



(ENG) Become an architect

Introduction

Step 1 - Motivational Stage

Step 2 - Investigational Stage

Step 3 - Consolidation Stage

Introduction



#In-class activity #Inquiry-based learning #Experimental learning #Gamified learning #Simulation

Based on the given photos of the house, the pupils will create a new image of the facade of the existing house with their ideas. They will combine a maximum of two selected colours. Then, according to their ideas, they will repaint the facade with colour pencils and calculate the amount of paint needed for the renovation, according to their plans.

Learning Objectives

- ☐ Acquire knowledge and define the concept of architecture, interior and exterior
- ☐ Create a new image of the facade and calculate the required amount of material for the renovation, based on the attached photos
- ☐ Use a pocket calculator for calculating
- ☐ Calculate the area of the facade
- ☐ Write down the results

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art

Man has always been looking for a better way of life. Throughout history, he has been looking for the best way to create a home and a refuge where he will feel good and safe. One of the essential things for well-being is a tidy home. This is why people pay a lot of attention to their living space. It must be created and arranged according to their wishes.



Link to local, national School Curriculum —

Percentage/Solve real life problems



Equipment required —

- A computer,
- photos of the house,
- a pencil,
- a ruler,
- a sheet of paper,
- colour pencils,
- a pocket calculator.



Duration of activity —

45 minutes



Sources —

Credits:

- Figure 1: foto by Barbara Klanšek, CC
- Figure 2: foto by Barbara Klanšek, CC
- Figure 3: foto by Barbara Klanšek, CC
- Figure 4: <https://www.pergola.si/wp-content/uploads/2017/03/147re-800x400.jpg>
- Figure 5: https://upload.wikimedia.org/wikipedia/commons/e/eb/Brogi%2C_Giacomo_%281822-1881%29_-_n._5076_-_Pompei_-_Anfiteatro.jpg
- Figure 6: https://www.mojaobcina.si/img/1/H_MAX_1024x768/3326_1547015351_apreicab.jpg
- Figure 7: <http://test.maribor.si/podrocje.aspx?id=1180>
- Figure 8: <https://www.potnik.si/wp-content/uploads/2019/11/predjamski-grad.jpg>
- Figure 9: <https://www.hisa.si/wp-content/uploads/2015/11/kovinske-konstruktionie-780x500.jpg>

- Figure 10: https://www.arhinova.si/uploads/2/2/8/5/22859538/objekt-03c_orig.jpg
- Figure 11: <https://www.zurnal24.si/media/img/75/55/044714ba646251385029.jpeg>
- Figure 12: foto by Matjaž Bizilj, CC
- Figure 13: foto by Matjaž Bizilj, CC
- Figure 14: foto by Matjaž Bizilj, CC
- Figure 15: foto by Matjaž Bizilj, CC
- Figure 16: foto by Matjaž Bizilj, CC
- Figure 17: foto by Matjaž Bizilj, CC
- Figure 18: foto by Matjaž Bizilj, CC
- Figure 19: foto by Matjaž Bizilj, CC
- Figure 20: foto by Matjaž Bizilj, CC
- Figure 21: foto by Matjaž Bizilj, CC
- Figure 22: foto by Matjaž Bizilj, CC
- Figure 23: foto by Matjaž Bizilj, CC

Step 1 - Motivational Stage



Explain:

Throughout history, man has built a place to live. However, in the distant past, more than 10,000 years ago, our ancestors did not know how to build houses. Moreover, they did not know how to build even the most straightforward dwellings. That is why the first constructions of man are temporary shelters (a framework made of branches or bones, covered with animal skin (tent), with which man protected himself from the weather, enemies and animal attackers.

We spend most of our time in the space where we live, so, understandably, we have been paying a lot of attention to it throughout history.

Architecture gradually developed, from the use of primary materials (wood, stone) and the construction of simple dwellings, all the way to the use of modern materials (steel, glass, plastics) and the construction of complex homes. But, of course, architectural development worldwide did not progress similarly. The proof is magnificent pyramids, sanctuaries, castles, palaces, etc., which are not found worldwide and are specific only to certain areas.

Planning buildings, houses, spaces, landscapes, etc. is the design of three-dimensional space, also called spatial design.

The field of spatial design includes architecture, urban planning and landscape architecture.

i Architecture is the field of art that shapes space and is closely related to human survival.

The concept of architecture includes:

- the design of buildings and houses,
- the arrangement of external built-up areas,
- the planning of parks and other landscape interventions,
- the design of interior fittings.

The designers of buildings are called architects. In their work, they consider the client's requirements, the peculiarities of the cultural environment, climate, materials and other factors.



Figure1

The architect first creates a sketch and then the conceptual plan of the building.

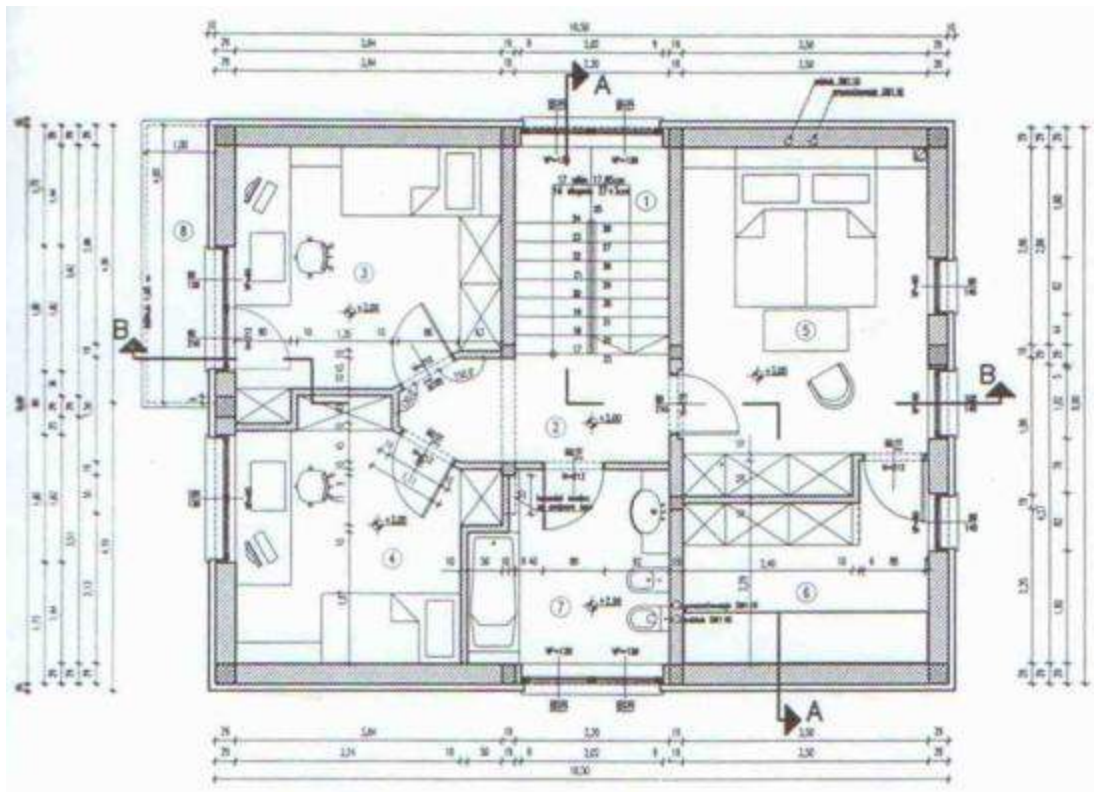


Figure 2

Next, he makes an execution or construction plan (exact representation of the house with all elements on a reduced scale).

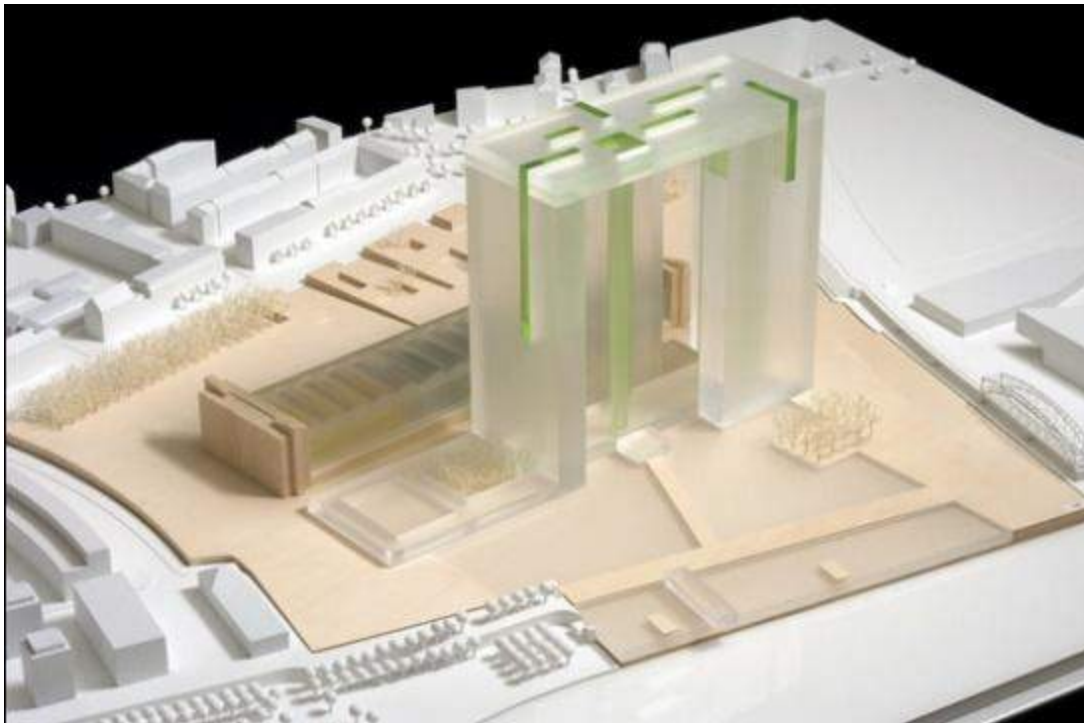


Figure3

Ultimately, the architect makes a mock-up (model of the house on a reduced scale).

Builders build a building or a house according to the architect's plans.

BUILDING

Buildings can be made in different shapes (a cube, square, cylinder, etc.) and from other materials (brick, concrete, iron, glass, etc.).

The space of the building can be composite or single.

SPACE is the void in which we live and move and where things and objects are located. It is formed inside a 'shell', built from different materials.

When we limit a space, we say we have designed it; the base of a room's design is a wall. The "shell" consists of the floor, ceiling and walls. It has length, width and height. It is of various shapes.

The space with all walls and a roof is called a CLOSED SPACE (houses, buildings, garages...).



Figure 4: <https://www.pergola.si/wp-content/uploads/2017/03/147re-800x400.jpg>

i **OPEN SPACE** is a space without walls and a roof (e.g. amphitheatre).



Figure 5:

https://upload.wikimedia.org/wikipedia/commons/e/eb/Brogi%2C_Giacomo_%281822-1881%29_-_n._5076_-_Pompei_-_Anfiteatro.jpg

- ① When the space has almost all walls and a roof, such as bus stops and pavilions, it is called **SEMI-ENCLOSED SPACE**.



Figure 6:

https://www.mojaobcina.si/img/1/H_MAX_1024x768/3326_1547015351_apreicab.jpg

① A space with almost all walls and no roof is called a **SEMI-OPEN SPACE** (stadium, balconies, etc.).



Figure 7: <http://test.maribor.si/podrocje.aspx?id=1180>

So the wall divides the space into two parts - open and closed.

This creates an interior space (interior) and an exterior space (exterior).

The interior can be of various shapes; the space's purpose has a significant role when designing the interior. The interior space is closed, limited by the floor, walls and ceiling. It has windows and doors through which we can enter and exit.

A building consists of a foundation or base, a facade shell or exterior walls, and a roof.

CONTINUE

Considering the construction of the buildings, we divide the constructions into:

MASSIVE construction

(thick walls, small windows, dark interior, etc.),



Figure 8: <https://www.potnik.si/wp-content/uploads/2019/11/predjamski-grad.jpg>

SKELETON construction

This method is found in modern architecture. It enables the construction of tall buildings filled with glass and other materials (tents, churches, modern facilities, hayracks, etc.),

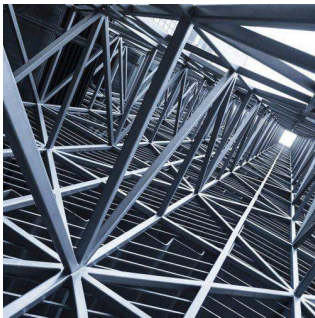


Figure 9:
<https://www.hisa.si/wp->



Figure 10:
<https://www.arhinova.si/upl>

[content/uploads/2015/11/kovinske-konstruktionie-780x500.jpg](#) [oads/2/2/8/5/22859538/object-03c_orig.jpg](#)

PREFABRICATED construction

This is a construction from prefabricated elements, which builders assemble directly on the construction site into a whole (prefab houses, apartment blocks, office buildings, etc.).



Figure 11: <https://www.zurnal24.si/media/img/75/55/044714ba646251385029.jpeg>

The elements of harmony of shape, materials, surfaces, colours and details with the entire building and the building with its surroundings serve the purpose of the building, aesthetic requirements, ecological conditions and ergonomic needs.

The facade gives the building its final look and can be an extremely prominent element in the environment. At this point, the question arises as to whether the choice of facade color is the domain of the builder or the municipality. Until July 2018, there was a law in Slovenia that dictated that the builder could apply for a use permit only when the building was completely finished and had a facade. In addition, the builder could only choose between colors or smaller colors that were determined by the municipality (in the municipal spatial plan - OPN). As of July 2018, an amendment to the Building Act allows obtaining a use permit without a facade on the building, with the condition that the builder facades the building within the next three years. In practice, this means that the choice of facade colors is now freer, as the builder does not need to refer to the municipal color specification, as he already has the use permit in his pocket.

Everyday life problem

Explain:

We want to create a new image of an existing house and calculate the amount of paint for painting the facade shell (external walls) according to the designed conceptual plans.

Consolidation of already known content

Pupils use the knowledge of dwellings throughout history, architecture, and area calculation.

Step 2 - Investigational Stage



STUDENTS' TASKS

1

Task 1

Expalin:

A customer came to your company with pictures of his house. He wants to renovate the exterior but wants to keep the same colours of the facade. You have to give him a piece of advice and calculate how much the

renovation will cost.

The current appearance of the house with dimensions is:



Additionally, the pictures show the surfaces of the doors and windows, which you have to subtract from the facade's surface.

2

Task 2

Ask pupils:

Your first task is to calculate the area of the facade - draw geometric shapes of rectangles and triangles and start calculating. You can cover all surfaces with mentioned geometric shapes. For better visibility, paint all the characters on the white part of the facade with blue color, and the characters on the brown part with green.

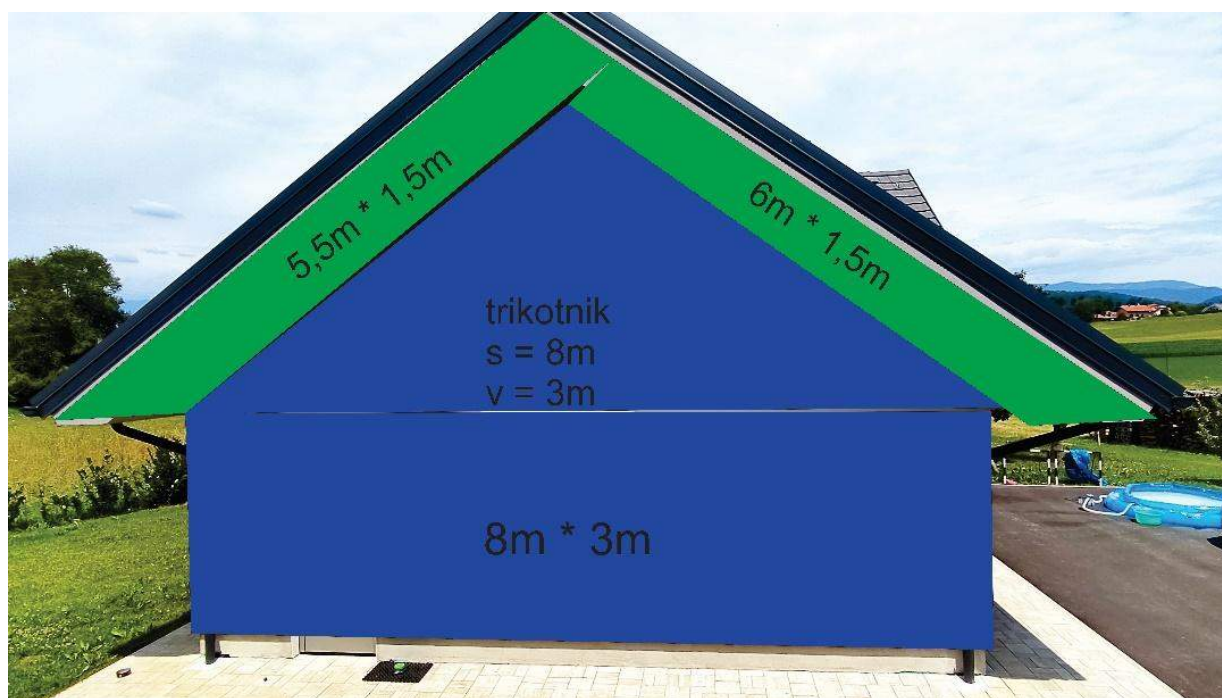


Figure 16

Explain:

On the southern side, draw four geometric shapes:

$$p_1 = 8m \cdot 3m = 24 m^2$$

$$p_2 = 5,5m \cdot 1,5m = 8,25 m^2$$

$$p_3 = 6m \cdot 1,5m = 9 m^2$$

three rectangles, the area of which you calculate using the formula $p=a \cdot b$, and you get these results:

$$mp = \frac{s \cdot h}{2}: p_4 = \frac{8m \cdot 3m}{2} = 12 m^2$$

a triangle with a side length of 8m and height of 3m. You can calculate the area of a triangle using the formula

$$p_{jb} = p_1 + p_4 - \text{area of doors and windows}$$

$$p_{jb} = 24 m^2 + 12 m^2 - (2 m^2 + 1 m^2 + 1 m^2 + 1 m^2)$$

$$p_{jb} = 31 m^2$$

On the southern part of the facade, the area of the white-painted facade is equal to the sum of the rectangle's area p1 and the triangle's area p4. You must not forget to subtract the area of doors and windows.

$$p_{jr} = p_2 + p_3 = 9 m^2 + 8,25 m^2 = 17,25 m^2$$

In brown colour, there are two rectangles with areas p2 and p3. The area of brown colour on the south side of the facade is:

Ask pupils:

The other sides of the facade are solved similarly. Again, draw the geometric shapes and calculate the area of the white colour and the area of the brown colour. Do not forget to subtract the area of the windows and doors.

The northern side of the facade:



Figure 17

The area of the white colour is

$$p_{sb} = 37,5 \text{ m}^2,$$

and the area of the brown colour is

$$p_{sr} = 11 \text{ m}^2.$$

The area is white

$$p_{vb} = 64,5 \text{ m}^2$$

and brown

$$p_{vr} = 27 \text{ m}^2$$

on the eastern side of the facade.



Figure 18

The area on the western side of the facade is a white

$$p_{zb} = 65,5 \text{ m}^2$$

and brown

$$p_{zr} = 19 \text{ m}^2.$$

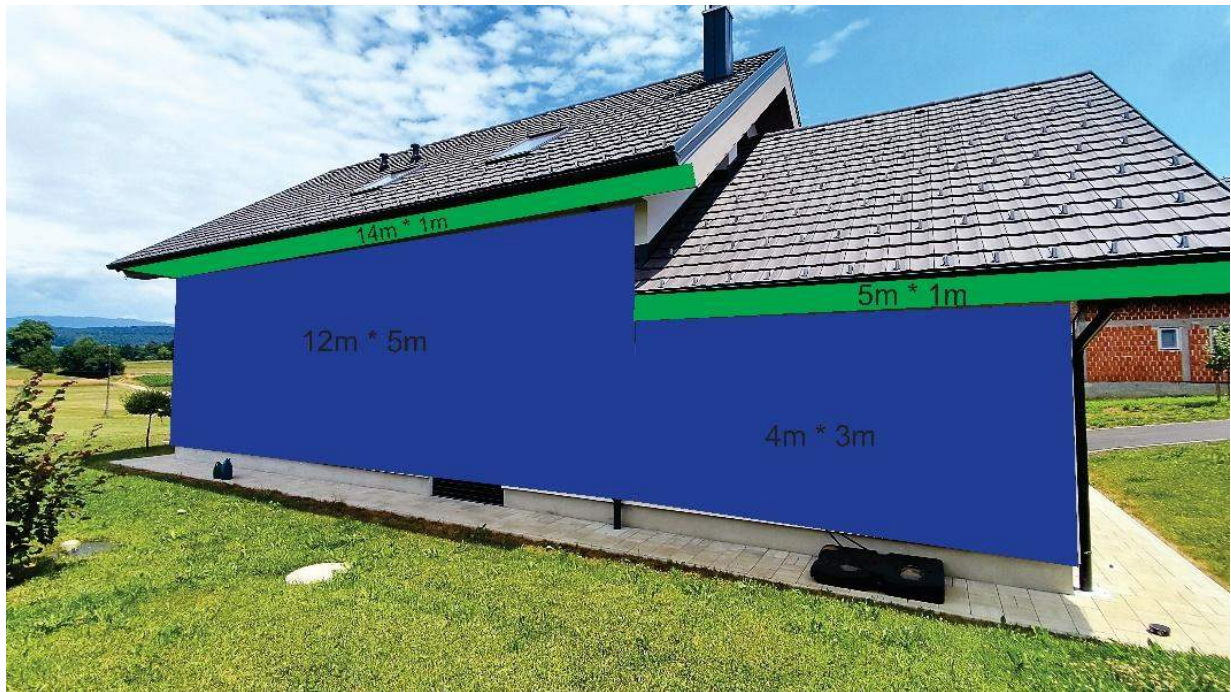


Figure 19

Ask pupils to sum up the white and brown areas.

$$p_b = p_{jb} + p_{sb} + p_{vb} + p_{zb}$$

$$p_b = 31 \text{ m}^2 + 37,5 \text{ m}^2 + 64,5 \text{ m}^2 + 65,5 \text{ m}^2$$

$$p_b = 198,5 \text{ m}^2$$

White paint

$$p_r = p_{jr} + p_{sr} + p_{vr} + p_{zr}$$

$$p_r = 17,25 \text{ m}^2 + 11 \text{ m}^2 + 27 \text{ m}^2 + 19 \text{ m}^2$$

$$p_r = 74,25 \text{ m}^2$$

Brown paint

It is necessary to repaint 198.5 m² of the facade with white paint and 74.25 m² with brown paint.

Calculate what percentage of the facade is brown and what percentage is white.

A total of 272.75 m² of the facade needs to be repainted.

$$\frac{74,25 \text{ m}^2}{272,75 \text{ m}^2} = 0,272 = 27,2\%$$

Brown paint presents 27,2% of the facade

$$\frac{198,5 \text{ m}^2}{272,75 \text{ m}^2} = 0,728 = 72,8\%$$

White paint presents 72,8% of the facade:

Therefore, the white paint presents almost $\frac{3}{4}$ of the facade. Ask pupils:



“In your local shop check, how much colour do you need for colouring one square metre? Calculate How much colour you need.”

Explain:

The paint consumption is between 200 and 400 ml/m², so choose the median value of 300ml/m².

$$198,5 \text{ m}^2 \cdot 300 \frac{\text{ml}}{\text{m}^2} = 59500 \text{ ml} = 59,5 \text{ l}$$

We need 59,5 litres of white paint

$$74,25 \text{ m}^2 \cdot 300 \frac{\text{ml}}{\text{m}^2} = 22350 \text{ ml} = 22,35 \text{ l}$$

We need 22,35 litres of brown paint

Paint is sold in cans, which contain 15 l or 5 l of paint. Bigger has lower price/liter.

Ask pupils:

How many cans do we need to buy in order to repaint the house?

Explain:

The technical sheet (technical specifications) of the paint states that the paint must be well mixed and diluted with water before use. The paint is diluted with water up to a maximum of 10%. You decide to add 8% water to the paint.

Ask pupils:

Calculate how much water you need to add to each shade separately and how litres of paint you get after mixing it with water.

Summary

Explain:

The students calculate the amount of necessary material (paint) for the renovation of an already existing house based on the created concept plans.

Step 3 - Consolidation Stage



Explain:

I want to present something new to the client, or I would like to renovate the house visually.

Ask pupils:

Take pictures of homes with the entire facade white and paint the facade using your ideas. Use no more than two colours on the facade. You can also draw lines and patterns.





Figure 20



Figure 21

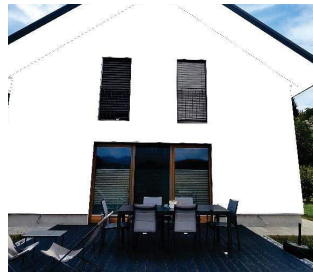


Figure 22



Figure 23

After finishing painting, calculate the surfaces, the proportions of different colours, the consumption of paint and the necessary amount of water added before mixing.

End of the activity

EXIT