

National STEM Contest 2024

Open Category

(1st - 4th Grade)

Improving my city by using Simple Machines

Rules

1st Edition (October 2022)



Editors: Michael Mpakaloglou & Anna Koumara

Foreword by the President of STEM education

The great **celebration of STEM and Educational Robotics** is here! This year marks 17 years in the effort to introduce educational robotics as well as STEM methodology into compulsory education. This year's Panhellenic Competition is **organized for the 10th consecutive** year by STEM Education and is under the **auspices** of the **Greek Ministry of Education**.

The **organization** of a major event such as the National STEM Competition requires **experience and know-how** that STEM Education has acquired and offers completely **free of charge** in terms of **participation** in the service of the educational community.

Through the competition, the introduction of educational robotics, as well as the wider **STEM** (Science-Technology-Engineering-Mathematics) methodology, into the official education system is sought. The Panhellenic Competition is a unique way for young students to understand natural sciences, programming, and automation, learn to think like engineers, develop their problem-solving ability and expand their creativity.

During their preparation for the competition, the students, with the guidance of their teachers-coaches:

- form teams (**teamwork**)
- study the relevant literature and experiment (**critical thinking**)
- explore the science of engineering (**engineer thinking**)
- face challenges and propose solutions (**problem solving**)

By exploring these skills in a hands-on and participatory way, children develop resources that are essential to them today and **for the future**, whatever career choice they pursue.

The elements that make up the new competition include the following innovative changes:

- Single theme for all ages
- The introduction of simple machines
- **The introduction of measurements in Primary School.**

Overall, the Panhellenic Competition supports STEM as a methodology for compulsory education and defines the ways in which students will acquire the skills of the 21st century. At the end of the competition, the educational community - from Kindergarten to High School - is invited to participate in the competition to respond to the **convergence of Greece with technologically developed countries**.

Good luck

Ioannis Somalakis

Introduction



by side.

From prehistoric era, humans created small settlements, that were the start of the first cities. Some cities exist for thousands of years, and they have evolved either slower or faster, pillaged, destroyed, and rebuilt. Most of the cities that have suffered a disaster they were rebuilt on the ruins of the previous ones, and in many cases the ancient coexists with the modern side

Over the years, cities have evolved so that the living conditions in them are better and better. Living conditions in the cities of the Middle Ages were dire, diseases spread extremely quickly simply because there was no clean water and sewage systems.

Now, with most of the world's population living in cities, the well-being of citizens is one of the most important goals of governments and local authorities. For example, the public transport network, cycle paths, parks and recreation areas, energy management, and green buildings are only some of the areas of global interest.



Think and look for the characteristics of the city you would like to live in, make your models and come and present them!!!

Team composition

Your team consists of:

- the coach (over 20 years old)
- 3-6 students who in the current school year are in grades 1 - 4

Objective - Themes

Your team needs to work on a project with at least 3 mechanisms that use simple machines and an electric motor connected to the battery case described in the equipment materials.



Because this category does not include the use of automation, students' projects should provide solutions outside the logic of "smart cities". Goal 11 of UNESCO's 17 Sustainable Development Goals for green and sustainable cities.



More specifically, for the design of a sustainable city, the social, economic, environmental effects, the living conditions of the citizens and their symbiosis with the flora and fauna of the area are considered. Finally, this design should not deprive future generations of the opportunity to continue this effort.



Cities' infrastructure, such as buildings, utility networks (electricity, water, telecommunications, sewage), security, public transport, cycle and pedestrian networks, wellness and recreation areas are topics that you can study and represent. Quality education (UNESCO goal 4) is present through the school, libraries, and local museums.



Your Mechanisms should be applications and solve an existing problem in one or more of the above UNESCO goals (3, 4, 6, 7, 9, 12 and 13) for sustainable development especially in urban centres.



Goal 17 for the cooperation of all of us (state and citizens) is important to be understood by the children and to be seen in the solution they will propose.

Examples of mechanisms with simple machines in cities to pick up students:





Figure 2 Machines on construction sites use plenty of simple machines to operate



Figure 3 Cart and tools for urban or school gardens

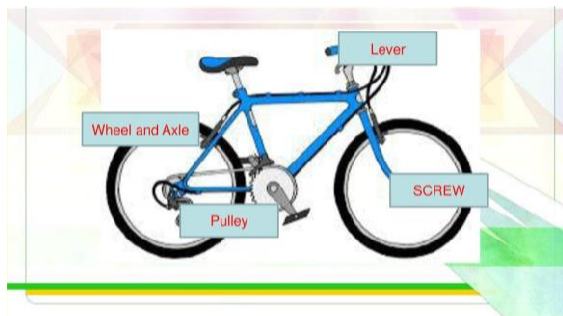


Figure 4 Bicycle! Full of simple machines and with zero CO2 emissions!

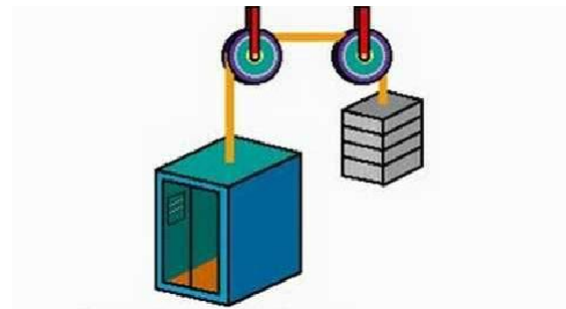


Figure 5 Elevator for lifting people and objects in buildings

Interesting citations:

https://www.bbc.co.uk/bitesize/articles/zdqt7nb?fbclid=IwAR014DgNfYoDW3qRnlpcCd8NPxvXiscNtEwQ9UOfJMdjhfr5IAI_pEau2M

<https://theconversation.com/people-love-the-idea-of-20-minute-neighbourhoods-so-why-isnt-it-top-of-the-agenda-131193>

General Rules

- Coach is at least 20 years old; he is escorting his team at any time, takes care of his team's safety and any needs and collaborate with the organiser. He must be an example of behaviour and promote fair play to his team, the parents, and the rest of them competitors. He is responsible for the behavior and attitude of his team.
- The team consists of 3-6 students from 1st to 4th grade and their coach.
- The recommended equipment is being described later in the rules.
- A **Mechanism** is a construction that has movable parts, that they move by using simple machines, and is a clear solution to the problem or the cause that has been designed to solve or serve.
- Your **project** must consist of **3 mechanisms that they must**
 - contain at least 2 simple machines (see the next section of the rules).
 - either the whole mechanism or a part of it needs to move either by hand or motor.
 - At least one of them must have a motor and the battery pack with switch to move.
 - You are allowed to construct more than 3 mechanisms, **CAUTION** the maximum scoring stays the same for the whole project and will be shared among any number

of mechanisms.

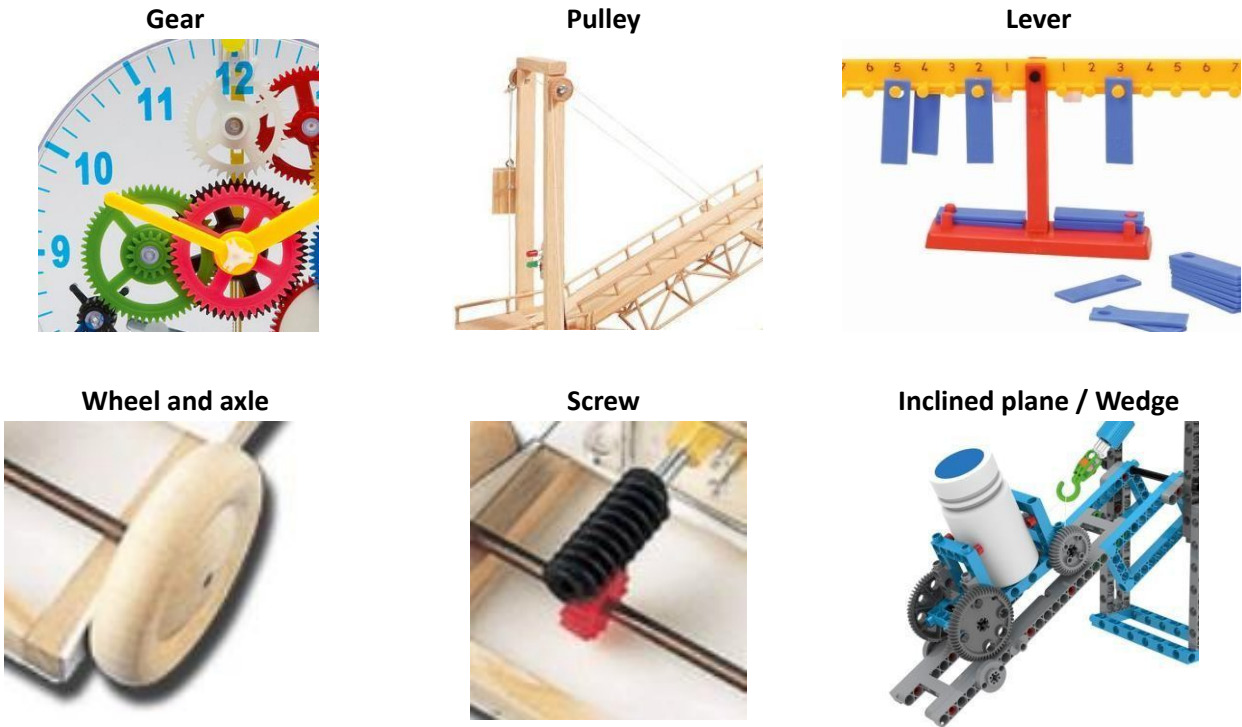
- Your mechanisms can be preassembled before the start of the competition.
- **CAUTION** Projects that **are not related** to the topic of the competition or they use **automation** will not be assessed. (Sensors and motors of the wedo 2.0 **are not allowed**)

Simple machines and some examples of them

Simple machines are parts of mechanisms that can transfer power to other parts so they can move. Your goal is to use these simple machines in your project and point out why you do so. There are 6 fundamental simple machines:

Lever	Wheel and axle	Gear
Screw	Pulley	Inclined plane / wedge

These machines can be found in many everyday objects that students use in their home as a STEM Toy and in school as laboratory or class equipment.



Also, we can find simple machines in many more construction that we used in the past but also in the present. Their usage helps us to achieve our goals easier and safer!



Figure 6 Manual water pump (Lever and axle)



Figure 7 Olive press (Lever, screw & axle)



Figure 8 Door stop (wedge)



Figure 9 Scissor lift (Lever, screw, toothed bar)

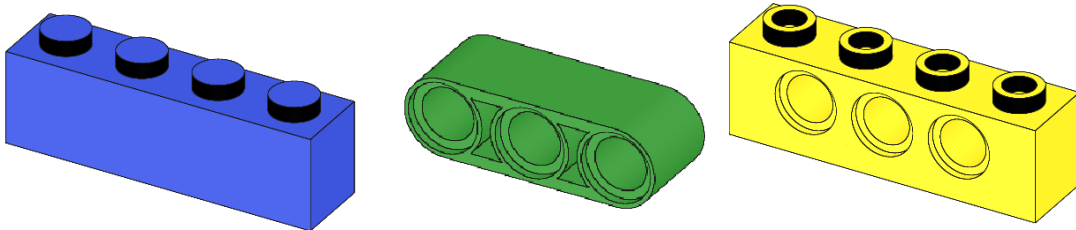


Figure 10 Manual winch with wire rope (Gears, pawl & ratchet, axles, screws and lever)

Equipment kits

Mechanism building materials and motors must be Lego Classic, Technic, or hybrids. Lego pieces can also be used from students' toys.



The following 3 pieces belong to the respective Lego Classic, Technic, and hybrid systems.



Depending on what you are missing, see the suggestions below.

Recommended packages and sub-components (click on the blue letters to see them)

1. Engineering Kits (if you don't have gear)

<p>Απλές Μηχανές (Simple Machines)</p> 	<p>Battery SET and 3 Sizes of Motors and Accessories</p> 
--	--

PR
OP
OS
ITI
ON
B

Σύνθετες Ηλεκτρικές Μηχανές (Complex Electric Machines)



2. Mechanism parts (to complement your existing equipment)

<p><u>Power Functions Battery Box</u></p> 	<p><u>Power Functions M-Motor</u></p> 
<p><u>Power Functions L-Motor</u></p> 	<p><u>Power Functions XL Motor</u></p> 
<p><u>Extension cable Power Functions 8"</u></p> 	<p><u>Power Functions Extension Wire 20"</u></p> 
<p><u>Power Functions Control Switch</u></p> 	<p><u>Power Functions Servo Moto</u></p> 
<p><u>Power Functions Rechargeable battery for models</u></p> 	<p><u>Power Functions IR Receive</u></p> 
<p><u>Spare Parts</u> (Lego Classic and Lego Technic)</p>	



rubber band, thread for their operation that are not

Technical specifications of the presentation area

In the competition, each team will be allocated:

- a space of approximately **1.5 m x 1.5 m** where all the material parts of the project should fit
- in this area there will be a table approximately 100cm x 60cm and electricity will be available. **The model of the project should not exceed the dimensions of the table**
- Posters can be placed on the back of the booth approximately 2 m high or held by the team during the presentation.

Required Portfolio

At least 7 days, before participating in the regional competition of their region, the teams should post on the WRO Hellas website the portfolio described below. They are essential for the judging committees on the day of the competitions and the free sharing of good practices in the educational community.

Steps for posting the portfolio:

- The groups will create a folder in the cloud (Google Drive, One Drive, Dropbox etc) that will belong to them, and they will upload the portfolio described below.
- The link that leads to the team's cloud AND with download rights (!) should be shared with WRO Hellas to anyone who visits it.
- This notification is done by processing their registration form and filling in the "Required deliverables" field with the link.
- To edit your registration form at any time, find the email in your inbox with the subject "Participation Confirmation" and the sender eventora.

Required portfolio contents:

Inside the cloud folder you will create 6 separate folders named in bold and will contain the files described below. On the day of the competition and during the presentation, each group of judges must be given a folder containing in A4 size the contents of folders 2, 4 and selectively material from 3 and 6.

1. **Consent Documents:** Documents with the consent of the parents for the use of the photos or videos in which the faces of the students may be seen (special printable forms that will be posted on the WRO Hellas website)
2. **Team Report:** The Team Report form and a table for each mechanism you will present (you will find them at the end of the rules)
3. **Photographs:** Clear photographs where the stages of construction can be seen, and the construction of the mechanisms

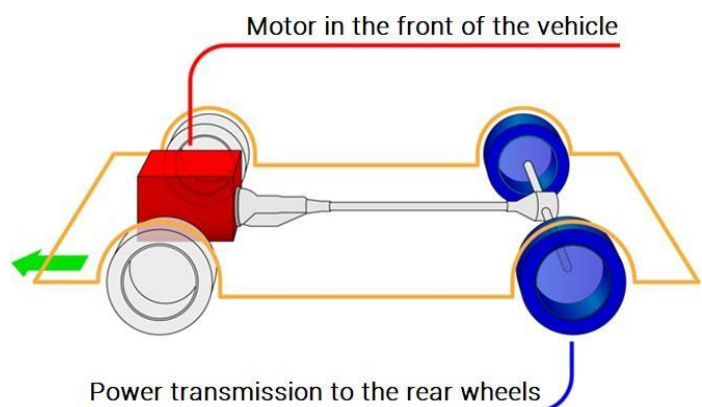


Figure 11 Example of a digital Build Sketch with the simple machines used highlighted

4. **Sketches:** The Sketches of the simple machines of the mechanisms either in electronic form (pdf, jpg, png) or in a digital photo or imprint on rice paper (Information in the webinars that you can watch live or asynchronously).
5. **Video:** At least one video where the students will show and describe the operation of the mechanisms, focusing on the simple machines they used. To zoom-in, to see the construction details in pause and in operation!!! Its size should not exceed 7 minutes and 200MB
6. **Other material:** posters, presentation and any other material related to the project!

Competition flow

The teams during the (Regional or Final) competition need to:

- Install their project in the space that will be allocated to them (including placing the posters, sketches, etc.).
- Be audited for compliance with regulations.
- Demonstrate and present the project to the judges, answering their questions
- Visit the booths of the other teams, keeping in mind that they may be called back to their booth.
- Demonstrate and present the project to the students of the other groups who will visit their stand.

When presenting to the judges, they should be given the envelope described in the required deliverables in 3 to 4 copies.

Assessment

For judging the projects, a limited amount of time will be allocated to each group - indicatively seven minutes - of which a part (eg the five minutes) will be for the presentation by the group and the remaining time for questions from the judges.

- The students will present the project they have created and state how it is related to the theme of the competition
- The team report and mechanism tables contain important information for the judges, which the team should present.
- There will be a demonstration of the operation of the project, with an emphasis on the presentation of simple machines.
- The sketch will be presented through the digital or printed poster, with reference to the function and the solution to the problem it solves.
- The students will answer any questions of the judges, related to the project.

During the evaluation, no help or involvement of any kind from the coaches to the teams is allowed.

Assessment Procedure

Details of the process to be followed during the evaluation will be described in a subsequent post at www.wrohellas.gr

Scoring criteria

Categories	#	Criteria	Points
Concept & Innovation	A	Category's total points: 60	
	1	Idea and creativity	15
	2	Research and evolution of the idea	15
	3	Applicable and fine solution of the challenge	15
	4	Innovation of the project	15
Educational Mechanics	B	Category's total points: 60	
	1	Structural integrity and tastefulness	15
	2	Mechanical advantage / efficiency	15
	3	Correctly pointing out and naming the simple machines	15
	4	Mechanism's functionality	15
Mechanism sketches	C	Category's total points: 30	
	1	Accurate depiction of the construction's chassis/frame	10
	2	Accurate depiction of the construction's simple machines	20
Presentation & team spirit	D	Category's total points: 50	
	1	Presentation assessment	15
	2	Communicational skills and collaboration	20
	3	Booth's decoration, videos, posters, etc	15
Maximum Score:			200

Panhellenic Competition of Educational Robotics and STEM 2023

Open Category

(1st -4th Grade)

Improving my city by using Simple Machines

TEAM REPORT

Team's name:		
Coach's name and surname:		
Member's names:	1.	2.
	3.	4.
	5.	6.
(Theme) Goals of sustainability that we are focusing in		
What are we trying to invent or evolve ?		
Where did we search for our information ?	Internet Libraries Other:	Museum Professionals
What are the solutions that you have agreed upon to construct ?		
How many mechanisms are you going to present?		
What difficulties or challenges did you face?		

TEAM REPORT

Table of Mechanism No _____

Name of Mechanism:

Problem

Solution

Photo of constuction

Sketch of mechanism

Simple machines used

1 Whell and

4

Lever

axle 2 Gear

5

Screw

3 Pulley

6

inclined plane / Wedge