EFFECTIVE COMMUNICATION
A SUCCESSFUL FUTURE LIFE
2015/2018

PRACTICAL MATHS IN USE

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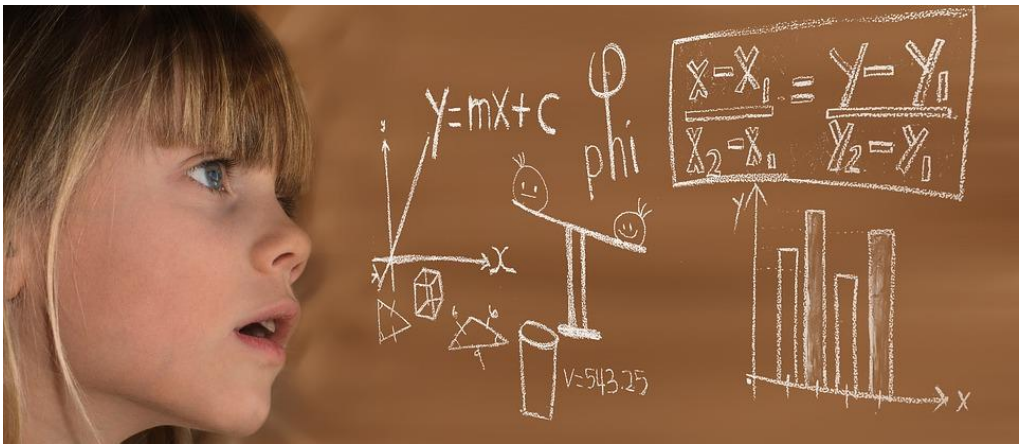
INTRODUCTION

Mathematics – some of us like it, some of us love it, some of us hate it.
However, none of us can avoid it. Mathematics is present in our everyday life.
It teaches us to solve the problem, to keep trying to solve it and not to give up.
Solving mathematician problems is just like playing chess,
in which each wrong or unreasonable decision may lead to a crucial aftermath.
Mathematics makes us to be responsible and careful in what we are doing.
It teaches us to confess our mistakes.
It allows us to think a step forward and in advance.
Maths makes things easy to realize.

If you do not believe, have a look into our brochure and you will find some examples of using mathematics in our lives. There are examples from seven different countries in Europe. Teachers and students from Bulgaria, Czech Republic, Latvia, Poland, Portugal, Slovakia and Slovenia have brought some problems from everyday life to educational process at their schools and shown their mathematical solutions.

We hope the brochure will be helpful assistant at your educating efforts and make your pupils to be good friends with maths.



BULGARIA

THE TRAVELLING MATHEMATICIAN

Problem 1
Trip
1.Take a map and choose a route for your travelling to the following distances:
Solution:
Varna – Kalofer - Plovdiv;
Plovdiv - Sofia;
Sofia - Paris;
Paris - Barcelona;
Barcelona - Varna.

2. Use a scale of the map to find the distance in km.
Solution:
We used a map of Bulgaria in scale 1 : 2 000 000 and with the help of knowledge about proportion, we found the distances.
1 : 2 000 000
12,5 x
x = 12,5 . 2 000000 = 25 000 000 cm = 250 km
Varna - Kalofer - 250 km
Kalofer – Plovdiv - 50 km
Plovdiv – Sofia - 130 km
In the same way we used a map of Europe in a scale 1 : 20 000 000.
Sofia- Paris - 1800 km
Paris- Barcelona - 820 km
Barcelona - Varna - 2120 km

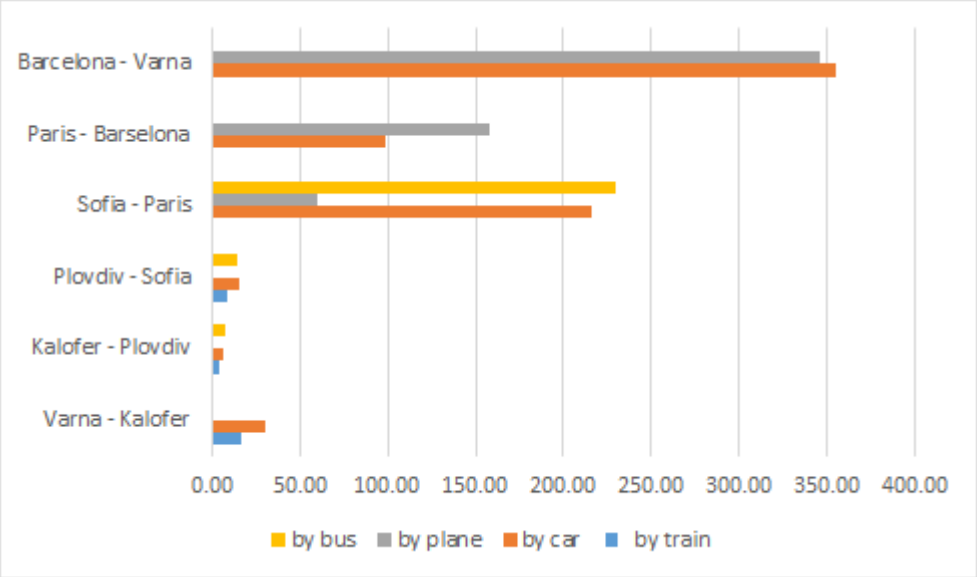
3. If there is a time difference, define it.
Time difference:
Bulgaria – France - + 1 hour
Bulgaria – Spain - + 1 hour

4. Research how does the travelling cost by bus, by car, by train, by plane.
Solution:
To define the cost of the travelling by car we used the knowledge for proportions as well:
average expense for 100 km
average price of oil - 2 levs
real distances - from the solution 1.2
6 litres - 100 km
x litres - 250 km x = (6 . 250) : 100 = 15 litres
15 l . 2 lv. = 30 levs Varna - Kalofer

For the travelling by bus, plane or train we searched the information on the Internet.

5. Fill in the data facts in the table. Then represent them in histogram and find the most efficient variant.

Route	by train	by car	by plane	by bus
Varna - Kalofer	16,60 lv	30 lv	0	0
Kalofer - Plovdiv	4,60 lv	6 lv	0	8 lv
Plovdiv - Sofia	9,00 lv	15,60 lv	0	14 lv
Sofia - Paris	0	216 lv	60 lv	230 lv
Paris - Barselona	0	98,40 lv	158 lv	0
Barcelona - Varna	0	354,40 lv	346 lv	0



Problem 2

You are preparing a school trip. You are supplied with a number of buses of the same type. 100 students are travelling to Plovdiv and 50 to Kalofer. If the bus seats are going to be fully occupied, calculate:

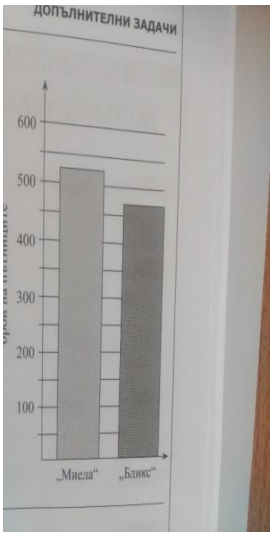
- **How many seats are there in each of the buses?**
- **How many buses are travelling to Plovdiv and how many to Kalofer.**

Solution:

The greatest common measure - (100; 50) = 50 seats buses;

100 : 50 = 2 buses to Plovdiv

50 : 50 = 1 bus to Kalofer



Problem 3

A bus company was rented to transport the students to Plovdiv and Kalofer. The company offers 2 types of buses - "Miela"- 35 seats and "Blix"- 52 seats. On the diagram is shown the max number of passengers which is possible to be transported by these buses.

Define:

- the number of the buses for each of the type of buses, which the firm has on its disposal;

- how many students can be transported by the buses of the company.

Solution:

a) 525 : 35 = 15 buses "Miela"

468 : 52 = 9 buses "Blix"

b) 525 + 468 = 993 passengers

Problem 4

Three buses (1, 2 and 3) leave Varna Bus Station at one and the same time. Their routes are to Plovdiv, Kalofer and Sofia. The timetable of bus 1 is in every 6 hours period, bus 2 - in every 2 hours, bus 3 - in every 4 hours. If the three buses are at the bus station of Varna at 12:30, what is the earliest time when they will leave the bus station again at one and the same time?

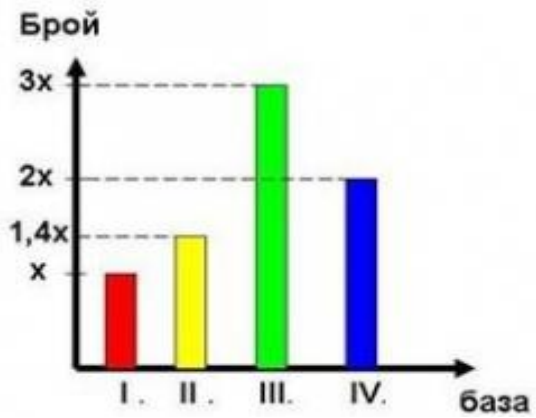
Solution:

The least common multiple (L.M.C) (6;2;4) = 12

12.30 + 12 = at 0.30

Problem 5

The students are accommodated in two different places in Plovdiv (places I, II) in Kalofer (place III) and in Sofia(place IV). The allocation of all students in all four places, is given on the diagram.



It is known that in places III and IV are accommodated totally 100 students.

- **Complete the gaps in the text:**

As a consequence that in places III and IV are accommodated totally 100 students and they are respectively……. and……in number, the correct equation is……. with a solution x, equal to…… .

- **Fill in the missing facts in the table:**

Solution:
To the fact that in places III and IV are accommodated 100 students and they are 3x and 2x (number), the correct equation is $3x + 2x = 100$ with a solution x, equal to 20.

place	marked by x	number of students
I	X	20
II	1,4x	28
III	2x	40
IV	3x	60

Problem 6
Holiday trains
In the Old Town of Plovdiv holiday trains are offered to the tourists to make their travelling in to town easier. Each carriage and locomotive is 1,5 m long. Two trains passed each other for 4,5 sec. as one of them is travelling at the speed of 8 km/h. The speed of the train that is unknown, is composed of 4 carriages and a locomotive and is 2 carriages shorter than the first one.

a) A tourist told the following statements:
1. The train with the 5 carriages is 7,5 m long.
2. The longer train is 9 m long.
3. The sum of the distances that the trains are going to pass at the time of their passing each other is 18.10^{-3} km.
Consider if these statements are true and give reasons for your answers.
Solution:
1. Right - 5 . 1,5 = 7,5 m.
2. Wrong - The longer train has got 4 + 2 = 6 carriages + a locomotive = 7
   7 x 1,5= 10,5 m
3. Right - 7,5 + 10,5 = 18m = 18.10^{-3} km

b) Define the speed of the second train in km/h. Give the reasons.
Solution:
S = V . t

train	s (m)	v (m/s)	t (s)
1	10	8 km/h = 20/9 m/s	4,5
2	8	6,4 km/h = 16/9 m/s	4,5

S_2 = 18 - 10 m = 8 m is the travelling distance of the second train.
S_2 = 8 m t =4,5 s V = S : t; V = 8 : 4,5 = 16/9 m/s = (16 . 3600) : (9 . 1000) = 6,4 km/h

Problem 7

The group of students that are travelling to Plovdiv, decided to visit the Amphitheatre in the Old Town. The number of the seats in each of the rows of a sector in the open-air Amphitheatre is calculated by the formula B = 20 + 10n, where n is the number of the row.

a) How many seats are there in the row number 6?

b) The number of the seats on the last row of the sector is 180. How many rows are there in this sector?

Solution:

a) n = 6; B = 20 + 10 . 6 = 20 + 60 = 80 seats in the 6th row

b) B = 180; 10n = 180 - 20; n = 160 : 10 = 16 rows in the sector

Problem 8

The group of students that are travelling to Kalofer decided to propose to the Mayor of the town to build a lift to link Kalofer to Mount Botev. They had to go hiking to the highest peak. They decided that it would be better for tourists, who don't like hiking very much, to have a chair lift to the peak. They calculated that the capacity of a chair lift is 1200 people per hour. Each lift-chair can seat two people.

a) How many lift-chairs pass the terminal station for a minute?

b) If 5 out of 25 lift- chairs, that have passed the terminal station, are empty, 15 of the lift-chairs are with 2 people and 5 lift-chairs are with one person only, calculate what is the percent of the capacity which the chair lift is working with at this moment?

Solution:

a) 1200 : 2 = 600 chairs per hour; 1 hour = 60 min; 600 : 60 = 10 chairs per minute

b) 25 - 5 = 20 occupied chairs; 15 . 2 + 5 . 1 = 35 passing people

25 . 2 = 50 capacity; 35 : 50 = 35/50 = 70/100 = 70%

Problem 9

The group of students that visited the town of Kalofer, decided to go hiking to the "Paradise" hut, at the foot of the peak Botev and there, they wanted to enjoy the view of the Paradise Waterfall - the highest waterfall of Bulgaria. They reached the hut where they had to spend the night. There were no other tourists in the hut. When they accommodated themselves, it became clear that there were 5 rooms vacant. The unoccupied rooms represented 25% of all the rooms in the hut.

a) How many rooms are there in the hut?

b) What is the percent of the occupied rooms?

Solution:

a) x - rooms in the hut; 25% . x = 5; x = 20 rooms in the hut

b) 100% - 25% = 75 % occupied rooms

Problem 10

Boyan and Stoyan are preparing for the hiking to the Paradise Hut. For this purpose, they want to take 10 thermal cups of juice. The capacity of each cup is 224 ml. In each of the thermal cups the children put 3 small ice lumps in a cube shape.

Each ice lump is with an edge of 2 cm. The children fill the cups up with juice. If the ice cubes are that ones and they sink to the bottom when they are put in the thermal cups filled with juice, find:

a) **the volume of all ice cubes.**
b) **the quantity of juice which is necessary to fill up 10 cups.**
c) **write with irreducible fraction the proportion (ice/juice) in each cup in the moment of the they are put.**

Solve the problem using a physics Archimedean principle: "A body immersed in a fluid buoyed up by a force equal to the weight of the fluid displaced by the body".

Give the answers to the problem in 10 a) by filling up the text:

The volume of each cube with 2 cm edge is V= (.....) cm^3. For 10 thermal cups with 3 ice cubes in each of them it is (.....) cm^3.

Solution:

a) V = a . a . a = 8 cm^3; For 10 cups. 3 ice lumps. 8 cm^3=240 cm^3
b) According to the task of the problem, the small ice cubes sink to the bottom of the cup. Therefore they buoy liquid which is equal to their volume in ml.
The buoyed liquid for 10 cups will be 240 ml.
Notice: 1 m = 1 cm^3
The quantity of juice which will be needed to fill up 10 cups is:
10 . 224 – 240 = 2000 ml
c) The proportion ice /juice in each cup is:
24 ice cubes/200 juice = 3/25 = 3 : 25

Problem 11

Deposit for a trip

150 students have signed for an excursion to Plovdiv and Kalofer. The tourist operator has calculated that to be able to rent a bus, each of the volunteers must pay a definite amount of money for renting the bus. When the number of students dropped off by 10%, the tour operator had to increase the amount of deposit money for each of the volunteers. Finally, it proved that the money collected was 190 lv more than the necessary. How much money did each student have to pay in the beginning?

Solution:

Students	Payment	Total
150	x	150x
150 - 10% . 150 = 145	x + 10%x = 110%x = 1,1 x	145 . 1,1x

CHRISTMAS PARTY

The aim of the project"Christmas party" will help to create skills in enterpreneurship in 2nd grade pupils.This is a business plan which provokes them to solve a real situation problems. The types of the problems are bearing the characteristics of PISA format.By means of funny approaches, when solving the typical requirements of the problem, pupils will be able to apply their obtained knowledge in Bulgarian, Maths, Art, Home Economics and other school subjects. The help by the side of the parents is acceptable and even profitable. The skills of team work will be encouraged and promoted, too. Photos, during the working process, can also be supportive.

1. Choose a costume for the party.Do a reseach for the kinds of costumes in rental shops.

article	**number**	**Price**
sleeveless	1	3 lv
skirt	1	4 lv
princess dress	1	10 lv
hat	1	4 lv
mules	1pair	3 lv
boots	1 pair	4lv.
trousers	1	8 lv
shirt	1	6 lv
mask	1	4 lv
animal mask	1	4.lv
accessories- handbag, belt, scarf, hat, earings, jewellery		1 lv each.
national dress	1	15 lv
animal costume	1	20 lv

- Describe your costume. Choose the best combination of clothes and accessories.
- Calculate the amount of money for a rent.
- You can use a costume for 6 days(from the day you borrow to the day you return it). If you exceed the time limit, you should pay 3 lv. per day over tax.If you exceed the time limit for 3 days, how much over tax should you pay?
- The party will be held on Friday. When can you hire the costume to avoid paying a default?

Notice: The rental shop closes at 6 p.m. and the party starts at the same time (you should consider when the most appropriate time to bring the costume back is).

2. Prepare your classroom decoration. For doing this, you need garlands, decoration for Christmas tree, Christmas tree, etc.Do a research for their prices. Complete th table, add the articles you think are necessary, and the amount of them you need.

Article	**Price (1 article)**	**Quantity (x)**	**Price (x)**
Christmas tree			
garland			
decoration 1			
decoration 2			

- How much money should you collect from your classmates to buy these articles? Is it enough to collect 1 lev from each of them? And 2leva?
- The classroom has a rectangle shape. How many metres of garlands do you need to go round the whole length of the walls with garlands if the measures of the room is 8 m to 5?
- The length of one garland is 2 m. How many pieces of garlands do you need?
- To make a small coloured ribbon you need 2 dm band. How many ribbons can you make from 20 dm band?

3. Invite guests to your Christmas party. Calculate the number of chairs which are necessary.Make invitations.

- There are 28 pupils in class.Each of them will invite a guest.The number of your teachers is 5. Calculate the number of people attending the party.
- There are 34 chairs in the classroom. How many more chairs will you need?
- How many chairs can you put along the two longer walls of the room if you know that the length of 2 chairs next to each other is 1 metre?

4. Make pancakes for your guests.

Recipe for a dose (9 pancakes)
3 eggs
2 cups of flour
2 cups of milk
a pinch of salt
2 spoons of oil

- How many children will have to make a dose of pancakes(9 pancakes), so that there will be enough pancakes for all the guests?
- How many cups of flour do you need for a double dose?
- How many eggs do you need for a double dose? And for 27 pancakes?
- If you know that 1 litre of milk is equal to 4 cups, how many doses can you make from a litre of milk?
- How many litres of milk are necessary for 8 doses?

5. Do a research how many students have a birthday in December(work with a calendar). In Home Economics classes prepare some small presents for your classmates.

6. The party starts at 6 p.m. How long will it be in hours, if it finishes at 8 p.m.?

7. Choose your favourite music. The length of one CD is 90 min. How many hours of music on CDs will you need for the whole party? How many CDs you need at least to the end of the party?

8. Make an advert for the event.

9. Think of songs, magician tricks, quiz tasks and sketches to have great fun together.

Do you know?

Present day symbols of fractions came from ancient India. Europeans borrowed it from Arabs in XII-XVII century. Leonardo Fibonachi was the first European scientist who used the present-day symbols. In 1202 he brought into use the term "fraction". The terms "numerator" and "denominator" were introduced by Greek Mathematician Maxim Planud.

Do you know?

The word "per cent" came from Latin "pro centum" and means "completely", "entirely, to one hundred". It is supposed that the sign " % " has derived from its contracted way of writing. In manuscripts the word "cento" was often used instead of "pro centum", and they wrote the contracted "cto".

In 1685, in Paris, an arithmetic book was edited where by mistake the symbol " % " was published instead of "cto".

Do you know?

Do you know that the total area of Bulgaria represents 1% of the total area of Europe?

CZECH REPUBLIC

CONSTRUCTION OF THE DETACHED HOUSE

- We are going to build the detached house, for its construction we need a definite plot with definite size.
- To start with the construction we have to buy a plot, get required permission and arrange for financing the complete realization.
- We need the contract of sale, the building permit and the certificate of the estate ownership.

CONTRACTS

For this realization a typified project was chosen, the surface area is 150 m² of the settled area. The 30 x 30 m plot was bought and it was verified that it is authorized by the territorial scheme to the construction of the chosen house.
After purchasing the plot to the cadaster contract proves to be written. The enrollment takes 30 days. The announcement the building after registration into the cadaster takes 40 days. During the registration into the Cadaster it must be requested the views of to the building institutions that are affected by the construction. This means fire department, environment protection department, energy companies. Length of the statement is about 20 days.

REGISTRATION:
Building permit - six months (24 weeks), because we the building up to 150 sqm, we can have only the announcement the building, which may be objected within 30 days. Larger buildings must have a building permit.
The contract of sale – a request for entry into the Cadaster - 40 days
The certificate of the estate ownership – statement – 20 days

CALCULATION:
All the required permits can be obtained for 70 days.

PLOT

The detached house will be built on the square plot. The length of one side is 30 m. What is the content of the plot and what is its price, when 1 m² is for 1050 CZK?
S = a * a
S = 30 * 30 = 900 m²
1 m² = 1050 CZK
900 m² = 900 * 1050 = 525 000 CZK
ANSWER: The plot area is 900 m², the price of the plot for is 525 000 CZK.

The plot has got 900 m². The settled area occupies 96 m² (12 x 8). How many % of the total plot occupies the settled area?

$$100\% = 900\ m^2$$
$$X\ \% = 96\ m^2$$

$$100 : X = 900 : 96$$
$$100 * 900 = X * 96 = \underline{9{,}4\%}$$

ANSWER: The settled area occupies 9.4%.

AREA AND TECHICAL SPECIFICATION	
Useful area	900 m²
Settled area	96 m²
The width of the house	8 m
The height of the house	12 m
Number of rooms	5
Roof inclination	40°

GROUND FLOOR - ROOMS	
Sitting room	35 m²
Kitchen	16 m²
Bedroom	20 m²
Bathroom	6 m²
Hall	5 m²
Utility room	7 m²
Corridor	7 m²
TOTAL	**96 m²**

FIRST FLOOR - ROOMS	
Bedroom	19 m²
Bedroom	16 m²
Bedroom	15 m²
Bathroom	10 m²
Lumber-room	8 m²
Corridor	4 m²
TOTAL	**72 m²**

The important is the budget. Not only for the construction, but also for devices which are needed for the unfinished buildings

CALCULATIONS – windows and doors	
Amount of	**PRICE**
12 windows	36 000 CZK (1 = 3000 CZK)
2 roof windows	4 000 CZK (1 = 2000 CZK)
4x balcony doors	20 000 CZK (1 = 5000 CZK)
8x doors	16 000 CZK (1 = 2000 CZK)
1x garage door	15 000 CZK
TOTAL	**91 000 CZK**

CALCULATIONS – TOTAL PRICE

	PRICE - CZK
Earthwork	39 000 CZK
Basics	97 000 CZK
Structural works	488 070 CZK
Heating, water and sewerage	243 319 CZK
Roof (trussing and covering)	78 091 CZK
Holes filling	126 898 CZK
Surface and floor treatments	322 126 CZK
Heat insulation etc.	58 568 CZK
Electrical installation etc.	107 375 CZK
Completion and other works	361 172 CZK
Windows and doors	91 000 CZK
Plot	525 000 CZK
TOTAL	**2 537 619 CZK**

Other important financial factors are project costs. They include a survey of the terrain statics and the most important which is the house project. The original costs are in the amount of 40000 crowns.

	PRICE - CZK
Survey	10 000 CZK
Project work	15 000 CZK
Reserve	15 000 CZK
TOTAL PRICE	**40 000 CZK**

	PRICE - CZK
Costing	2 537 619 CZK
Project work + survey	25 000 CZK
Reserve	15 000 CZK
TOTAL PRICE	**2 577 619 CZK**

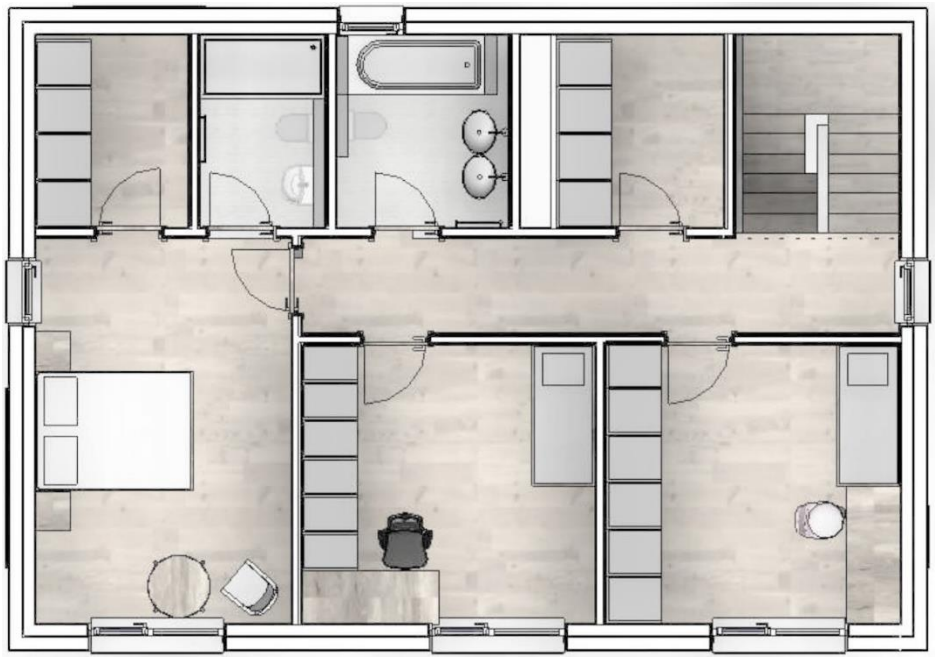
The overall implementation of the typified house construction including the plot and the project will be cost **2 577 619** crowns. Is it a finished structure (building) with a network connecting engineering without any interior equipment. For the realization will be used 300 000 crowns from own resources. Residue financial security will be drawn from the mortgage. The total amount of mortgage loans will be 2 300 000 crowns

The mortgage we will draw by the Czech National Bank, this bank offers amount 2300 000 crowns for 30 years with 1,75% p.a.

Monthly installments will be 8217 crowns.

For our house we chose the location not far from Ostrava in village Janová. The house will cost almost to 3 million crowns and we have to reckon with the fact that some of our costs may rise as a result of the price increase, the cost of unexpected situations etc.

Ground floor



First floor

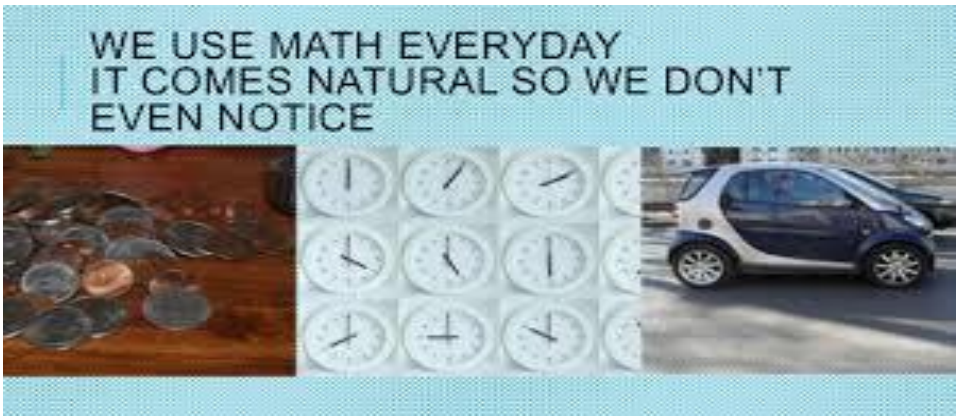
Disposition: 5+ kitchen corner
Settled area: 96 m^2 (12x8)
Number of floors: 2
Gabled roof
House height: 6,5 m

LATVIA

When am I ever going to use mathematics?

Variations of this question have echoed through the halls of math classrooms everywhere. Struggling students often become frustrated with complex math problems and quickly give in to the notion that they will never use math in “real life” situations.

It’s almost impossible to get through a day without using maths in some way, because our world is full of numbers to handle and problems to solve. Studying maths in everyday life provides students with the tools to make sense of it all, making life that little bit easier.



At the supermarket.

One of the most obvious places to find people using maths in everyday life is at your neighborhood supermarket**.** Shopping requires a broad range of math knowledge from multiplication to estimation and percentages.

Calculating price per unit, weighing produce, figuring percentage discounts, and estimating the final price are all great ways to include the whole family in the shopping experience.

Problem 1

Mother sent her daughter to the shop to buy milk products. For three packs of milk and four packs of cottage cheese the girl has paid 4 eur and 78 cents. How much does one pack of cottage cheese cost, if it is 24 cents cheaper than a pack of milk?

Solution:

x - 24 – cost one pack of cottage cheese

x cents – costs one pack of milk

4 × (x - 24) – cost 4 packs of cottage cheese

3x – cost 3 packs of milk

4(x - 24) + 3x = 478

4x – 96 + 3x = 478

7x = 478 + 96

7x = 574

x = 82 cents – costs one pack of milk

x – 24 = 82 – 24 = 58 cents – costs one pack of cottage cheese

Answer: One pack of cottage cheese costs 58 cents.

Cooking and baking

More math can be found in the kitchen than anywhere else in the house. Cooking and baking are sciences all their own and can be some of the most rewarding (and delicious) ways of introducing children to mathematics.

Working in the kitchen requires a wide range of mathematical knowledge.

Celsius to Fahrenheit Conversion

Example: The recipe calls for the oven to be set at 428 °F, but yours is labelled by Celsius.

What to do?

Formula: Fahrenheit to Celsius: $(°F - 32) \cdot {}^{5}/_{9} = °C$

(428 - 32) . 5 : 9 = (396 . 5) : 9 = 220 °C

Answer: **The temperature of the owen should be 220 °C.**

Math's applications in traveling is just one example of how math helps as a real-life tool.

Problem 2

You are travelling to Latvia, but you have a limited amount of money for living – 500€. You have an opportunity to stay in two places in Riga: Radisson Hotel where the price per night is 50€ or in a hostel in Riga Old Town where the price is 25€ per night. How long is going to be your stay in Riga based on your choice of stay hotel/hostel? Where can you stay the longest? How many days?

Solution:

1) 500 : 50 = 10 (days) - you can afford 10-day stay at Radisson Hotel.
2) 500 : 25 = 20 (days)-you can afford 20-day stay at hostel in Riga Old Town.
3) 20 – 10 = 10 (days) The stay in Riga is going to be longer for 10 days if you choose the stay in a hostel.

Answer: You can stay the longest in the hostel for 10 days.

Problem 3

Three teachers from Latvia are planning to visit Slovakia (Bratislava) from April 30 to May 5. For their trip they have got 1,725€. They have already bought three airplane tickets (Riga - Vienna - Riga) and paid 209€ for each ticket. They will travel from the airport in Vienna to Bratislava and back by bus. A single bus ticket costs 12€. They have also booked the hotel in Bratislava: one single room and one double room. One single room is 30€ per night /per person. One double room is 20€ per night /per person. Every teacher will be paid travel allowances - 29€ per day. **Will the teachers have money enough for their trip?**

Sollution:
Three airplane tickets: 209 × 3 = 627€
Bus tickets: (12 × 3) = 36 × 2 = 72€
Hotel per 5 nights:
Single room: 30 × 5= 150€
Double room: (20+20) × 5= 200€
Travel allowances: 29 × 6 = 174 × 3=522€
Total: 627 + 72 + 150 + 200 + 522 = 1.571€ (for trip)
Answer: 1.725 - 1.571 = 15 4€ (left)

Problem 4

Anna had a birthday party. She has bought a big cake. Its weight is 4 kg. She cut the cake into 20 equal pieces. Anna's parents got two pieces of the cake. Anna's grandmother asked to slice a half of a piece for her. The other guests got a piece for each one. Anna took one piece of cake for herself. How much cake have they left (in %), if there were 7 guests not counting Anna and her parents?

Sollution:

1. 1 kg = 1000 g
   4 kg = 1000 × 4 = 4000

2. 4000 : 20 = 200 g (1 piece of cake)

3. 2 × 2 × 200 = 800 g (cake for parents)

4. 200 : 2 = 100 g (for Anna's grandmother)

5. 7 - 1 = 6 guests
   6 × 200 = 1200g (for guests not counting grandmother)

6. 800 + 100 + 1200+200 (Anna's piece) = 2300g

7. 4000 = 100%
   2300 = X%
   4000 x X = 2300 × 100
   X = 57,5%

8. 100% - 57,5% = 42,5%

Answer: 42,5% of cake

POLAND

MATHS IN THE KITCHEN

BAKING A CAKE FOR EIGHTEEN STUDENTS FROM GRADE 6

Aims and focus of the project:

Aims: a) developing skills such as looking up and selecting information from different sources
b) creative problem solving
c) presenting information
d) group cooperating

The project is referred to sixth grade of primary school.
Students work on this project in the group of four.

Project scope: practical maths in use
General area: maths around us

Specific topic: **CAKE RECIPE**

1) Gathering information
2) Working on data
3) Data presenting
4) Creating maths problems based on gathered data (at least three)
5) Developing the strategy of presenting the effects of students' work – for example: brochure, multimedia presentation
6) Source of information: cookbooks, Internet, confectioner's advice, discussion with parents, information from the shop, library etc.

Working schedule:

Stage 1: Deciding about the cake students want to bake.
a. Students responsible for the task
b. Information sources
c. Description of the project implementation
d. Deadline: 22 January
e. Task evaluation: (0 – 2)p

Stage 2: Listing all the ingredients needed to bake the cake. Gathering information about the product prices. Rating the product prices (min, average, max.) after analysing different shop offers.
a. Students responsible for the task
b. Information sources used
c. Description of the project implementation

d. Deadline: 23 February
e. Task evaluation: (0 – 4)p

Stage 3: Presenting gathered information according to the price offer (min., average, max.) in the form of self-created table.
a. Students responsible for the task
b. Information sources
c. Deadline: 28 February
d. Task evaluation: (0 – 2)p

Stage 4: Calculate the amount of ingredients necessary to bake a cake. Every student is supposed to receive 100 g of the cake to consume. Presenting the calculation results.
(It is necessary to calculate the volume of particular ingredients to their mass e.g. How much do two spoonful of baking powder weigh?)
a. Students responsible for the task
b. An accurate description of the way of solving the task – for each ingredient separately (baking powder, flour etc.)
c. Presenting the amount of needed ingredients in the form of table
d. Deadline: 27 January
e. Task evaluation: (0 – 8)p

Stage 5: Calculating the costs of ingredients according to average prices. We assume that we don't have any product necessary to bake the cake.
a. Students responsible for the task
b. A very precise description of solving the task (for each ingredient separately)
c. Presenting data in the form of tables and bar graphs illustrating the dependence between the product and its value .
d. Date: February
e. Task evaluation: (0 – 4)p

Stage 6: Calculate the price of 100 g cake without considering the amount of work and energy.
a. Students responsible for the task
b. Method of solving the task
c. Date: January
d. Task evaluation: (0 – 2)p

Stage 7: Find the information about the caloric value of each used ingredient. Calculate the caloric value of every ingredient separately and also the whole cake. Calculate the amount of kcal in 100 g of cake.
a. Students responsible for the task
b. Information sources
c. Description of the task implementation
d. Date of implementation / consulting
e. Task evaluation: February

Stage 8: Create at least 3 math word problems concerning gathered data. Solve the problems.

Examples of the word problems.

1) Calculate what part of the whole cost is the flour. What percentage of the whole cost is it?

2) What do you need more: sugar or flour, how much more?

3) What do you have more in the cake: calories from the sugar or kcal from the flour? How much more?

a. Date: February

b. Task evaluation: (0 – 6)p

Stage 9: Prepare a presentation containing answers to stages 1-9 in the form of brochure and electronic version (Word or PowerPoint).

a. Date: March

b. Task evaluation: (0 – 6)p

Evaluation rules: MAXIMUM: 42 points

Grades	Points
6	(40 – 42)
5	(36 – 39)
4	(32 – 35)
3	(25 – 31)
2	(16 – 24)

PORTUGAL

PROJECT Maths in Use

I - CONTEXT

1. Project justification

Mathematics is present in our daily lives. As we look around us we often see figures and geometric patterns, we are unexpectedly confronted with numbers and situations that require calculations and every day we see information on television, in newspapers and magazines based on figures, graphs and numerical data. In addition, mathematics is the basis for the development of all other sciences.

A broader knowledge of this discipline makes the current citizen more competent and prepared for the challenges of the society in which we live.

2. General objectives of the project

This project aims to approximate the mathematics of real situations using, in a classroom context, a computational program of Algebra and Dynamic Geometry.

Will be discussed the potential of this kind of software in the teaching and learning of Mathematics.

The main components and tools of one of these programs will be explored, proposing the resolution and discussion of tasks, aiming to analyze their didactic exploration, as well as the mathematical knowledge that mobilizes.

The applications of dynamic geometry benefit the understanding of concepts and geometric relations, so they must be used to observe, analyze, relate and construct geometric figures and operate with them.

II – PROJECT IMPLEMENTATION

3. Target population

Education level	Subject	Number of students
3rd cycle – 7th grade	Mathematics	7th - A 26 students

4. Methodology and Procedures

The methodology to be implemented contemplates the experimental practice, oriented to the training of competent producers and users, which will be developed within the scope of the output (013) included in the project Erasmus+ "Effective Communication - A Successful Future Life".

Students should develop the ability to visualize through concrete experiences with a diversity of geometric objects through the use of technologies.

The structure chosen for the development of the classes and the project aims at the involvement of the students in building their own mathematical knowledge and promoting their autonomy.

Thus, the tasks to be performed are divided by the following steps:

1º step	2º step	3º step
Exploiting the functionalities of an ADG program – **Task 1** (see attachment)	Reproduction and creation of paving in ADG – **Task 2** and **Task 3** (see attachment)	Exploring of elaborate paving in solving everyday mathematical problems – **Task 4** (see attachment)

4.1. Project development schedule

The tasks should take place during the months of January and February (2nd term 2016/2017), depending on the schedules of the students and teachers involved.

5. HUMAN AND MATERIAL RESOURCES

5.1. Human resources for the project

Teachers involved	Tasks to be performed
Mathematics teachers	Develop students' spatial sense, with an emphasis on visualization and understanding of properties of geometric figures in the plane and in space. Understanding of geometric transformations and the notion of demonstration, as well as the use of this knowledge and skills to solve problems in diverse contexts.
Teachers of Ersamus+ Team	Coordination of **Erasmus+ Project**

5.2. Material resources related to the project

Material designation	Quantities
Computer room	1
Video camera	1
Digital camera	1

6. PROJECT EVALUATION

The evaluation follows the project development, observes and interprets the effects, generating reformulations and readjustments to the project.

The implementation of this project strategy focuses primarily on its follow-up to such data collection is necessary through direct observation, promoting the analysis of changes in behaviour and the degree of satisfaction with the mathematics with regard to the application of technology Contexts of digital citizenship.

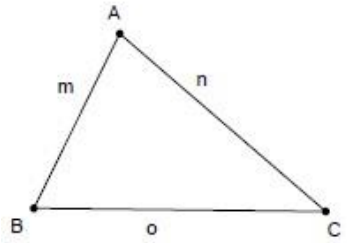
7. ATTACHMENT

TASK 1

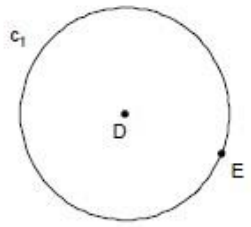
Exploring Geogebra - Part 1.

Geogebra is a dynamic geometry software that allows you to draw and construct figures using points, line segments and circles as basic elements.

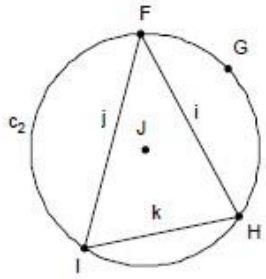
1. Draw the following figures.



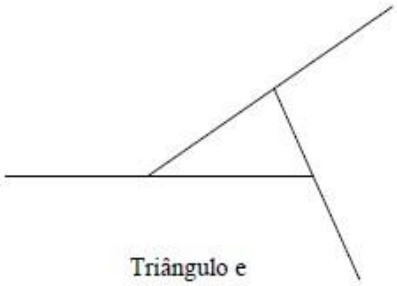
Triângulo
triangle



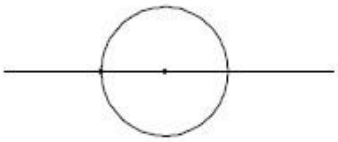
Circunferência
circumference



Triângulo sobre
a circunferência
Triangle on the circumference



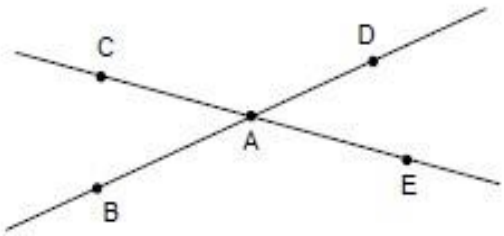
Triângulo e
semi-rectas
Triangle and semi-straight



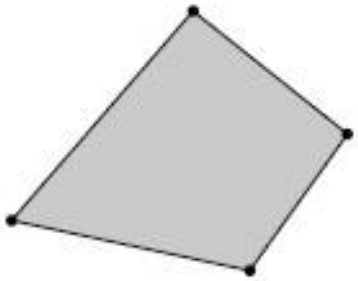
Circunferência e recta
contendo o diâmetro
Circumference and line containing the diameter

2. Draw a line segment and a point C outside this segment. Draw a parallel line and a line perpendicular to the initial segment and passing through the point C.

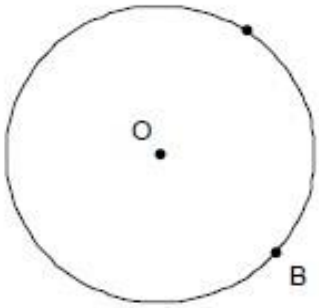
3. Draw two intersecting lines at point A (see figure). It measures the amplitudes of the BAC, CAD, DAE and BAE angles. Is there any relationship between these angles? If so, which one?



4. Draw a quadrilateral like the one in the next figure. Using the menus, displays the measurements of the amplitudes of your internal angles, perimeter and area. Drag one of the vertices and check what happens to all of these measures.



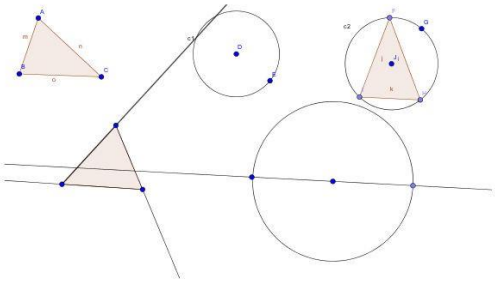
5. Draw a circle and a point, B, on it. With center in O, center of the circumference, makes successive rotations of 90º of the point B. It joins the points that you obtained on the circumference. What figure is obtained? Measure your sides and angles to test your conjecture.



6. Draw an ABC triangle and the CD and BD lines parallel to AB and AC respectively, as in the figure. Measures the angles ABD, BDC, DCA, CAB. What relationships are there between them?

Task 1 – Solution

1



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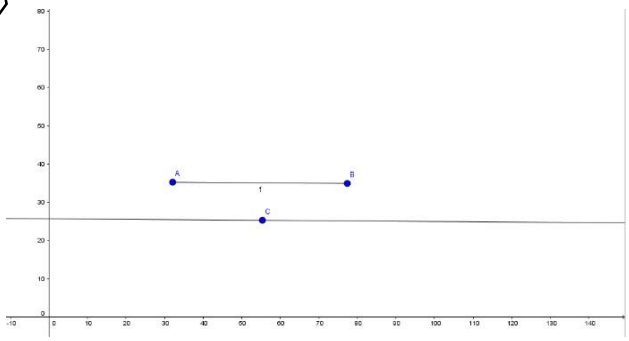

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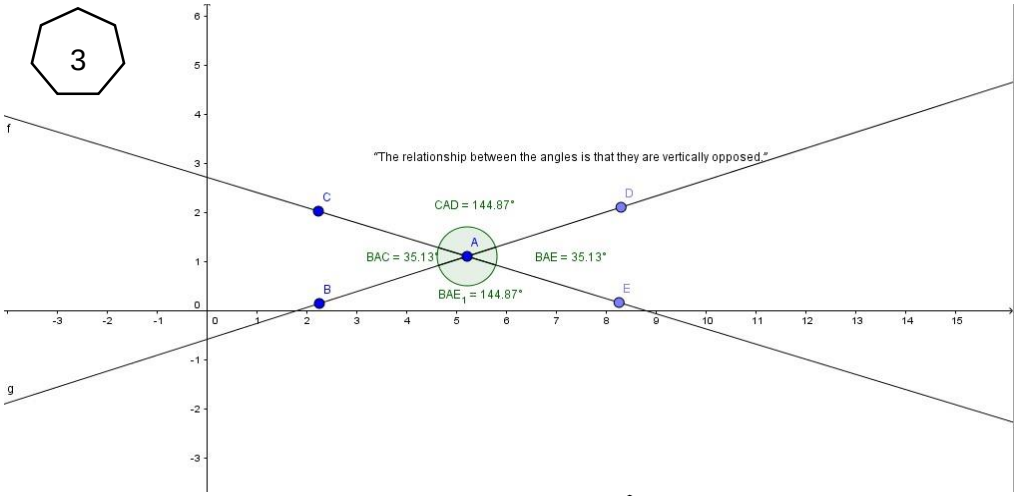

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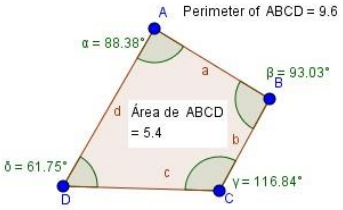
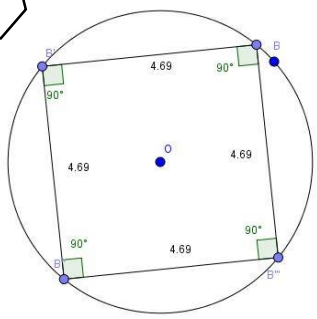


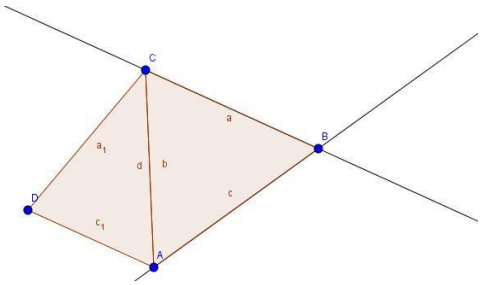
When we drag a vertex, all the measurements of the figure change.

5



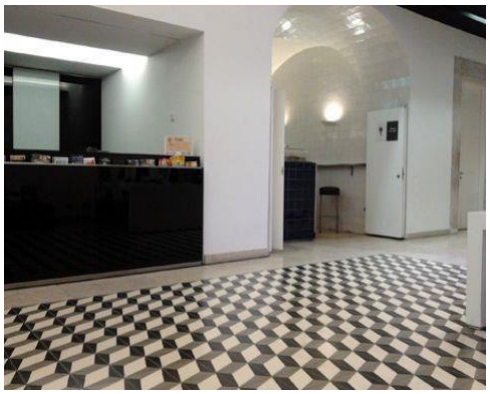
It is a square, because it has the angles and sides all the same.

6



TASK 2
Reproducing a tile (ADG)

It is a tradition in our region to pave streets, buildings and other public places using geometric patterns.
In the figures below you can see two photographs of two locations in Évora.

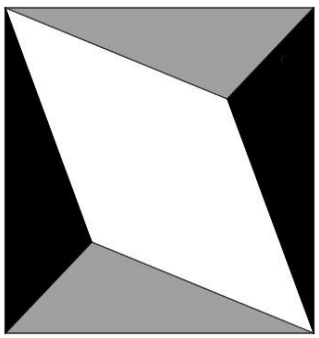


Evora Tourism information Office

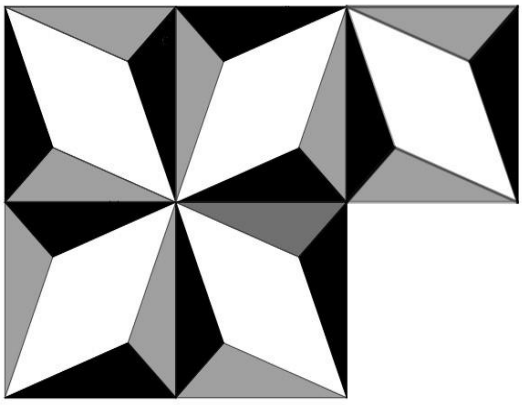
Évora Hotel

This way of constructing the paving can be done by making a single piece and this comes by isometry (rotation, symmetry or translation) of the original piece.

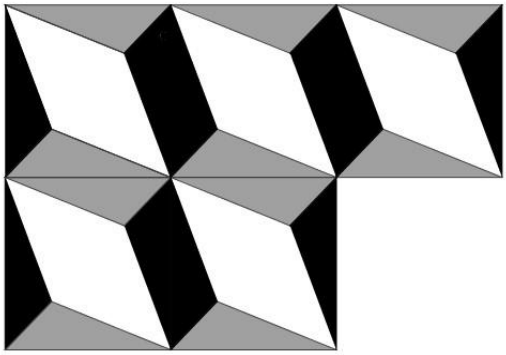
1. Using Geogebra, build the "mosaic" base for the paving of the Évora Hotel.
Keep in mind that the quadrilateral figure is a rhombus.



2. Using geometric transformations, build paving Évora Hotel with at least five "tiles".



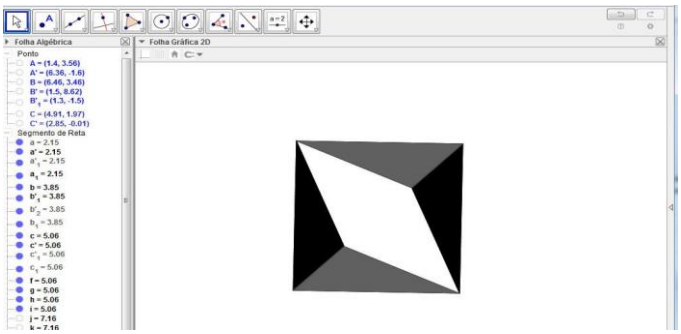
3. Using another geometric transformation, with the same tile, one can construct the paving of Tourism information Office. Try to build it.



4. Search the Internet for other pavements of public places in our region and reproduce in the AGD this pavement.

Task 2 – Solution

1



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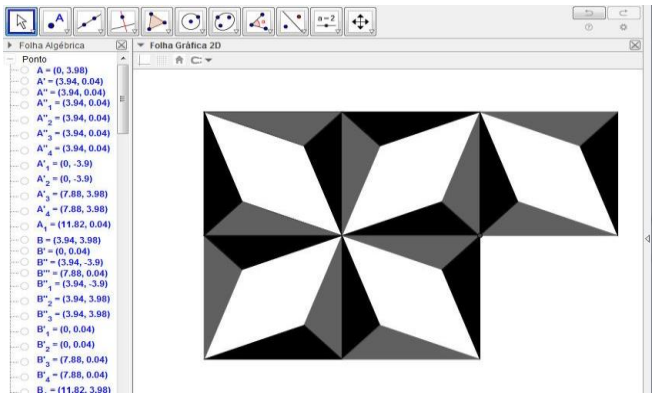

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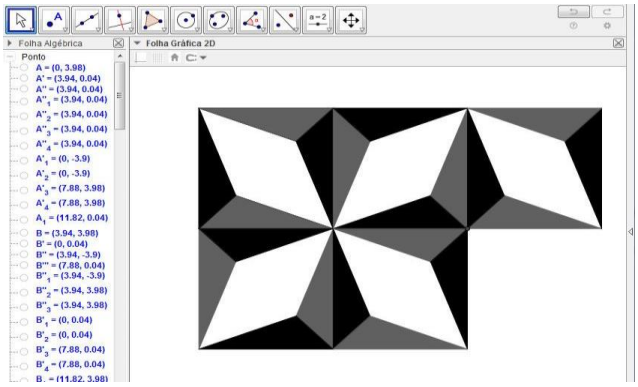
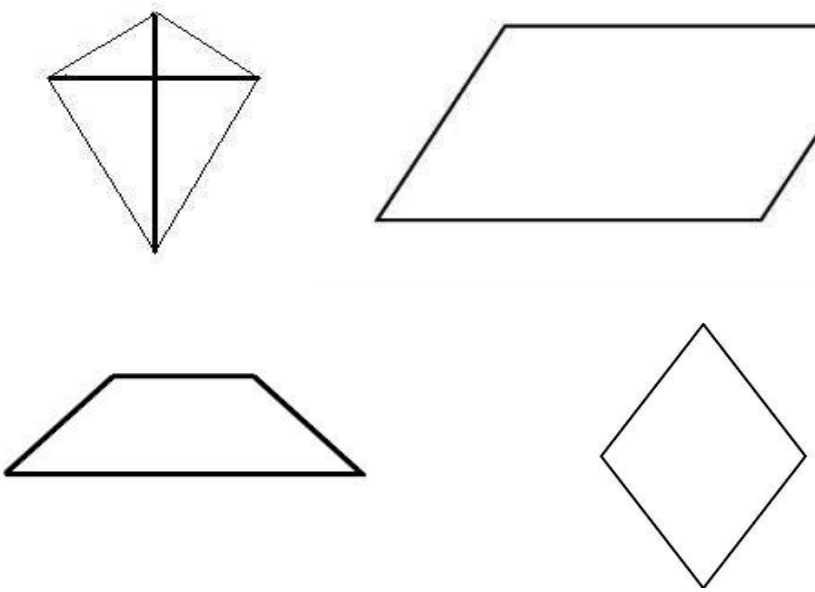


TASK 3

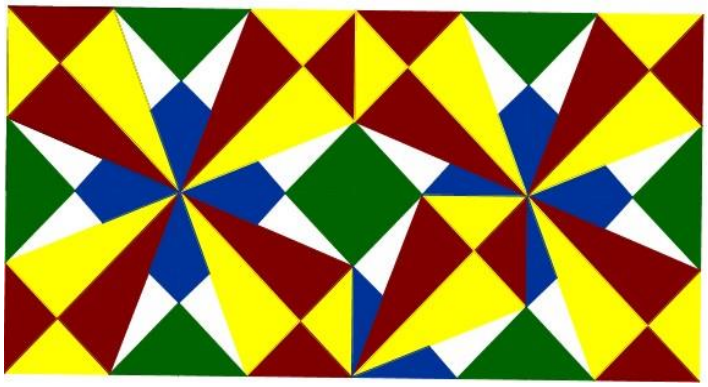
Doing a tile (ADG)

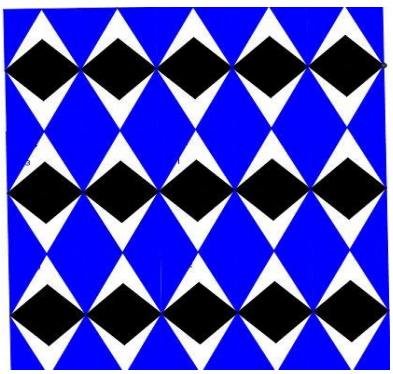
1. Build your own floor, using geometric shapes.

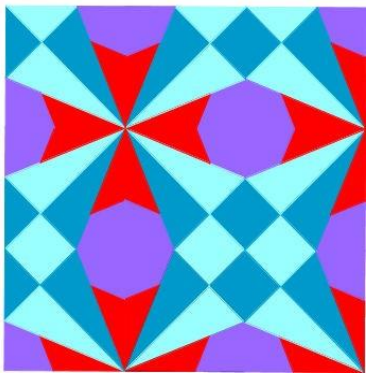
You must use at least the following forms: parrot, parallelogram, trapezoid and rhombus.

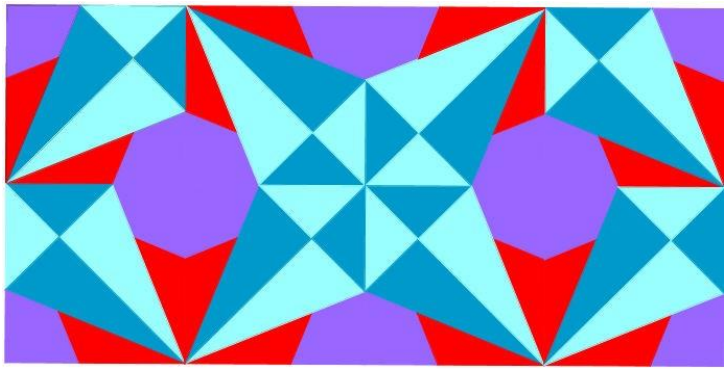


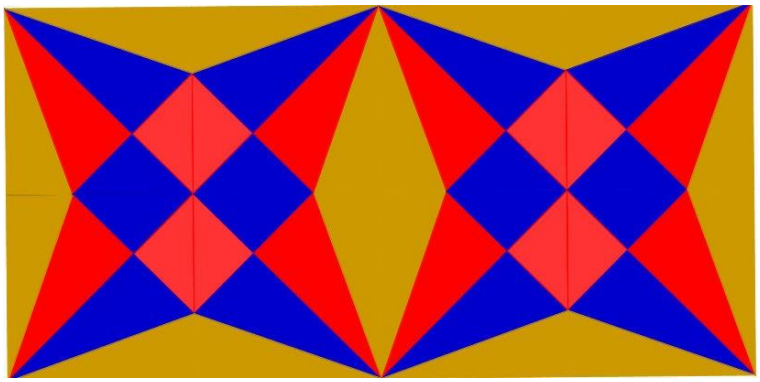
Task 3 – Final products

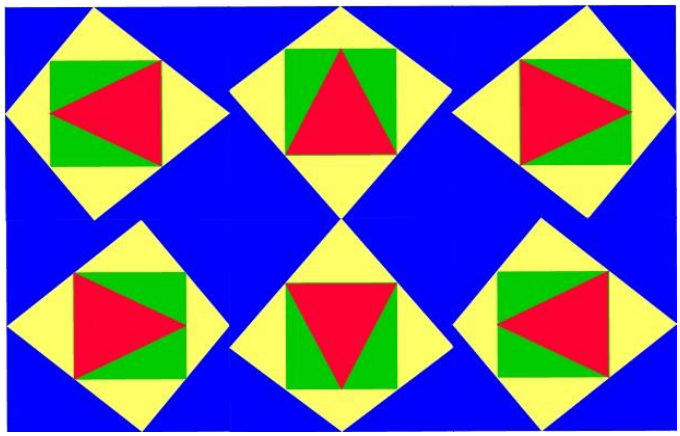






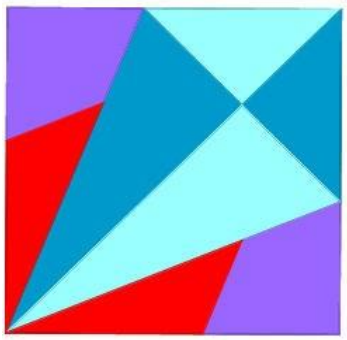






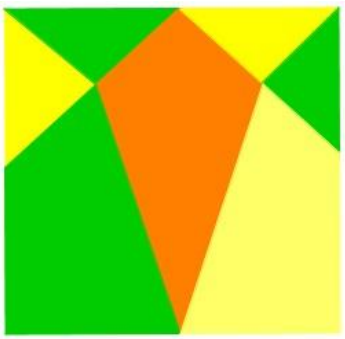
<u>TASK 4</u> (work group 1 to 7)

Congratulations on creating your tile! As it is a very beautiful piece, it will be manufactured in large scale in squares of 25 cm side.
Here's a copy of it.

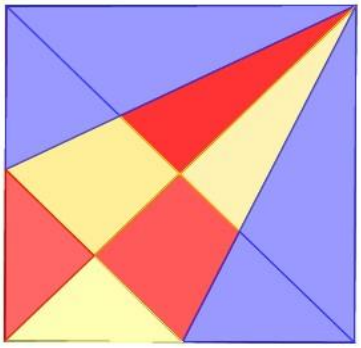


Work group - 1

Work group - 2

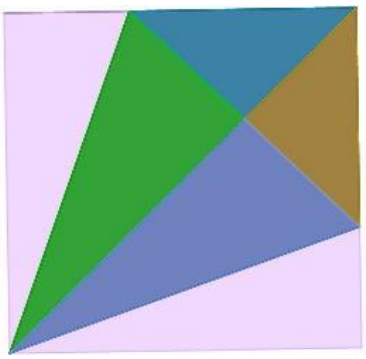


Work group - 3



Work group - 4

Work group - 6



Work group - 5

Work group - 7

To stylish the gymnasium of the School it was decided to pave one of the walls of the top of the gymnasium with your tiles.
The wall has the shape of a rectangle with 40 m of base and with 5 m of height.

1. What is the minimum number of tiles you will need to buy to pave the gym wall?

2. When you glue tiles on a wall there are always some breaks. In order not to miss tiles you should always buy yourself some surplus. The recommended is to buy yourself 2% more than the minimum required.

Given that the tiles come packaged in boxes of 50, what would be the number of packages that the school should buy to comply with this recommendation?

3. The school decided to buy 65 packages of tiles. What percentage of tiles did the school buy more than the minimum required?

4. The school will pay for each tiles the value of 0.40€. What is the total cost of the tiles?

5. 10 ml of paint is required to paint a single colour tile.

How many gallons of blue paint were spent to make the tiles the school bought?

SLOVAKIA

SKI COURSE

MATHS IN USE FOR 7th GRADE STUDENTS

The aim of the project is:

- to create the skills of students to solve real situations using their knowledge from Mathematics, Geography, Civics, Slovak Language, IT and others
- to develop cooperative and presentation skills

Way of work: All 7th grade students are divided to 4 groups. Each group has to gather data, solve the problem and present the solution the whole class. At first the students collect all necessary data. They can use internet sources and also ask the teacher responsible for organizing ski course for some information.

Description of the task: Our students are having a ski course in Martinské Hole resort. There will be some 7th grade students - 13 girls and 18 boys and some 8th grade students - 3 girls and 7 boys. The students will be leaving on Sunday afternoon and coming back on Friday afternoon.

Problem 1: You need to plan the journey and book a coach.

a) How much will the journey cost?
b) How much will it be per person?

Solution: The price is 2.60 €/km.

The distance from school to the ski resort is 232 km - we must count it two times:
232 km . 2 =464 km

a) 1 km …….. 2.60 €
464 km…… x €
x = 2.60€ * 464
x = **1206.4 €**

b) cost of the journey……. 1206.4 €
number of students…… 13 + 18 + 3 + 7 = 41
cost per one student…….... 1206.4 : 41 = **29.43 €**

Problem 2: You need to plan the accommodation, find out the food and ski passes expenses. (for the journey cost use the output of group 1)

a) Count the total price of the course for a student.
b) Count the percentage of each item and show it in a diagram.

Solution: a) Choosing a hotel – accommodation and food.

We have found out the prices: 1 day/night……. 25 € per person

5 days/nights……. 5 * 25 € = 125 € per person

ski passes: 1 day……. 5 € per person

5 days……..…….. 5 * 5 = 25 € per person

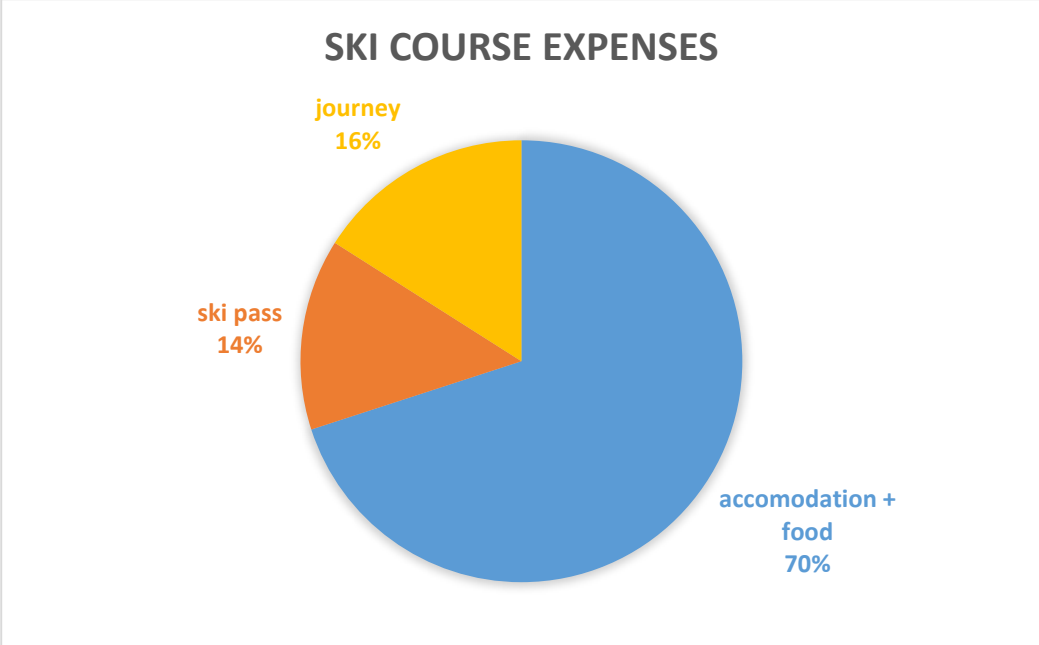
journey…… 29.43 €

Total cost per person: 29.43 + 125 + 25 = **179.43 €**

b) accommodation + food:
179.43 €…….. 100%
125 €……..... x%
x = 125 * 100 : 179.43
x = 69.67 % - approx. **70%**

ski pass:
179.43 €……...….. 100%
25 €……..... y%
y = 25 * 100 : 179.43
y = 13.9% - approx. **14%**

journey: 100% - 70% - 14% = **16%**



Problem 3: How many rooms at least do we have to book for all the girls and boys?

Solution: There are some 3-bedded and some 4-bedded rooms.

Number of girls: 13 + 3 = 16
16 : 4 = 4 rooms (4-bedded)

Number of boys: 18 + 8 = 25
25 : 4 = 6 the remainder of the division is 1, so we need to take 2 boys from 4-bedded rooms and then there will be four 4-bedded rooms and three 3-bedded rooms for boys
Number of rooms together: eight 4-bedded rooms and three 3-bedded rooms.

Problem 4: Compare number of girls and boys in each grade by ratio, express them by nonnegative numbers, fractions, percentages in a chart and make a histogram.

Solution: 7th grade girls : boys = 13 : 18
8th grade girls : boys = 3 : 7

13 + 18 + 3 + 7 = 41 students…… 100%
13 students…… 13 * 100 : 41 = 31.7%
18 students……..... 18 * 100 : 41 = 43.0%
3 students…….. 3 * 100 : 41 = 7.3%
7 students…….. 7 * 100 : 41 = 17.1%

	7th grade		8th grade		
	girls	boys	girls	boys	together
nonnegative number	13	18	3	7	41
fraction	$\frac{13}{41}$	$\frac{18}{41}$	$\frac{3}{41}$	$\frac{7}{41}$	$\frac{41}{41}$
percentage	31.7%	43.9%	7.3%	17.1%	100%

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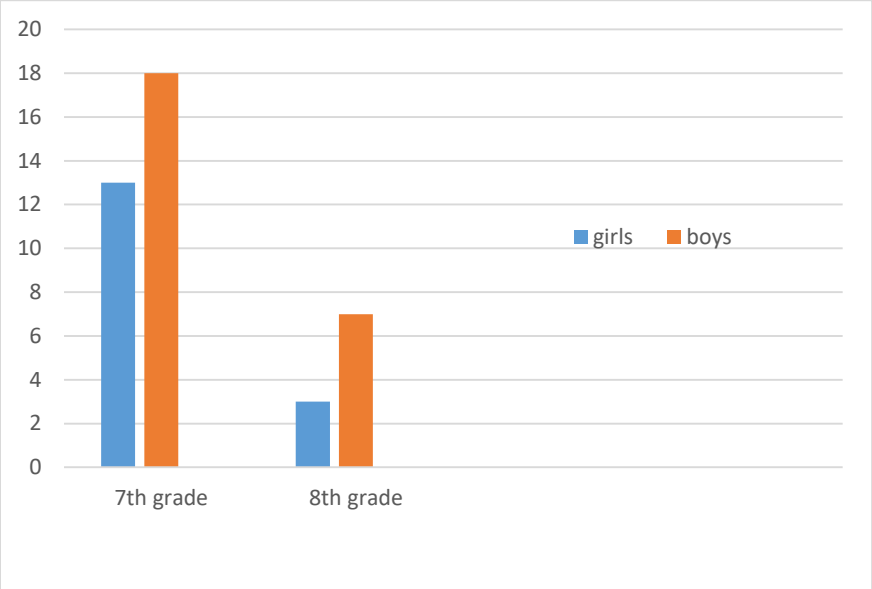


SLOVENIA

FROM KRAKOW TO NOVO MESTO

There is students' Erasmus exchange organised between pupils of a primary school in Krakow and Primary School Šmihel in Novo mesto. Five pupils are coming with a teacher from Krakow to Novo mesto and pupils of Primary School Šmihel have calculated the costs of their journey and their stay in Novo mesto.

KRAKOW (Poland)

NOVO MESTO (Slovenia)

MEANS OF TRANSPORT

1. BY PLANE

Expense: 6 return tickets from Krakow Airport to Ljubljana Joze Pucnik Airport cost 3,105 € and includes 1 adult and 5 children (2-11 years) return tickets + taxi to Novo mesto, which costs 111 €.
Distance: 590 km
Time: 1.5 h

2. BY VAN

Expense: the rent of a van (8 + 1 persons) costs 45 €/day + petrol cost
Distance: 837 km
Time: 8 h 30 min

AVERAGE SPEED

average speed = distance : time

1. BY PLANE
   590 km : 1.5h = 393.3 km/h
2. BY VAN
   837 km : 8.5h = 98.5 km/h

VISITING SIGHTS

DAY 1
- **Dolenjska Museum Novo mesto**, expense: 1 adult = 5 €, 5 pupils = 15 € (3 € per pupil), **together**: 20
- **Grm Castle**, Expense: 0 €

DAY 2
- **Postojna Cave**, expense: 1 adult = 23.90 €, 5 pupils = 71.5 € (14.30 € per pupil), **together**: 95.40 €
- **Predjama Castle**, expense: 1 adult = 11.90 €, 5 pupils = 35.5 € (7,10 € per pupil), **together**: 50.40 €

DAY 3
- **A stroll around Novo mesto and exploring the cultural sights**

Expense: 0 €
- A stroll through the Otočec Castle, expense: 0 €

TRANSPORT COSTS: the rent of a van (8 + 1 persons) costs 45 € a day

ACCOMODATION

- **Pupils of Poland are hosted at the homes of pupils** of Primary School Šmihel
- **The teacher stays at the Situla Hostel**, expense is 45.9 € for 3 nights (15.3 €/night)

FOOD

DAY 1
- School canteen, expense 0 €

DAY 2
- McDonalds, expense 49 € (7 €/ pupil or teacher)

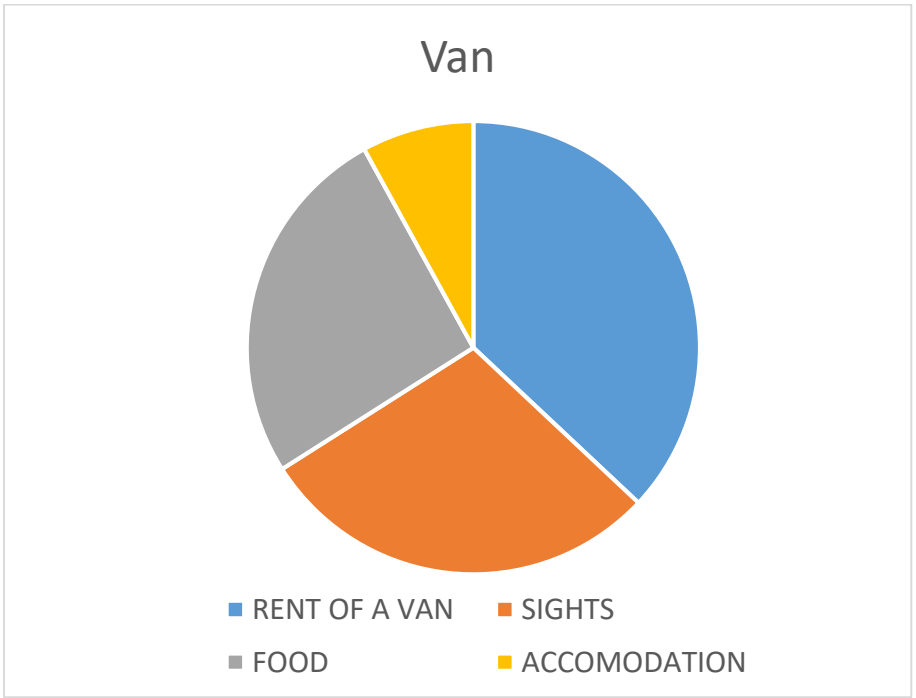
DAY 3
- Restaurant Don Bobi, expense 80 € (10 € for one lunch)
- A lunch contains beef or cauliflower soup, roast beef, chicken steak, Wiener Schnitzel, roasted potatoes, salad and dessert

	Number of people	Price for one person	Total costs
Day 1	6	0 €	0 €
Day 2	7	7 €	49 €
Day 3	8	10 €	80 €

TOTAL COSTS

1. possibility (a van): **535.7 €**
2. possibility (a plane): **3537.7 €**

	PLANE	VAN
TRANSPORT	3216	214
SIGHTS	165.8	165.8
FOOD	110	110
ACCOMODATION	45.9	45.9



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Its purpose is to explore and improve public presentation, its types and to give examples of good practices.

Materials contributed by following schools:

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A SUCCESSFUL FUTURE LIFE
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