

Math in Architecture

Our worksheet is inspired by a historical gem placed only **7 km** from Nitra – the



Church of St. Michael in Drážovce – the eldest Romanesque church built in the second half of the **11th Century**. The dating is based also on the discovery of a coin by King Andrew I (**1046 - 1061**) in one of the graves during archaeological research.

The church was depicted on an old Slovak **100 crown banknote** launched in **1941** and **50 crown banknote** in **1993**, too (today we have Euros in Slovakia). Around the

church, **55** medieval graves were discovered. Their inventory consisted of coins, ornaments, jewelry, and parts of clothing.



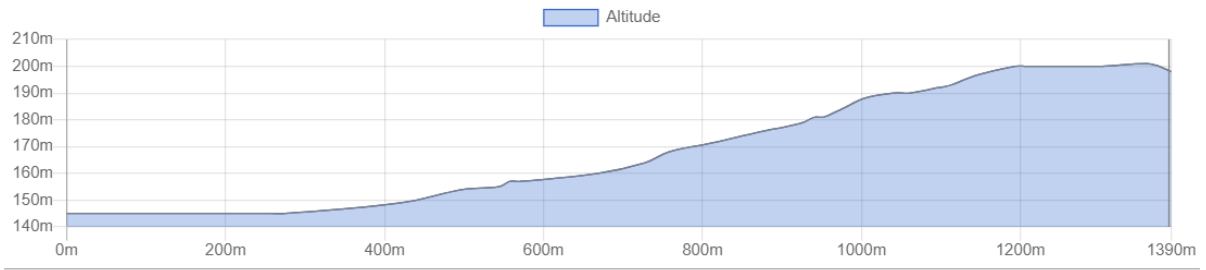
TASK 1:

Rewrite all the numerals from the text using **Roman numbers**:

| | |
|------|--|
| 7 | |
| 11 | |
| 1046 | |
| 1061 | |
| 100 | |
| 1941 | |
| 50 | |
| 1993 | |
| 55 | |

TASK 2 :

Let's go on a trip together! The graph shows an easy route that will take you to our church. **Calculate the ascent in % and in ‰.** The beginning of the route is at an altitude of 145 meters above sea level (AMSL) and the highest place is in 201 meters AMSL. The horizontal distance is 1,4 km.



Notation:

Horizontal distance:

Height difference:

Ascent in %:

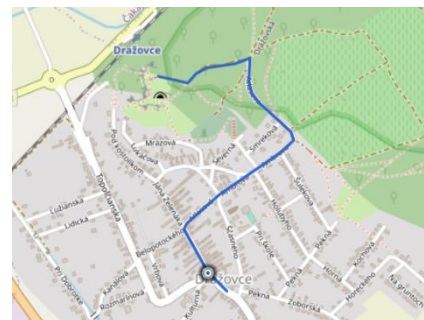
Ascent in ‰:

Calculation:

Solution: The ascent which corresponds to the height difference is

TASK 3:

Calculate how long it will take you to walk to the church if you go at an average speed of 4 km/h and cover the distance of 1,4 km. Express the time in hours and in minutes, too.



Notation:

Average speed:

Distance:

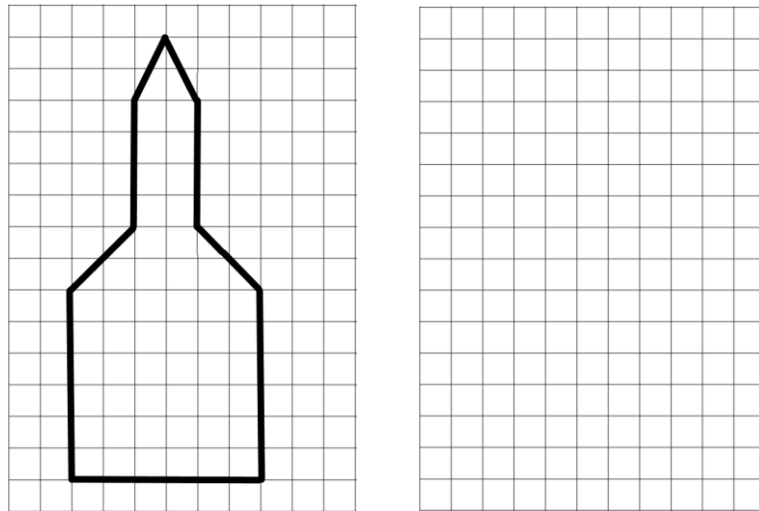
Time:

Calculation:

Solution: The route lastsminutes, that is equal to hours.

TASK 4:

Shrink/decrease the image in a square grid **twice** (N.B. the image doesn't correspond to reality):



Task 5:

Define the area of the image in the square grid. 1 square equals 1 m². Revise the relations to the calculations of a square, a rectangle, and a right triangle area. Complete the chart with the correct geometric shape (corresponding to given formulas):

| Geometric shape: | Formula: |
|-------------------------|----------------------|
| | $S = a \times a$ |
| | $S = a \times b$ |
| | $S = a \times b : 2$ |

Calculations:

Solution: The area of the displayed front wall of the church ism²

TASK 6:

The paper model of the Drážovce church is constructed on a scale of 1 : 200. Calculate the dimensions of our paper model, when the real dimensions are the following: length 6,4 m, width 4,3 m, apsis width (semicircular niche) 2,9 m, and height 15 m.



Notation:

Model's scale:

Real length:

Real width:

Real height:

Real apsis width:

Calculations:

Solution: Dimensions of the paper model are: lengthcm; widthcm; apsis widthcm; heightcm.

TASK 7:

Calculate the circumference and area of the church's ground plan. Use $\pi = 3,14$ in your calculations. State the correct units. Dimensions are marked in the sketch:

Notation:

length:

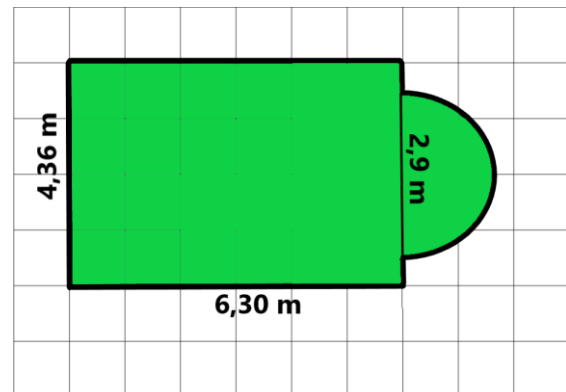
width:

diameter:

semidiameter/radius:

circumference:

area:



Calculations:

Solution: The church's ground plan circumference is The church is built in the area of

TASK 8:

During its reconstruction, the rectangular ceiling, with dimensions 6,30 m x 4,36 m, was lined with wooden boards.

What would be the price of the ceiling today, if 1 m² of spruce boards cost 16 € and the carpenters want 6 € for 1 m² installation?



Notation:

length:

width:

price for 1 m² of boards:

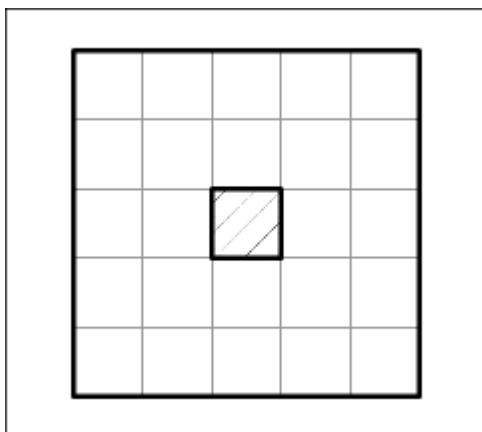
price for 1 m² work:

Total price:

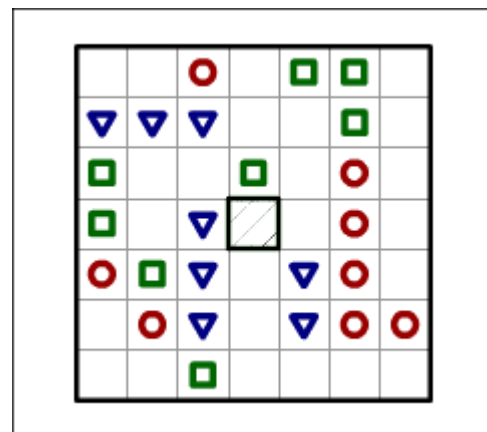
Calculation:

Solution: For the reconstruction of the ceiling, they would pay€.

Finally, ENJOY TWO GEOMETRIC BRAIN TEASERS:



Divide the area of 24 squares into 6 parts of the same shape and the same size.



Divide the square into four parts of the same shape and size. Each part must contain three couples of the same symbols (two squares, two triangles, two circles).