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Case study B

Basic data

Title of Research Teaching Unit	Solids around us and their representation on paper
Unit created by	Da Vinci School, Prague (CZ)
Based on Concept	M4M_IT-AREA_TU-3
Concept created by	Fondazione A.R.E.A., Italy
Date of teaching	15/12/2023
Number of students in class	16
Number of migrant students	2

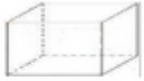
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1. Unit Description of Research Teaching Unit

Title	Solids around us and their representation on paper
Teaching unit concept	<i>M4M_IT-AREA_TU-3</i>
Age of students/grade	13 - 14 years old, 8 th graders
Length of the unit	90 min
Mathematical topic	solids, sketch, plan, side plan, solid grids
Prerequisite knowledge	<ul style="list-style-type: none">terminology: naming of solids, 2D representation of solids, solid grids
Materials needed	<ul style="list-style-type: none">pictures or models of solids for migrant studentsinternet accessworksheetpaper cubes for experimental activitiesev. the Scissors app in the Elica Dalest programme
Objectives	<ul style="list-style-type: none">to practice the terminology of solids, work with visualization for students with a different mother tongueto record and name solids in a real pictureto start from the model of the body to discover its physical architectural realization with respect to the country of originto recognize the outline, plan and side view of a set of solidsexplore the grids of the cube, and possibly other solids, in an unconventional way
Notes on work with migrant students	<ul style="list-style-type: none">it is necessary to ensure that students understand the terminologyit is useful to look for buildings in the country of origin and to cooperate within the group

Lesson plan

Evocation: Look around the classroom and find as many objects as possible in the shape of: cuboid, cube, cone, cylinder, sphere, pyramid. Pupils with a different mother tongue can be given pictures of the relevant objects to see visually in front of them.

cone		sphere		cuboid	
cube		cylinder		pyramid	

Group work: Pupils are divided into groups of three, ideally in such a way that they form mixed groups of migrants and non-migrant students. In the group they choose 2 pictures from the 3 prepared and mark (record, describe) as many of the bodies shown as possible. One of the groups then presents them to the rest of the class, and in the discussion the other groups add their suggestions.



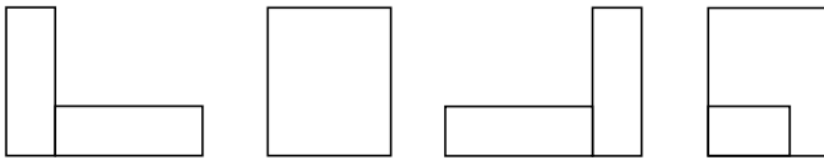
Project assignment GEOMETRY IN ARCHITECTURE: In the following 30 minutes, students work in groups of 3 or 4 to find well-known architectural works in their countries of origin (or in culturally close countries) that have the shape of a selected geometric solid. Each group chooses (or is assigned) one geometric solid and tries to find as many known buildings in the shape of that solid as possible. They then choose one structure for which they are given the task of calculating how many metres of wrapping paper they would need to wrap it - without the base. They need to allow a 10% margin for the amount of wrapping paper.



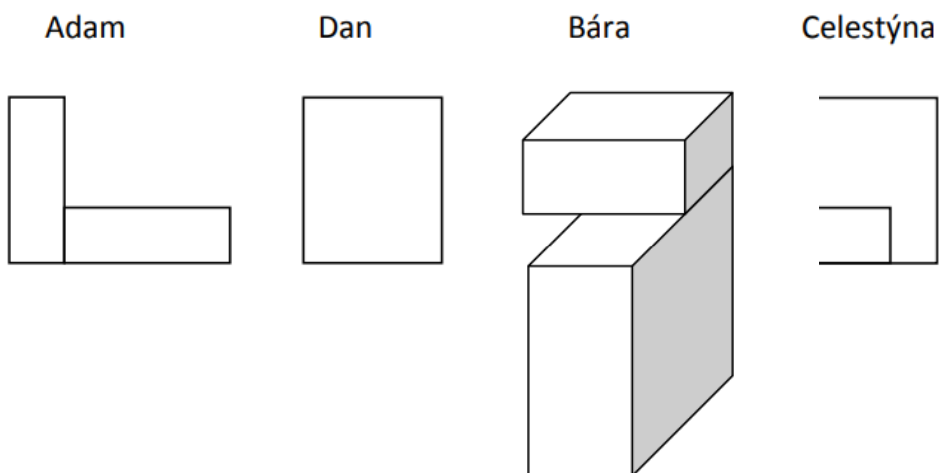
Worksheet - Solids around us

Tasks 1 and 2 are included mainly to clarify the terminology of sketch (front view), side plan, floor plan.

1. Each of the pupils drew the building as they see it. Match the drawings to the pupils.

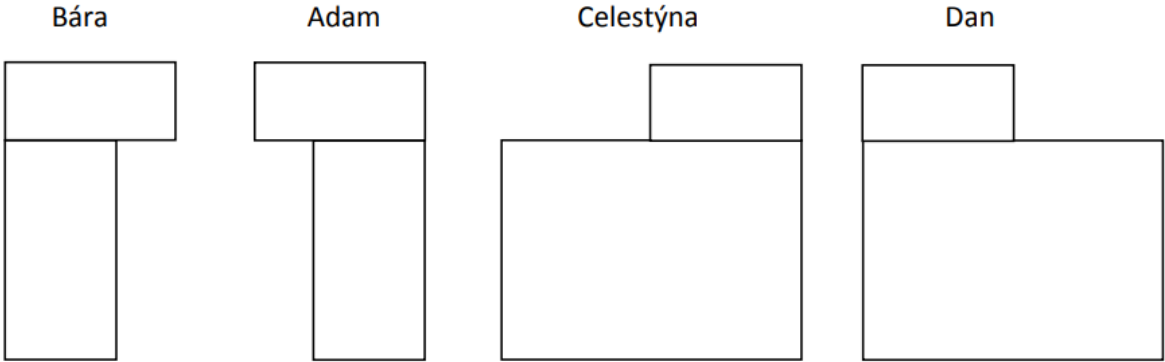


Solution:

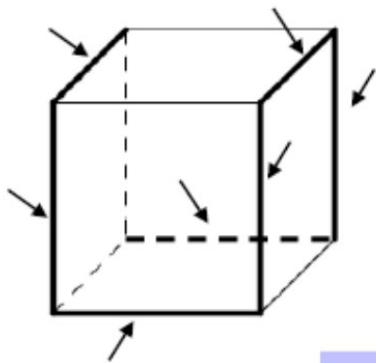
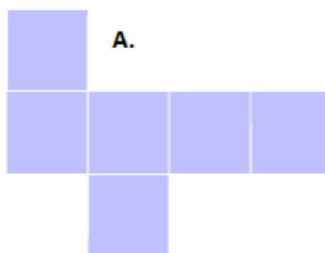
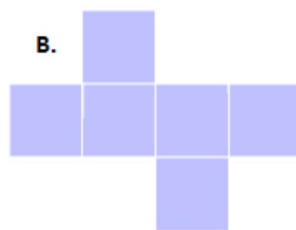
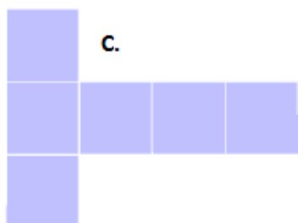
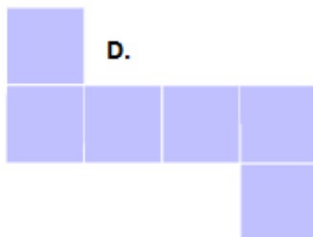
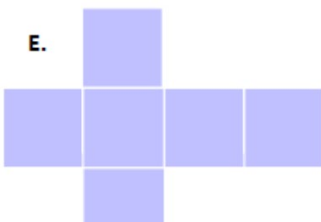
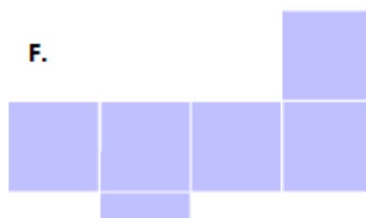
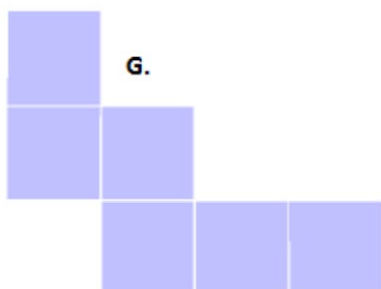
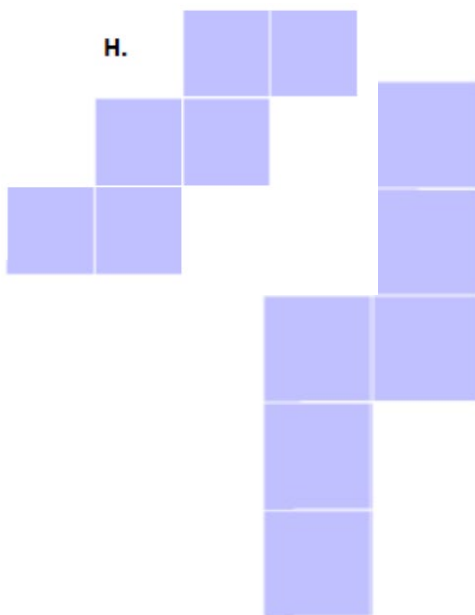


2. Another building is built on the table. Draw what you will see if you take the place of Adam, Bára, Celestina and Dan.

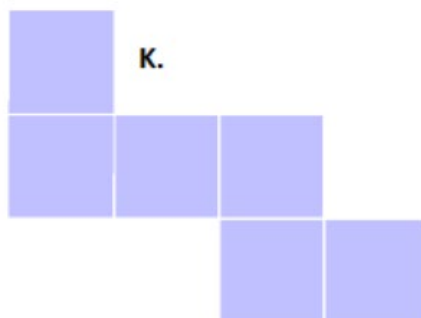
Solution:



3. What kind of grid do you get after cutting the edges marked with arrows? You can use a model paper cube.



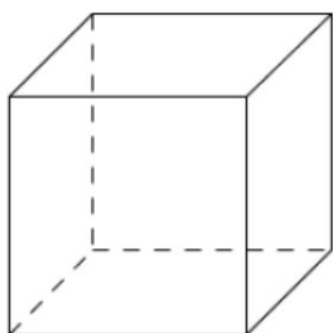
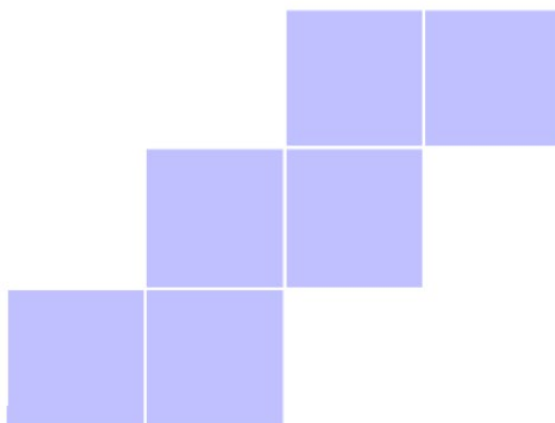
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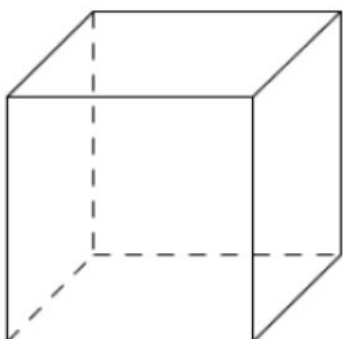
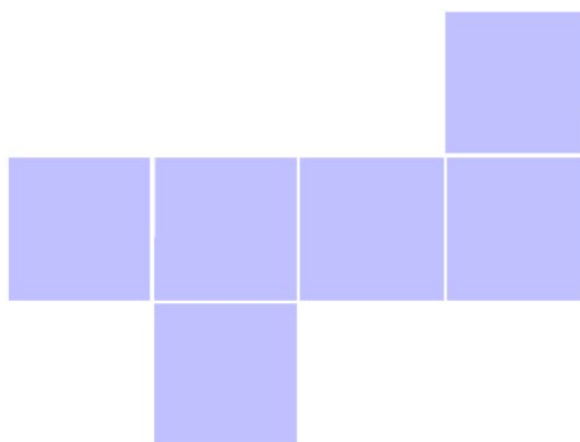
Solution:

4. Highlight in colour the edges you will need to cut to get the net below.

A.

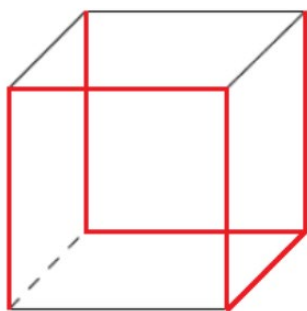


B.

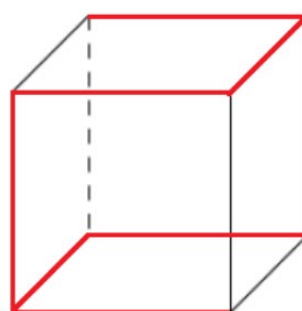


Solution:

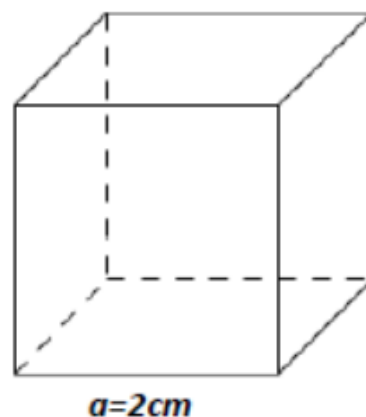
A.



B.



5. What is the smallest number of cuts that can be made to obtain the net of a cube? In the cube below, color-code the edges you would cut to form any grid. Sketch the grid you would cut the cube according to on the worksheet.



Reflection: Reflection focuses on the part of the lesson where students work with the worksheet. The reflection of the group work should follow immediately after the completion of the group work. During the individual work, it is useful to set up a model situation on a table so that pupils can try looking at the building directly from different 4 places to check their solutions. The reflection could include a discussion of how the pupils discovered which edges to 'cut' to create the desired grid.

2. Interview Analysis

The teacher teaching of this unit is an experienced teacher of mathematics with a teaching practice of 18 years. Her other subject she teaches is chemistry. She focuses on teaching mathematics to lower secondary school pupils but teaches at upper secondary school level as well. The teacher received no pre-service training in work with migrant pupils and no in-service teacher training in the issue before the last 12 months. However, she attended the in-service teacher training conference in Prague at Charles University organized within the frame of the M4M project.

Da Vinci school, where the lesson was conducted, is a private school where individual needs of each of the learners is respected.

The teacher does not have rich experience of teaching migrant pupils.

The lesson was conducted with sixteen students aged 14. Two of them had migrant background and were in the Czech Republic more than a year.

The objectives of the lessons were recognition and naming of solids with the aim of developing pupils' ability to use correct terminology when working with solids. The structure of the unit was from evocation to group work and reflection.

What could be observed in the lesson and was mentioned in the interview was the pupils' struggle with use of correct terminology. What worked really well was working with real-life objects and models. The atmosphere in the lesson was friendly, cooperative and respectful.

The cross-curricular character of the activity is its plus, it is linked to physics and arts.

Overall, she was very positive about the activity, its progress and outcome.

3. Improvement Suggestions

It is essential that enough time should be given to the introductory activity that will enable the pupils to get a better knowledge of correct terminology to work with in later stages.

Next time the teacher would rather start with the worksheet that helps recapitulation of the needed vocabulary that can be later enriched by more difficult solids and their nets.

The teacher also suggests the lesson plan to be used in two subsequent years, in Grade 7 work with the basic solids, in Grade 8 work with complex solids.