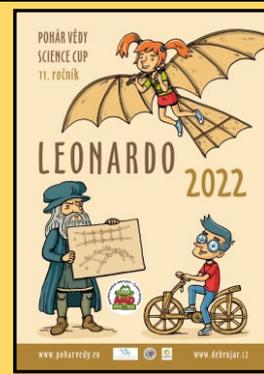


SCIENCE CUP – LEONARDO 2022



Category 2 – Primary School

1st round – January – deadline 31. 1. 2022 23:59



Introduction

Dear competitors, welcome in the first round of the 11th year of the **Science Cup – LEONARDO 2022**. Before you start working, please spend some time on this information on tasks, solutions, and evaluation.

Each month's assignment consists of three main tasks - Creativity and Idea (assessed with 20%) Theory and Research (30%) and Practice and Project (50%). Write down the solving process of each task in your own words and document it with your own pictures and photographs.

Solutions must be submitted no later than 23:59 on the last day of the round, when the assignment is closed.

The solution must be uploaded to the Science Cup web interface in the given period as one file in PDF format, not exceeding 10 MB in size. All the content of the solution (texts, drawings, schemes, photos) cannot exceed 3 pages of A4 paper format, and should be easily readable (simple font, minimal font size 11 pt.).

We can imagine you can write and fill with pictures far more than only three pages. The judges, however, need to have the possibility to read and fairly evaluate all the solutions. Thus, all the solutions that would not meet the given criteria would get, unfortunately, -20 points as penalization.

On the contrary, if your solution gets full marks, you can get 20 points for creativity and idea, 30 points for theory and research, and 50 points for practice and project. In total, you can reach to 100 points in each of the four rounds of the corresponding part of the competition. Each evaluation consists also from a written feedback, so you know what your strong part was, and what you can improve for the next rounds. For the evaluation, the work of the team, not of the team leader, is crucial.

For your presentation during the final, your team would have ONLY a table or a school desk of approx. 100 x 150 cm in size (exact size will be given in the acceptance letter for the finalists) and the proximate surroundings of 10 cm around the table. You would not be able to use any additional space (walls, notice boards, floor behind the 10-cm radius), so keep this in mind when preparing your products.

Now you can start working, good luck with the tasks and enjoy the exploring!

Yours LEONARDO 2022 Team – Jit'a H., Katka, Jit'a S., Nad'a, Andrea, Igor, and David

1. Creativity and idea (20 %)

This year's Science Cup is called Leonardo. It is named after a scholar, artist and scientist Leonardo da Vinci. From January to April, we will explore together the world around us, just like he did. Your first task is to find out and write briefly (just in bullet points) who Leonardo da Vinci was, when and where he lived and what he did. Use your own words - no copying! Look in books, encyclopedias, on the internet; you can also watch some videos or documents, for example the episode about Leonardo from the series "Once Upon a Time... The Discoverers". Always let us know where you got your information from. Talk to your team and write or draw what Leonardo's invention do you find the most interesting and the most useful and why.

2. Theory and Research (30 %)

One of the things Leonardo was interested in was the design and construction of bridges. He designed many bridges with various interesting structures.

- What different kinds of bridges do you know? Look outside in your neighborhood, look in books and in pictures or photographs. Classify the types of bridges according to at least three different criteria.
- What is the largest and the smallest bridge near your school or home?
- What materials are these bridges made of?
- What do these bridges cross?
- How many of you walk or drive over a bridge on your way to school?
- What is the oldest bridge in your country? What is it made of and what does it cross?
- What do you think is the most famous bridge in your country, what do you think is the most interesting and what do you think is the most beautiful? Always write why you think so.

3. Practice and project (50 %)

In the last part of this round you will build the bridges yourself.

Self-supporting bridge

In 1483, Leonardo designed the so-called self-supporting bridge for Duke Ludovigo da Sforza of Milan, which requires no nails, ropes or glue and spans a chasm wider than the length of the logs used to build it. This bridge can be dismantled and transported to another location where it can be rebuilt.

- Build Leonardo's self-supporting bridge over a chasm made from, say, two benches. You can build it with wooden spatulas or the same planks. Follow the instructions in the pictures.
- You can improve the stability of the bridge if you use something to hold the ends together so that they don't slip.
- How many spatulas did you manage to build the bridge with?
- Try bridging two different heights, perhaps a bench and a chair.
- Take pictures of the bridges you built.
- Is there anything that surprised you when you built the bridge?
- Is there anything you have to watch out for when building a bridge?
- What kind of spatula/planks do they need to be to make a good bridge and why? Which on the contrary are inappropriate and why?

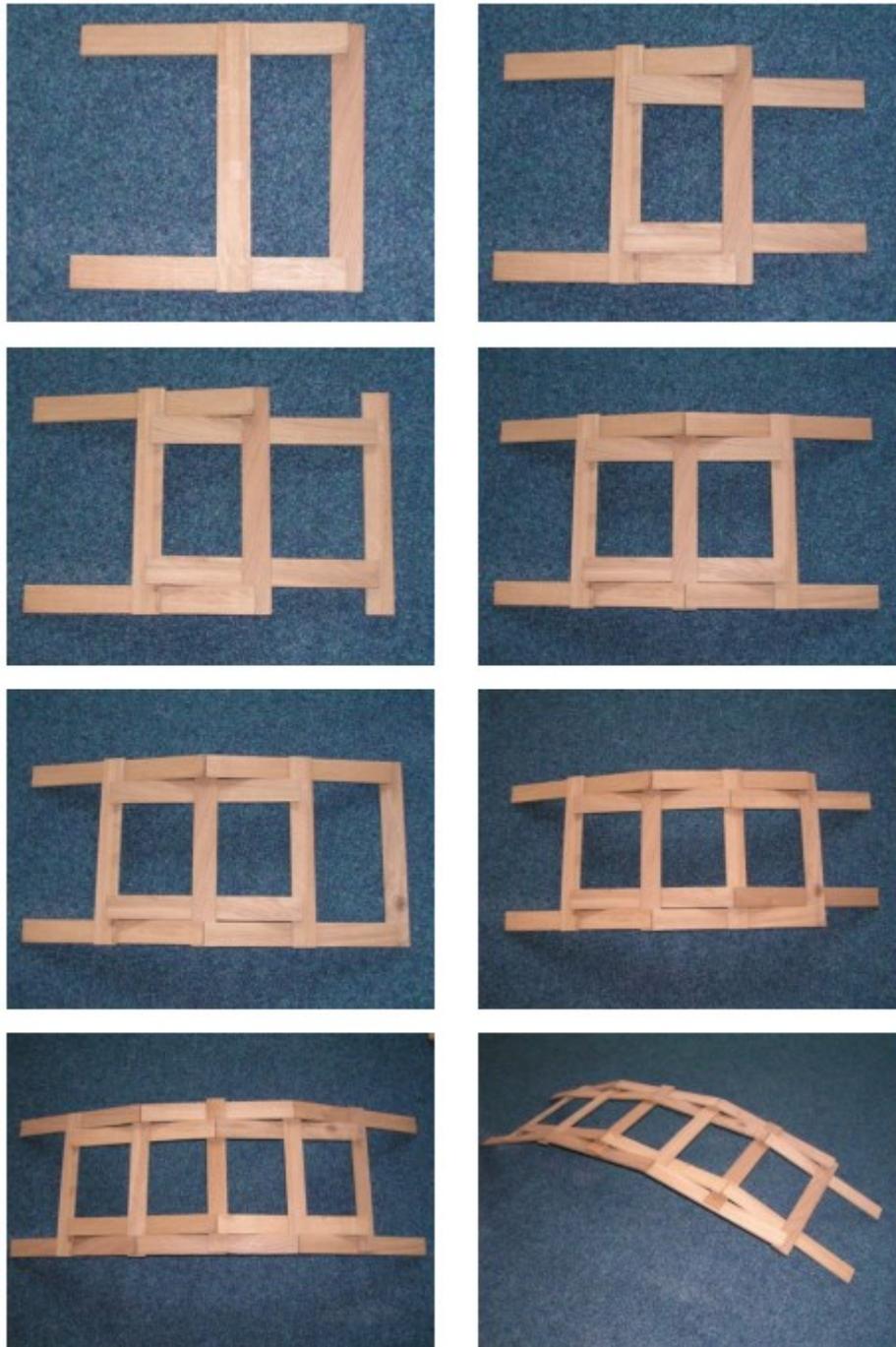


Figure 1: Instructions for building a self-supporting bridge by K. Lipertová (taken with the author's permission from the article Leonardo's self-supporting bridge in the Proceedings of the Heureka Workshop 2008, Prometheus 2009, ISBN 978-80-7196-397-4, available at <https://kdf.mff.cuni.cz/heureka/ke-stazeni/sborniky-dilen-heureky/sborniky/SbornikDilenHeureky2008.pdf>)

Paper bridge

- Using only ordinary office paper and paper glue, build a bridge that:
 - bridges a gap at least 30 cm wide, for example the space between two benches (30 cm is slightly more than the longest side of an A4 sheet of paper, i.e. a large notebook),
 - can carry a load of at least 250 g (if you do not have a scale and weights, try to find some product of this weight e.g. a package of butter or cheese).
- Try folding, twisting and gluing the paper in different ways.
- Compare different combinations of folded and rolled paper.
- Describe and draw the resulting construction of your bridge in detail.
- Take a picture of the finished bridge with the load.

- Test how much more than 250 g your bridge can carry and write it to us.
- We are also interested in what other designs you have tried and why you rejected them.

Your own bridge

- Build a bridge out of any material or combination of materials other than paper and spatulas.
 - the bridge must again hold at least 250 g,
 - the bridge must again span at least a chasm larger than the long side of a large notebook (30 cm), but try to make the chasm as wide as possible.
- Describe and draw the construction of your bridge and the material you used to build it.
- Take a picture of the finished bridge with the load.

Document your experiments with photographs and pictures, and write everything down carefully. We suggest you make research diaries, in which you will write and draw everything. You will not send us the diaries, but if you are promoted to the finals, you will take them with you together with the products from the individual rounds.

Remember, however, that in order for us to be able to evaluate all your solutions, what you send us must not exceed three pages!

We are looking forward to your solutions and see you in the next round!

Describe the solution procedure of each task, the results of your team work, and any additional information, and document them with photos.

The solution can be handed in only before the deadline. Only the solutions fulfilling all the requisites given in the propositions will be judged without any point loss.

If you have any questions, you can ask a category consultant in your country:

Czech Republic: Jitka Houfková – jitka.houfkova@gmail.com and Kateřina Vágnerová – Katerina.Vagnerova@seznam.cz

Turkey: Basriye Öngel – basriye.korkmaz@gmail.com