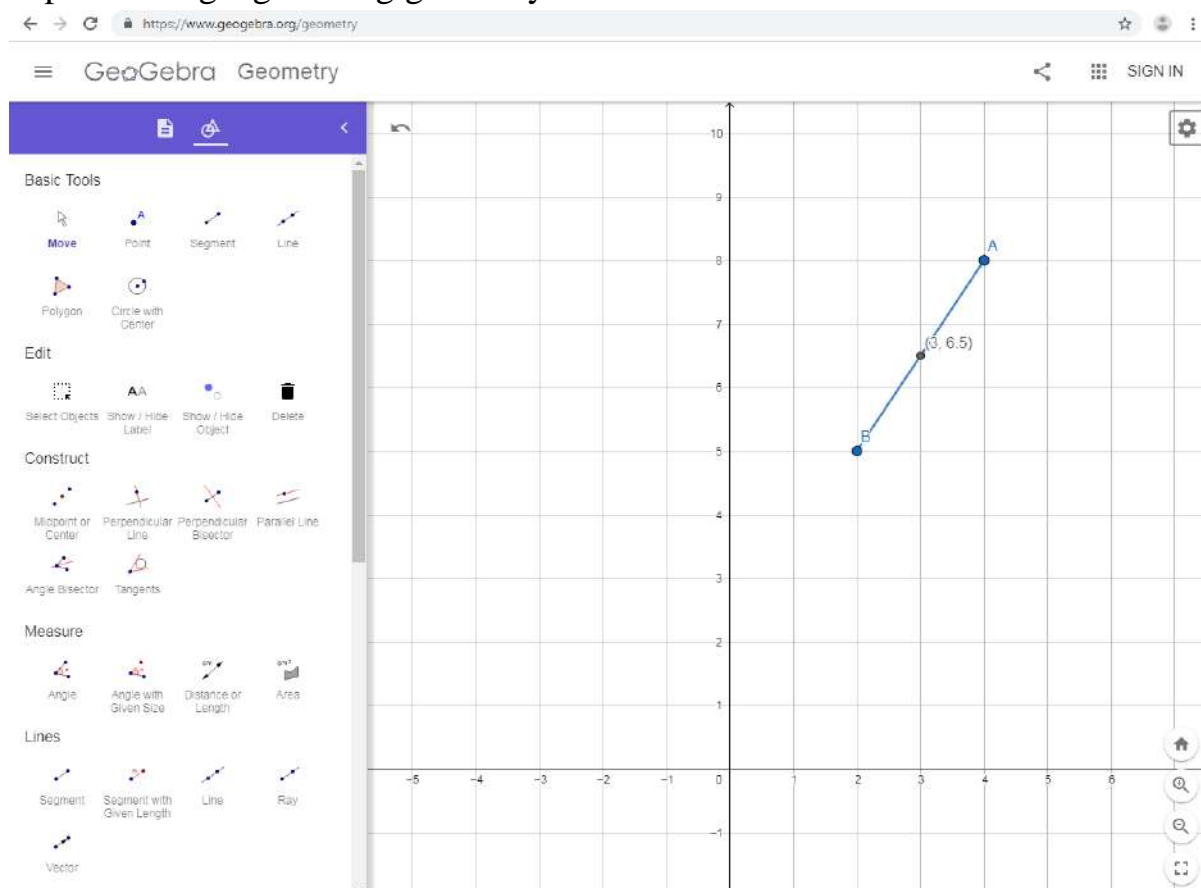
Example 1

Calculate the coordinates of the middle of the segment made by the coordinate points $P_1(4, 8)$ and $P_2(2, 5)$.

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
$$M\left(\frac{4 + 2}{2}, \frac{8 + 5}{2}\right) \Leftrightarrow M\left(\frac{6}{2}, \frac{13}{2}\right) \Leftrightarrow M(3, 6.5)$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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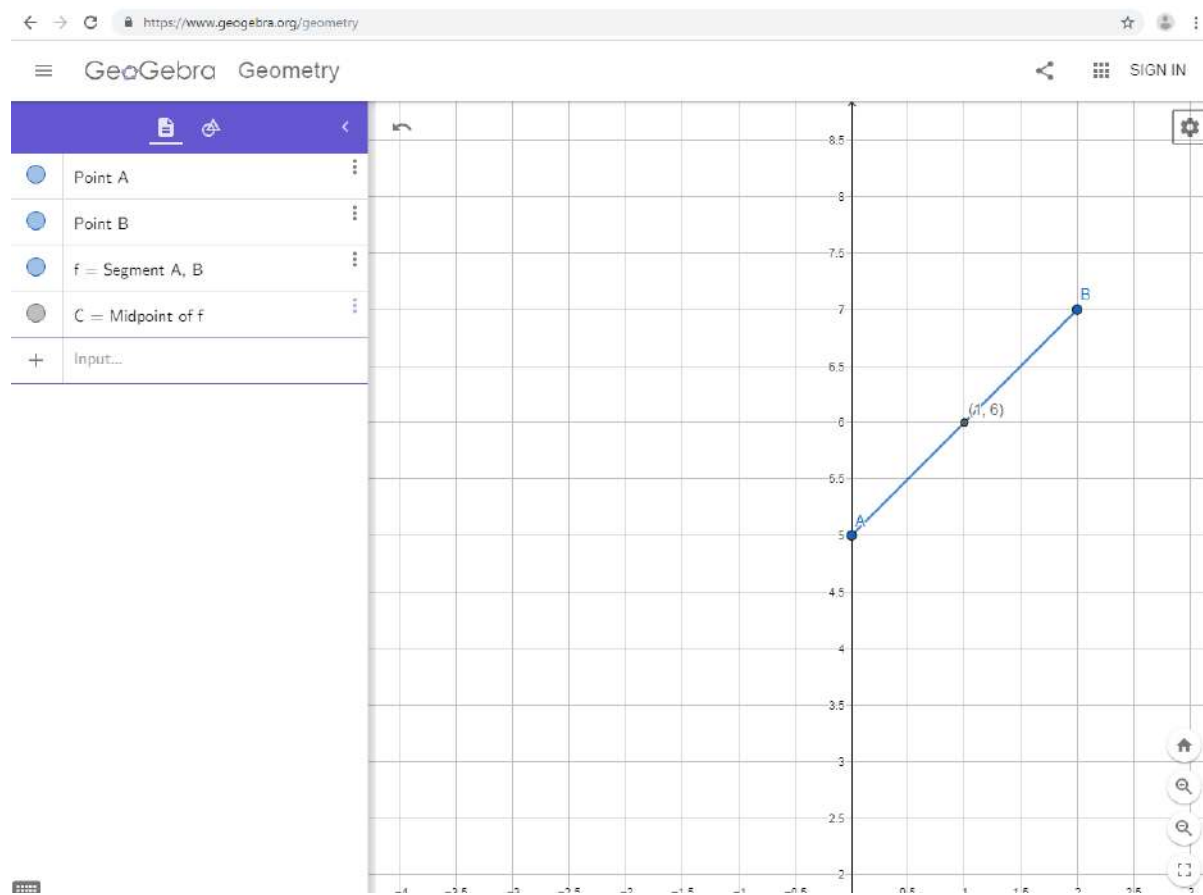
Example 2

Calculate the coordinates of the middle of the segment made by the coordinate points $P_1(0, 5)$ and $P_2(2, 7)$.

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
$$M\left(\frac{0 + 2}{2}, \frac{5 + 7}{2}\right) \Leftrightarrow M\left(\frac{2}{2}, \frac{12}{2}\right) \Leftrightarrow M(1, 6)$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Additional Applications

Calculate the coordinates of the middle of the segment made by the coordinate points

- $P_1(3, 8)$ and $P_2(4, 0)$
- $P_1(0, 8)$ and $P_2(-2, 0)$
- $P_1(1, 18)$ and $P_2(6, -3)$
- $P_1(25, 4)$ and $P_2(2, 2)$
- $P_1(4, 5)$ and $P_2(5, 4)$
- $P_1(30, 30)$ and $P_2(40, 40)$
- $P_1(-3, 0)$ and $P_2(0, 0)$
- $P_1(33, -8)$ and $P_2(44, 2)$

5.Geogebra – The Area of the Right Triangle

Teacher: Gabriela-Brândușa Horlescu

Example 1

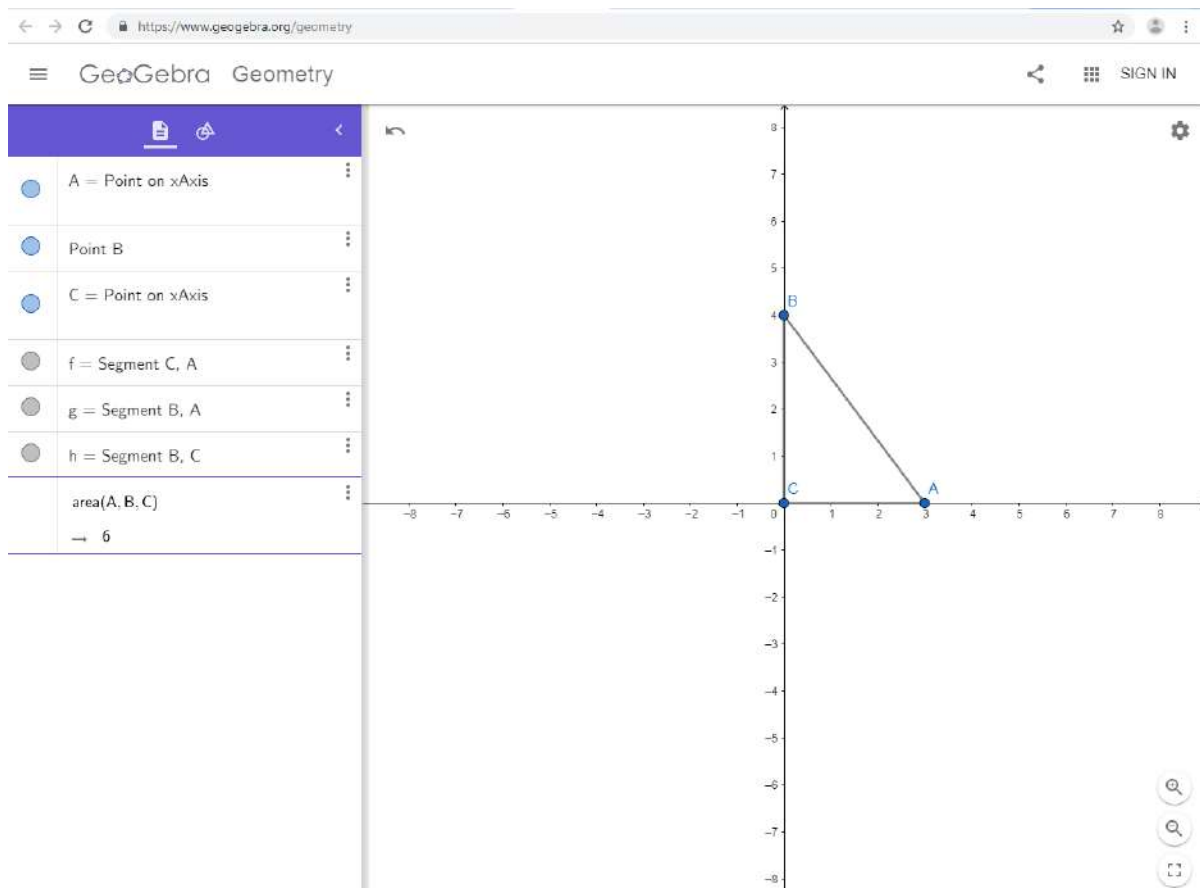
Calculate the area of a right triangle having the catheti $c_1=3$ and $c_2=4$.

$$A = \frac{c_1 \cdot c_2}{2}$$

$$A = \frac{3 \cdot 4}{2} = \frac{12}{2} = 6$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Example 2

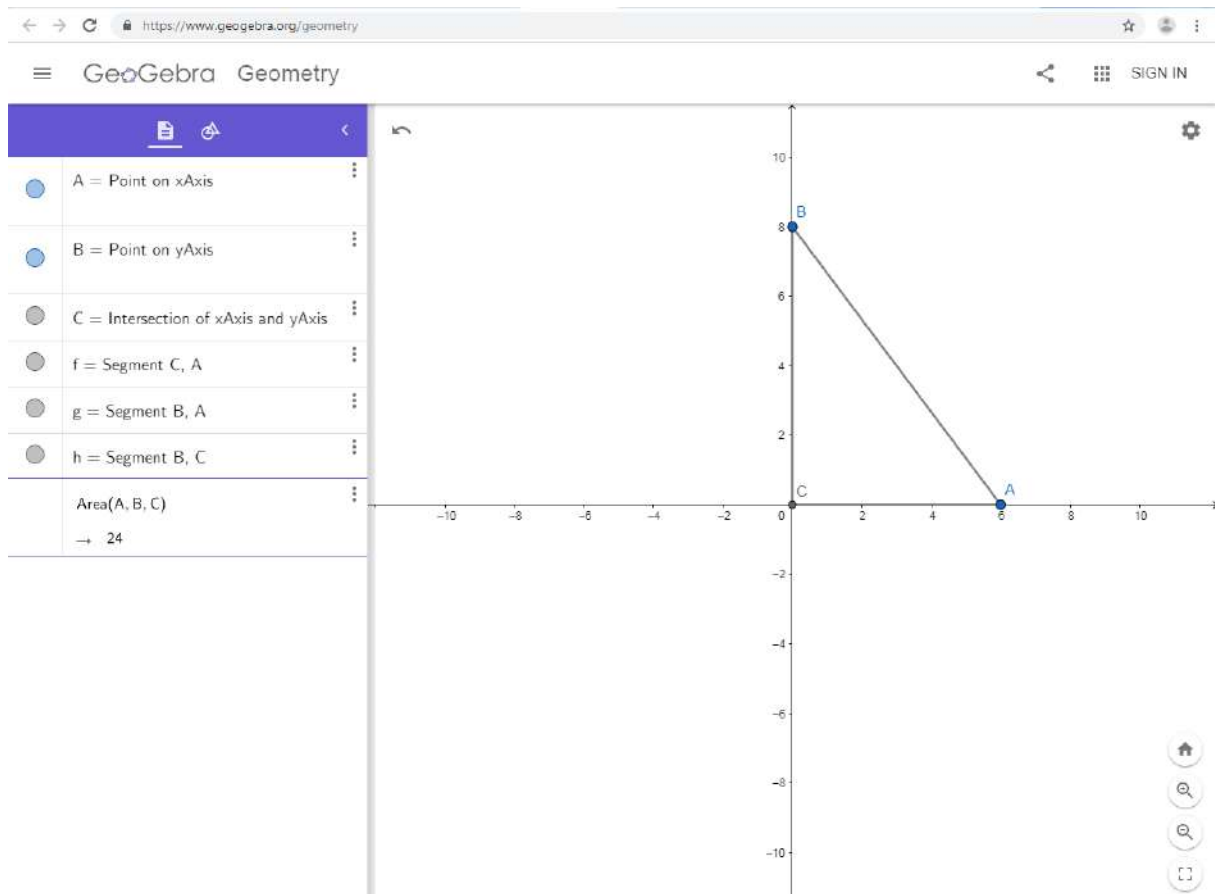
Calculate the area of a right triangle having the catheti $c_1=6$ and $c_2=8$.

$$A = \frac{c_1 \cdot c_2}{2}$$

$$A = \frac{6 \cdot 8}{2} = \frac{48}{2} = 24$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Additional Applications

Calculate the area of a right triangle having the catheti:

- $c_1=2$ and $c_2=5$
- $c_1=4$ and $c_2=4$
- $c_1=5$ and $c_2=6$
- $c_1=6$ and $c_2=7$
- $c_1=7$ and $c_2=8$
- $c_1=8$ and $c_2=9$
- $c_1=9$ and $c_2=10$
- $c_1=10$ and $c_2=11$

6.Geogebra – Areas of the geometric plane shapes

Teacher: Gabriela-Brândușa Horlescu

Example 1

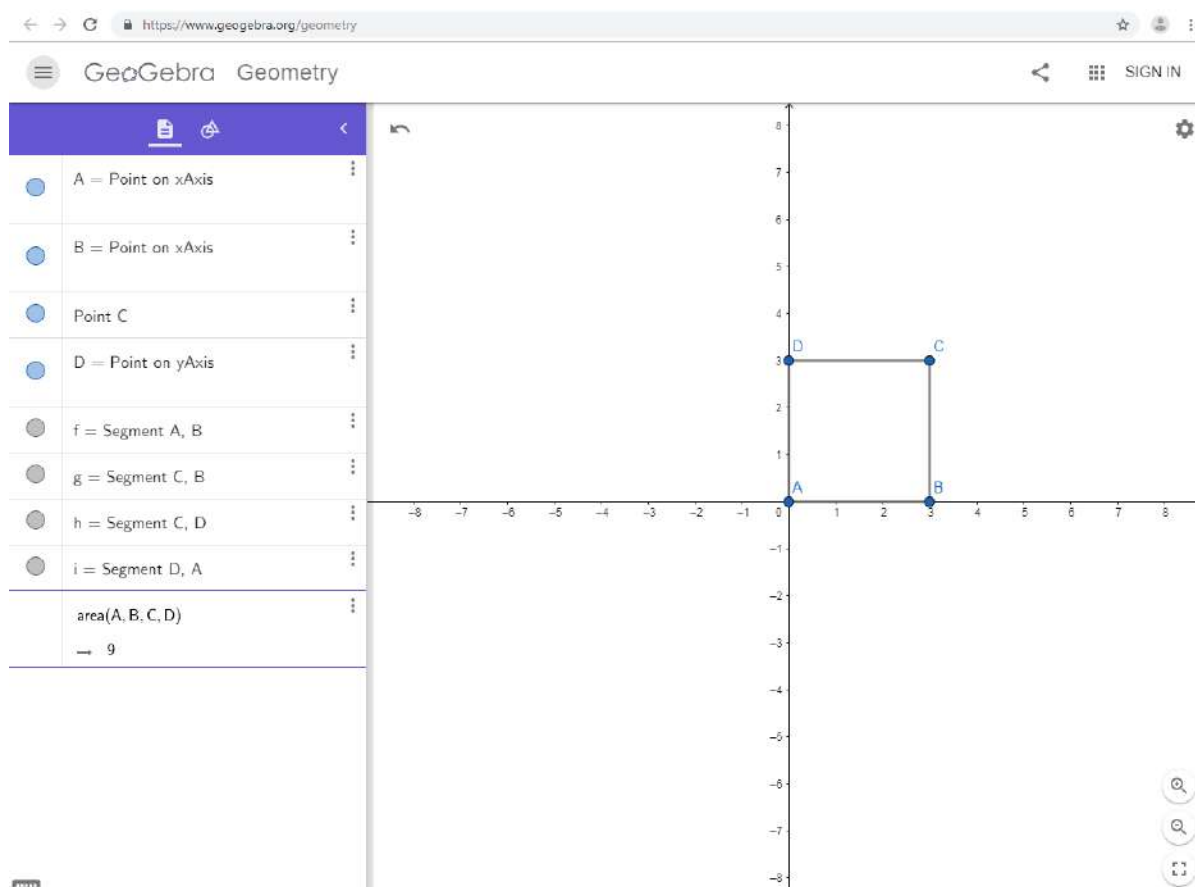
Calculate the area of a square whose side equals 3.

$$A = l^2$$

$$A = 3^2 = 9$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Example 2

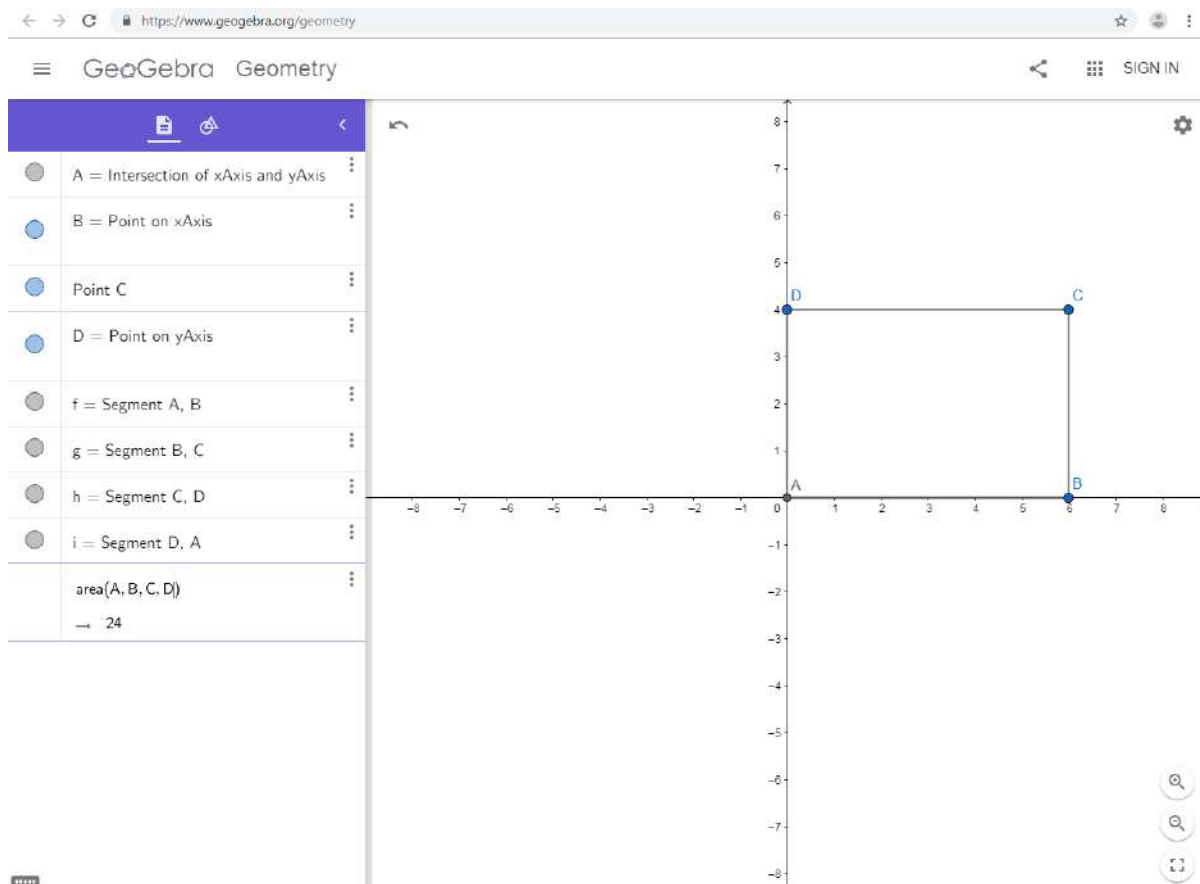
Calculate the area of a rectangle having Length (l)=6 and width (w)=4.

$$A = l \cdot w$$

$$A = 6 \cdot 4 = 24$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Example 3

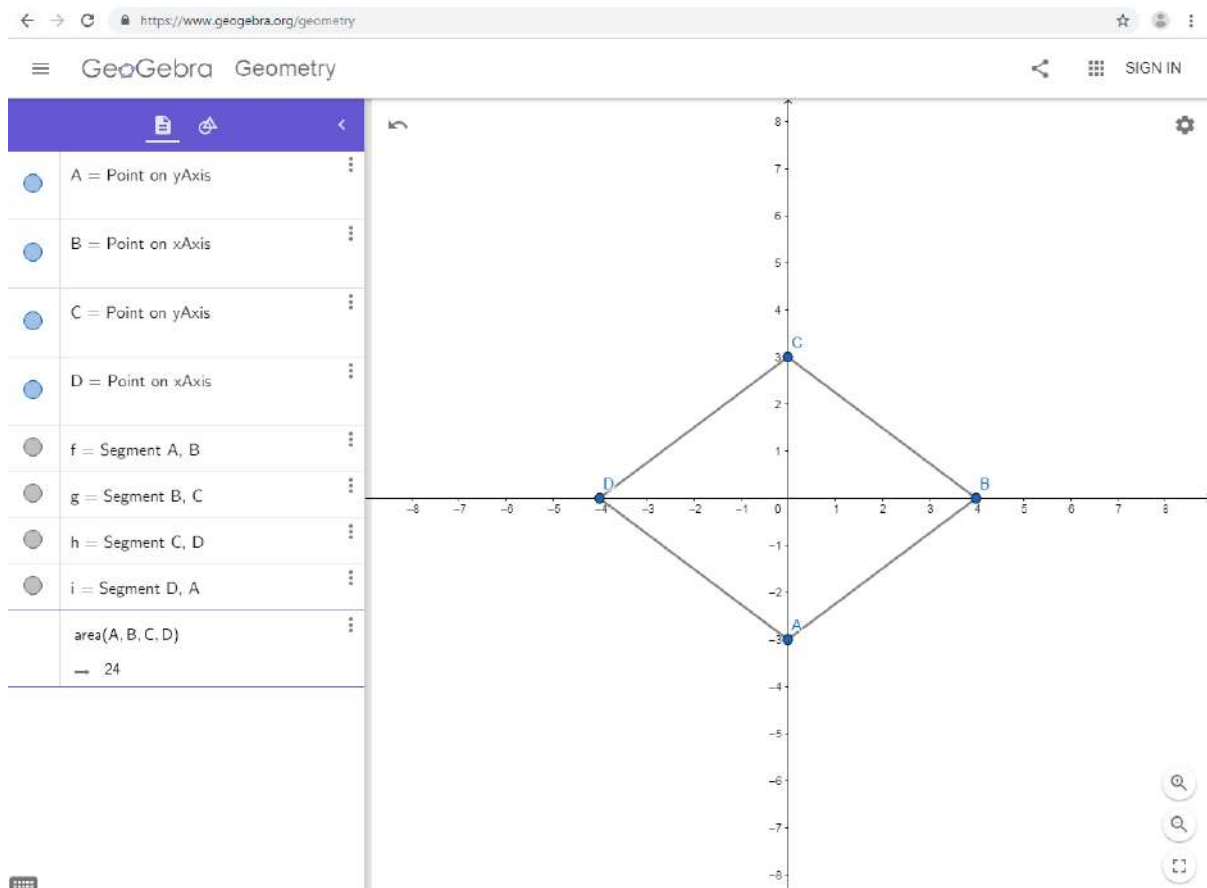
Calculate the area of a rhombus having $d_1=6$ and $d_2=8$.

$$A = \frac{d_1 \cdot d_2}{2}$$

$$A = \frac{6 \cdot 8}{2} = 24$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Example 4

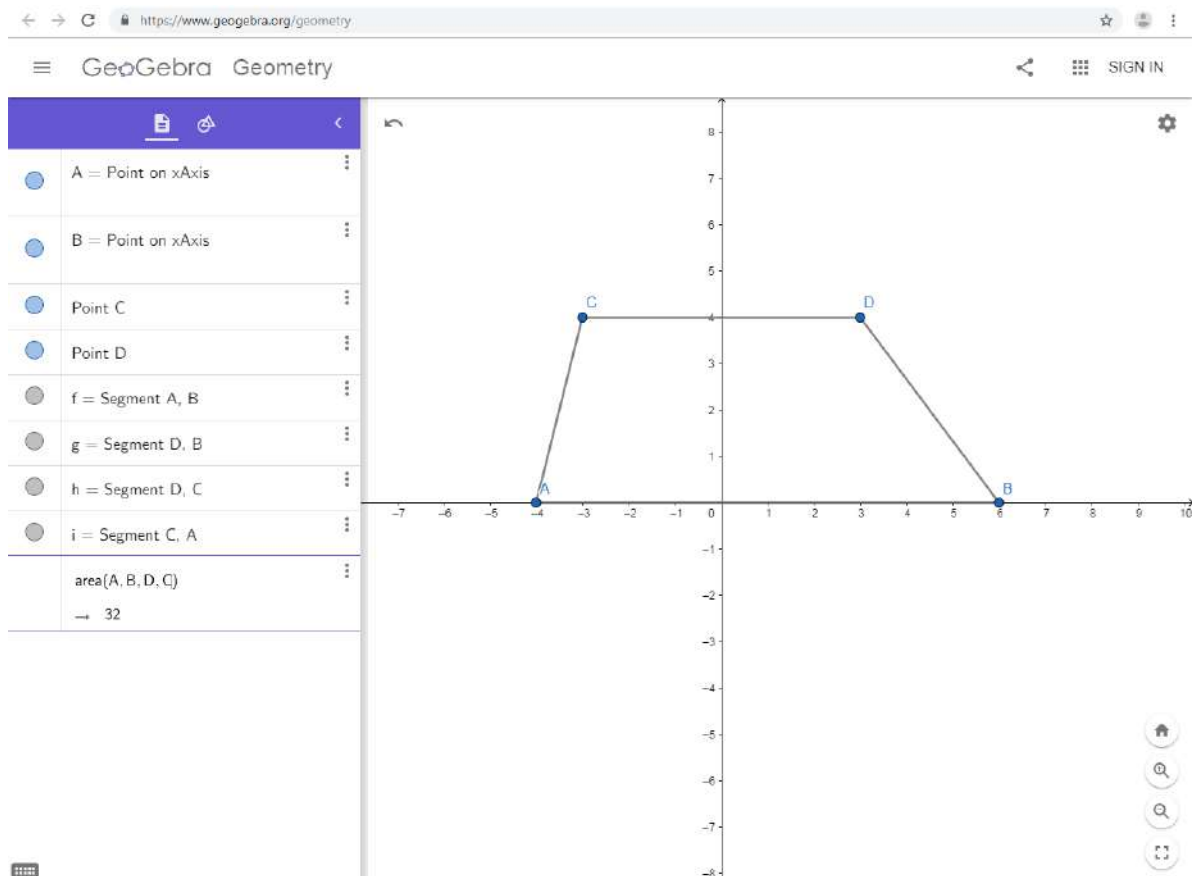
Calculate the area of a trapeze having $B=10$, $b=6$ and $h=4$.

$$A = \frac{(B + b) \cdot h}{2}$$

$$A = \frac{(10 + 6) \cdot 4}{2} = 32$$

The results can be checked online:

<https://www.geogebra.org/geometry>



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Additional Applications

- Calculate the area of a square whose side equals 9.
- Calculate the area of a square whose side equals 21.
- Calculate the area of a rectangle having $l=6$ and $w=4$.
- Calculate the area of a rectangle having $l=6$ and $w=4$.
- Calculate the area of a rhombus having $d_1=4$ and $d_2=8$.
- Calculate the area of a rhombus having $d_1=6$ and $d_2=10$.
- Calculate the area of a trapeze having $B=20$, $b=16$ and $h=3$.
- Calculate the area of a trapeze having $B=12$, $b=8$ and $h=5$.



LEGO MINDSTORMS EV3

Dragoș Andrei Manea, 4th grade, Middle School No. 3, Piatra Neamț

Tudor Ștefan Iftimie, 7th grade, Middle School No. 2, Piatra-Neamț

"Gheorghe Cartianu" Technical High School,

Neamț County Excellence Center,

Electronics and Robotics team

Guiding teachers: Gabriela-Brândușa Horlescu, Ana-Irina Secară

LEGO MINDSTORMS EV3 enablesthe building, programming and commanding of the LEGO robots. This robotics kit is useful for students who want to make the first steps in programming. At the same time other abilities are being developed: focus, intelligence, thinking, creativity and imagination.

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The robotics kit – component parts



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Remote Infrared Beacon



Programmable Brick



Large motor (x2)



Medium Motor



Infrared sensor



Color sensor



Touch Sensor



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EV3 Models



EV3RSTORM Robot

Building instructions – can be downloaded from:

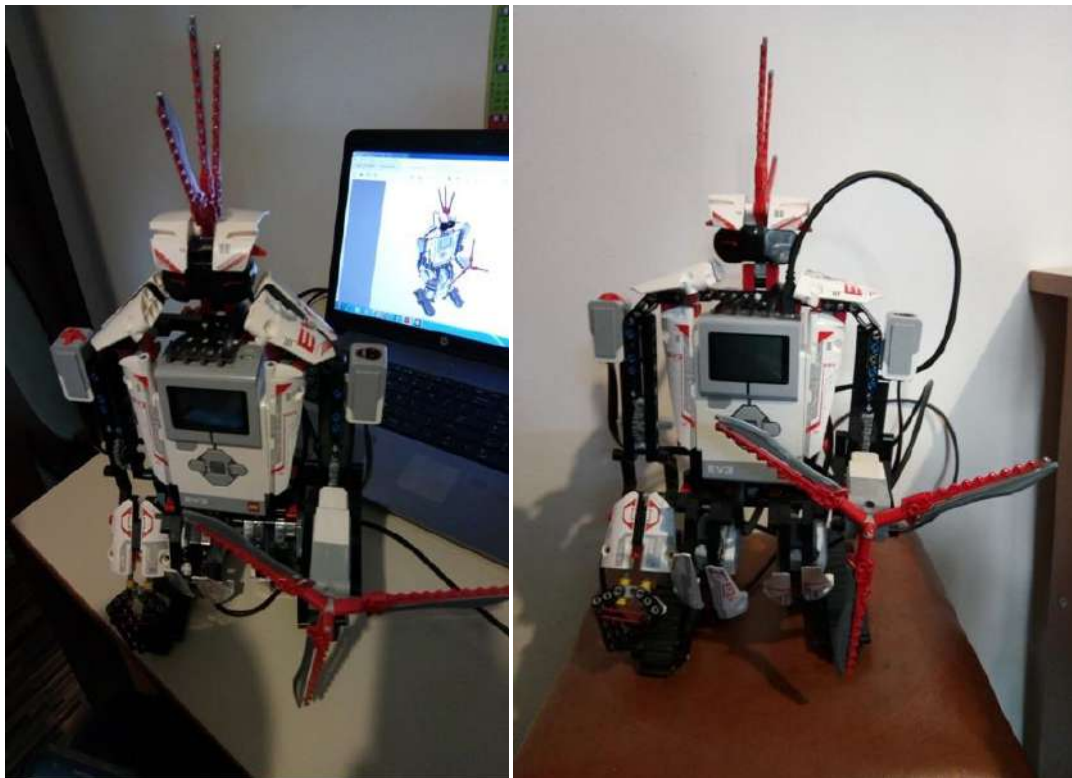
<https://www.lego.com/en-us/mindstorms/build-a-robot/ev3rstorm>



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EV3RSTORM - building the robot

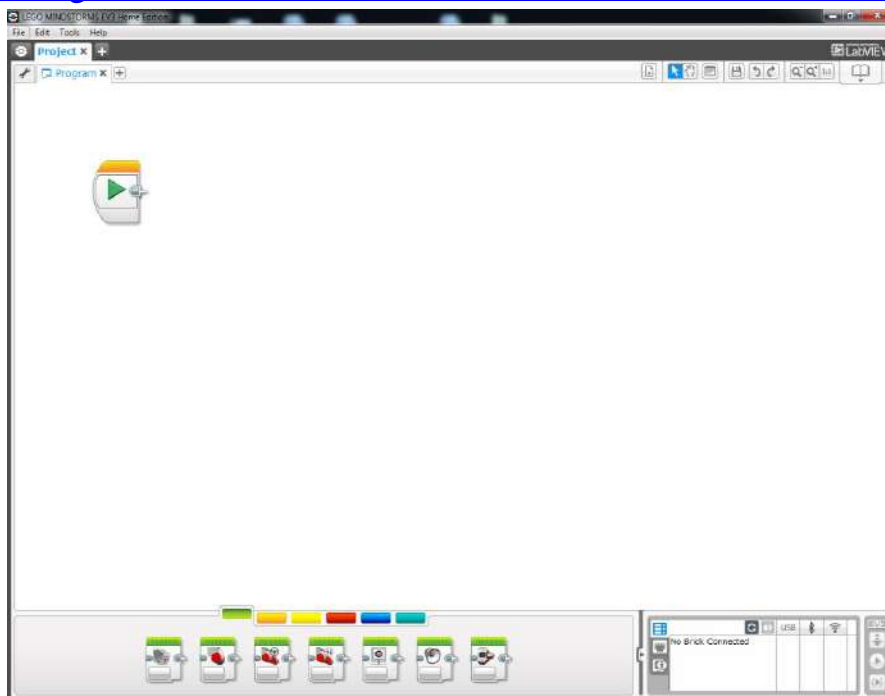


Software application

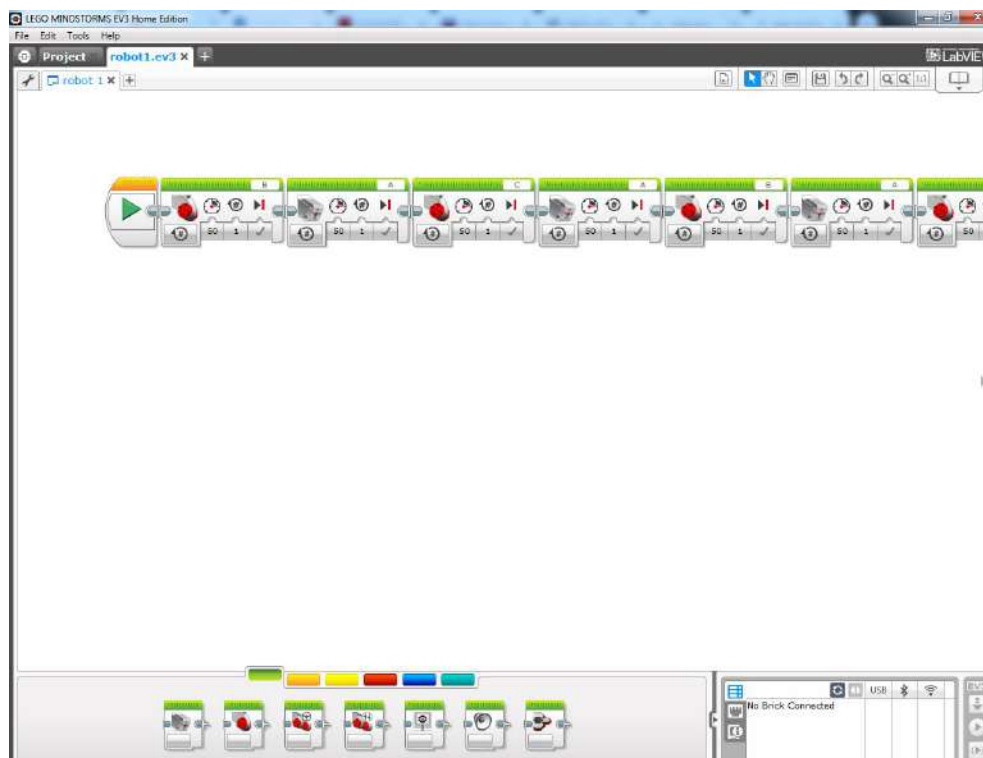
The programme can be downloaded from:

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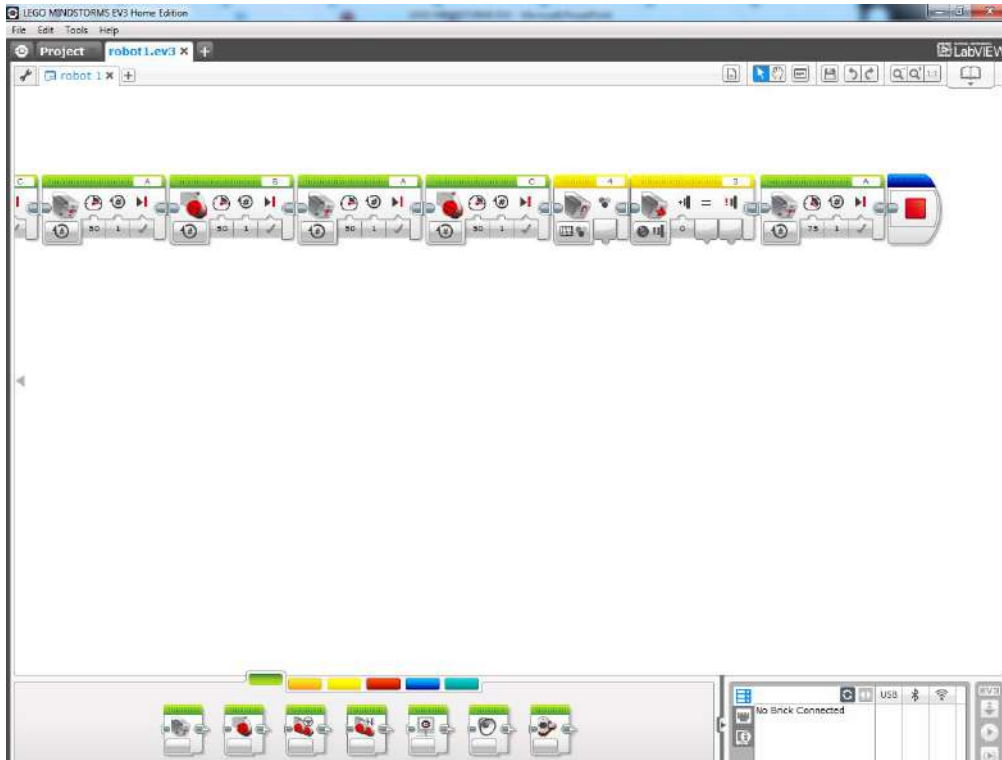
<https://www.lego.com/en-us/mindstorms/downloads/download-software>



-Programme 1- the robot walks

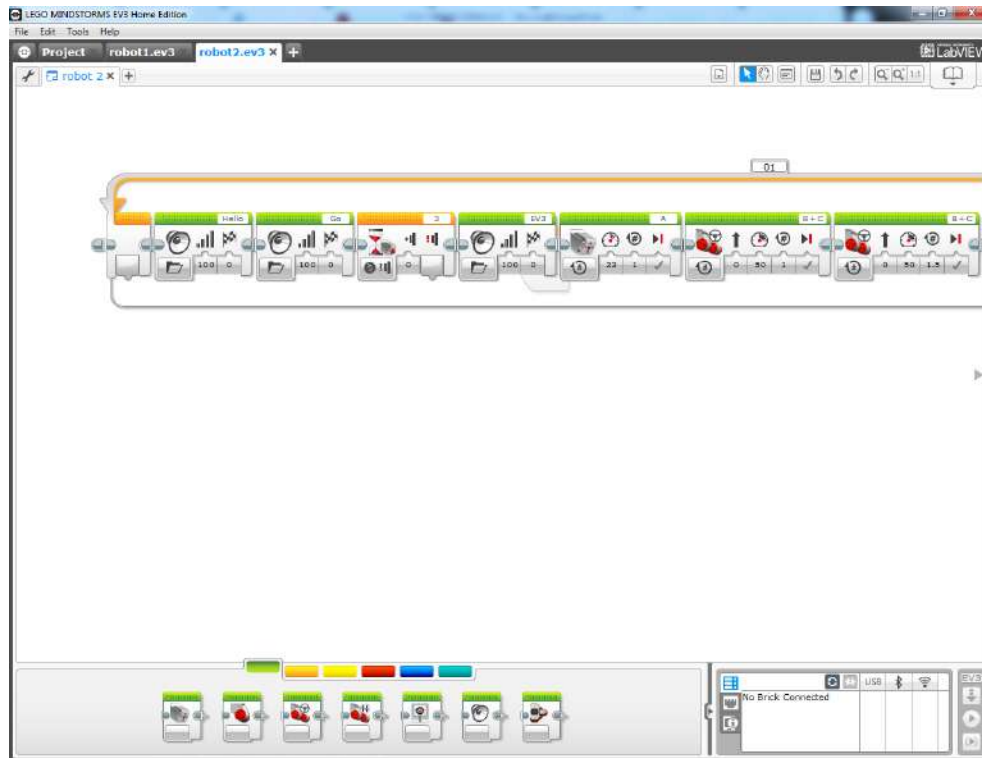


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Programme 2 – the robot walks and speaks



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Sensory Analysis of Wine

Teacher: Marian-Viorel Casian

Wine is an alcoholic drink exclusively made from completely or partially fermented grapes or grape juice (alcoholic drinks made from other fruit, including raisins, cannot be called wine).

The alcoholic strength of wine cannot be less than 8.5% in volume.

The principle of the method: the method is based on the evaluation by means of senses: sight, smell, taste of the following quality ratio: clarity-look, colour, taste, sparkle, smell, flavour (bouquet).

Sensory analysis technique:

Rules to be obeyed:

- **The tasting glasses** must be made of clear and thin glass with no deformities or bubbles, having shapes specific for the categories of wines. The international tasting glass is the tall "tulip" glass, 215cm³, that concentrates the flavour, the bouquet of the wine as well as the strange smells in the lower part. Most glasses are tall so as to prevent the hand from touching their rims.
- The glasses will be filled 1/3 of their volume otherwise there will be difficulties when the wine is stirred on the one side and the ratio between the volume of the wine and that of the glass is important for the smell.
- **The temperature** of the analysed wines varies according to the type of the beverage:
 - ✓ For white wines 12-15°C,
 - ✓ For red wines 15-20°C,
 - ✓ For sparkling wines 8-10°C,
 - ✓ For dessert wines 20°C.
- **The order of tasting** the wines is as follows:
 - ✓ First the white ones, then the red ones,
 - ✓ First the dry ones, then the sweet ones,
 - ✓ First the light ones, then the strong ones,
 - ✓ First the young ones, then the old ones.
- **Between tastings** there must be breaks during which bread or apples must be chewed.

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- **The assessment of clarity** is done both in transparent and reflected light by placing an electric lamp behind the glass while being in dark areas.

Way of working:

Assessing the clarity and colour

- Wine is poured in a tasting glass up to 1/3 of its volume.
- The glass is handled by its base, is lifted till visibility is optimum and is twisted several times while being in an inclined position.
- The sample is assessed by analysing the clarity and colour.

Assessing the smell

- The wine sample is smelled (the glass has been at rest);
- A circular motion is given to the glass and it is smelled by breathing in deeply;
- The glass is lifted to the lips slightly apart and the breathing is prolonged.

Assessing the taste and the flavour (bouquet)

- A small quantity of some cm³ of wine is lifted to the mouth in such a way as the tongue be totally deepened in the wine;
- The instant taste is established then half of the wine content is swallowed;
- The lips are partly open to get some air which fills the mouth with flavours;
- The rest of the wine is "blended" with the mouth closed;
- The taste, the flavour of the wine is assessed and the harmony of its components;
- The wine in the mouth is thrown away and the tasting process is made again.

Calculation and interpretation of results:

- The obtained results are compared to the sensory characteristics in the specific standard (see the table below)
- Conclusions regarding the quality of the analysed wine are drawn.

Wine – Sensory characteristics – excerpt of the standard

Characteristics	Admissibility conditions
Appearance Colour Smell Taste	a) The group of common table wines <ul style="list-style-type: none">• Clear, no sediment• White-greenish, white-yellowish up to light yellow, golden, pink or red• Specific for wine, no strange smell• Pleasant, of healthy wine, no strange taste
Appearance Colour Smell Taste	b) The group of wines having the name of the vineyard <ul style="list-style-type: none">• Clear, no sediment• White-greenish, white-yellowish up to light yellow, golden, pink or red• Specific for wine, no strange smell• Pleasant, harmonious, specific to the vineyard
Appearance Colour Smell Taste	c) The group of the wines having the name of the vineyard and the sort <ul style="list-style-type: none">• Clear, no sediment• White-greenish, white-yellowish up to light yellow, golden, pink, red or ruby red, specific to the sort of wine and the type• Flavour specific to the type• Pleasant, harmonious, specific to the type, specific to the soil and the vineyard, velvety and for wines older than 2 years with old wine bouquet.

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1. Nichita Luminița coord. – *Carrying out specific analyses in fermentation industry*, Textbook, 9th form, OscarPrint Publishing House, Bucharest, 2007.
2. Pană Olimpia –*The machine and technology in fermentation industry*, *Wine technology*, Didactic and Pedagogical Publishing House, Bucharest, 1992.

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