DIGITAL MAGAZINE

"Maths and Science Adventure"

I ISSUE, MAY 2017

SPECIAL POINTS OF INTEREST:

- **Meeting in Cyprus**
- **Meeting in Finland**

INSIDE THIS ISSUE:

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Erasmus+

Autistic genius - Daniel Tammet

On the outside, 31-year-old Daniel Tammet is an unremarkable young man. But behind Tammet's bookish exterior lies a superhuman gift: one of the most extraordinary brains our planet has ever seen. He is a mathematical genius, capable of astronomical calculations in the blink of an eye. And he's a gifted linguist, speaking nine languages, including one he created called Manti.

Tammet says he was born with the ability to experience numbers in an exceptionally vivid way.

"The numbers are moving in my mind," he says. "Sometimes they're fast, sometimes they're slow. Sometimes they're dark. Sometimes they're bright. That emotion, that motion, that texture will be highly memorable for me."

The phenomenon is called synaesthesia, a mixture of the senses that results in a heightened sensory experience. Tammet is able to see and feel numbers. In his mind's eye, every digit from zero to 10,000 is pictured as a 3-dimensional shape with a unique colour and texture. For example, he says, the number fifteen is white, yellow, lumpy and round.

Synaesthesia occurs when regions of the brain associated with different abilities are able to form unusual connections. In most people's brains, the recognition of colours, the ability to manipulate numbers, or language capacity all work differently in separate parts, and the information is generally kept divided to prevent information overload. But in synesthetes, the brain communicates between the regions.

Tammet doesn't need a calculator to solve exponential math problems such as 27 to the 7th power -- that's 27 multiplied by itself seven times -- he'll come up with the answer, 10,460,353,203, in a few seconds.

Tammet visualizes numbers in their unique forms and then melds them together to create a new image for the solution. When asked to multiply 53 by 131, he explains the solution in shapes and textures: "Fifty-three, which is round, very round...and larger at the bottom. Then you've got another number 131, which is longer a little bit like an hourglass. And there's a space that's created in between. That shape is the solution. 6,943!"

Tammet first discovered his mathematical abilities as a child, the eldest of nine children in his family in England.

"I learned to count, like anyone else, at a young age, and when I did I would see colours," he said. "I would see pictures in my mind. I assumed at the time that everyone saw numbers as I did."

Tammet didn't do math as it was taught in school. Instead, the answers just came to him.

It was Tammet's obsession with numbers that led to an incredible feat on March 14, 2004, known as Pi Day, when Tammet broke the European record for reciting the number Pi from memory.

Pi, the ratio a circle's circumference to its diameter is considered an "irrational" number in mathematics because it does not end. You may be able to remember the first few digits -- 3.14159 -- but not more.

Tammet says he only read through the digits once and was able to remember 22,514 of them. After a couple weeks to practice reciting the numbers back, in order, it

took Tammet just 5 hours and 9 minutes to reel off the numbers while mathematicians listened and simultaneously checked every digit.

To memorize a long number like Pi, Tammet said he just forms a beautiful landscape out of the shapes he pictures in his mind: "I'm taking the numbers, I'm making them into colours and shapes. I'm able to put those into combinations which form hills…or ground or sky…It's another world that I'm able to go into, experience, live within."

Gabriela Więckowska, Poland

Source: http://abcnews.go.com/2020/autistic-savant-daniel-tammet-solves-problems-blink-eye/story?id=10759598

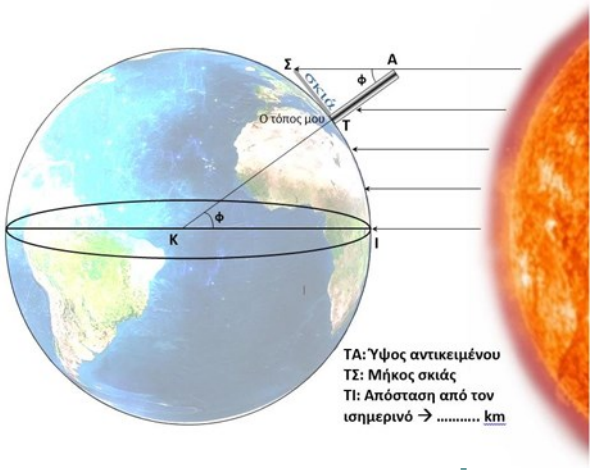
Eratosthenes' experiment to calculate the Earth's radius

In the middle of the 20th century scientists sent the first satellites into space,which can help us calculate earth's characteristics with ease and precision. As we know today, the Prime Meridian is 40.007 kilometers in size.

We didn't need the help of the satellites and technology to calculate earth's dimensions because of a great ancient Greek scientist named Eratosthenis who lived 2500 years ago.

Eratosthenis(3rd centuary BC) was the director of the Royal Library of Alexandria at the time.On the 21st of June, Eratosthenis read on papyrus scroll that columns don't have shadows and the Sun is mirrored exactly at the bottom of a well at the south of Aswan. Just like every scientist,Eratosthenis questioned himself if that phenomenon happens in another place like Alexandria.However, at the same day and time of the day, columns had shadows.

If Earth was flat,the columns in the two cities would be in parallel and therefore having shadows.We know that isn't true so what is the reason behind it?Eratosthenis gave the answer saying that earth is round shaped and not flat.That conclusion helped Eratosthenis calculate Earth's radius and length.We can calculate the difference between the latitude of the 2 cities if we know their shadows' length.He knew that the distance between the cities was 800 km,he calculated Earth's radius which Is approximately 40 000 km.



ΤΑ:Object's height

ΤΣ:Shadow's length

ΤΙ:Distance from Earth's equator

Eratosthenis gave the correct answer while using bars,his eyes and feet, as well as the power of his mind and resourcefulness.His calculations were 2% from being perfect,something that makes it a great achieve-

The experiment done and describe by the Cypriot team

ment for his time, 2500 years ago.So Eratosthenis was the first person to calculate Earth's dimensions , that's why he is considered the creator of mathematical geography. March 20 (Spring Equinox) and September 23 (Autumn Equinox) can be described as the beginning of Spring and Autumn respectively.On those exact dates, the Sun is directly above the Prime Meridian.As a result day and night have the same duration in every place on Earth.On those days, it is a good opportunity to repeat Eratosthenis' experiment because we know exactly where the Sun's rays are vertical on Earth's surface.It's remarkable that this experiment is included in the list with the 10 amazing science experiments in the history of Physics .

At 20/3/17 11:55 a.m. ,in Lakatamia and in our school. The Sun's rays are vertical to the Earth;s surface so we try to repeat Eratosthenis experiment every year.

Measurements

Object's Height: TA= 244 cm

Shadow's length: TA = 169 cm

Distance from the equator: TI=3886.6 km (from google earth)

Calculations

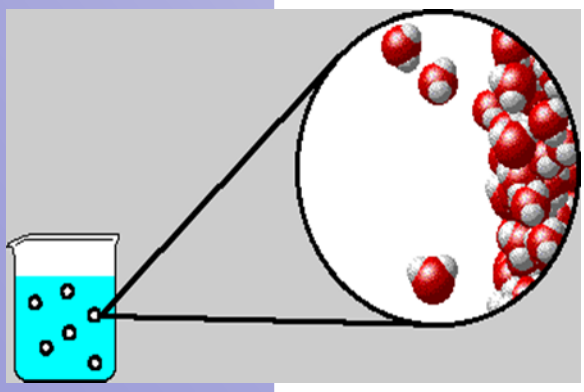
tanφ= TΣ/TA= 169/244 and φ=34.7°

TI/φ= Perimeter /360, Perimeter=40313.5216 km

Earth's Ray R= Perimeter/2π = 6416.1 km

(length given R=6371 km)

Fluids with strange properties



Introduction:

The distinction of the three physical states of matter is based on macroscopic observations and in particular on the ability of each material body to maintain its shape and volume.
In this work, reference is made to the fluid (liquid) which under conditions acquires solid characteristics. Such fluids are called non-Newtonian fluids.

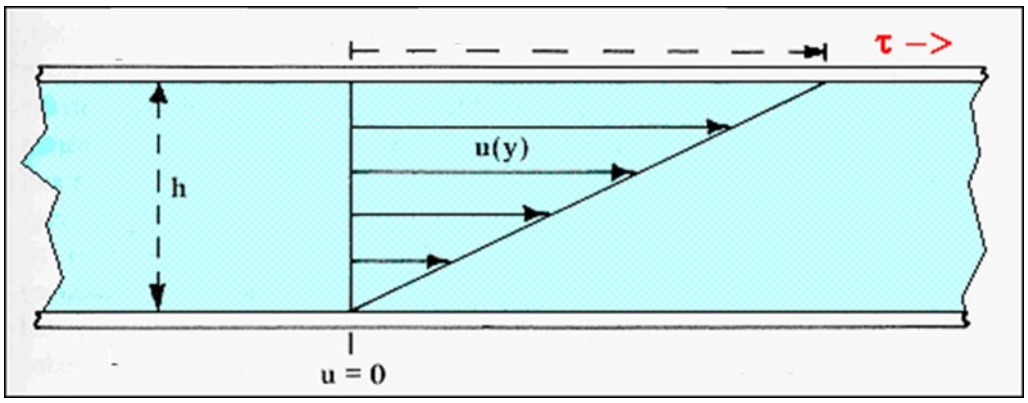
Fluid is any substance that exhibits continuous deformation, therefore its molecules are able to transfer momentum and kinetic energy from one to another and flow as we can see at the photo to the left.

The basic question that emerges is of what element differentiates the flow between liquids. What is the property that determines the dif-

ferent deformations (flows) that fluids have. This question emerges effortlessly by observing the flow of honey and water in the pictures on the right.

Why do fluids present viscosity?

Viscosity is presented due to the collisions between the fluid molecules, but also because of the cohesion forces of its molecules. For the study of fluid engineering we use the following simple model. As you can observe some kind of fluid is placed between two plates. The plate on the upper side slides at velocity V while the other is stationary .



From the above picture we observe that:

The fluid layers are located between the plane (y = 0) and the plate to a height of y = H where the fluid is impulse.
The velocity of each layer u_x (y) depends on its height in relation to the stationary plate..

When y = 0 u_x = 0
When y = H = u_x = V

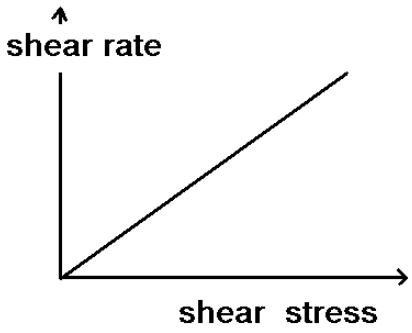
The above observations led Newton to his experimental law of viscosity.

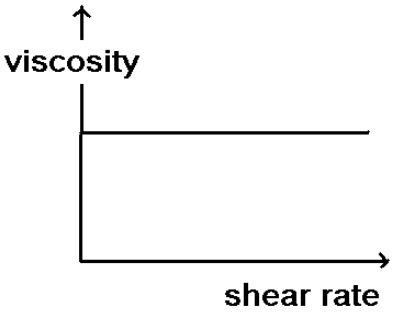
$$\tau_{yx} = n\frac{du_x}{dy}$$

Shear stress — Viscosity — Rate of deformation

Newtonian Fluid:

A fluid, whose viscosity does not change with the rate of deformation or shear strain, is called Newtonian fluid.
A fluid which obeys Newton's law of viscosity is termed as Newtonian fluid.

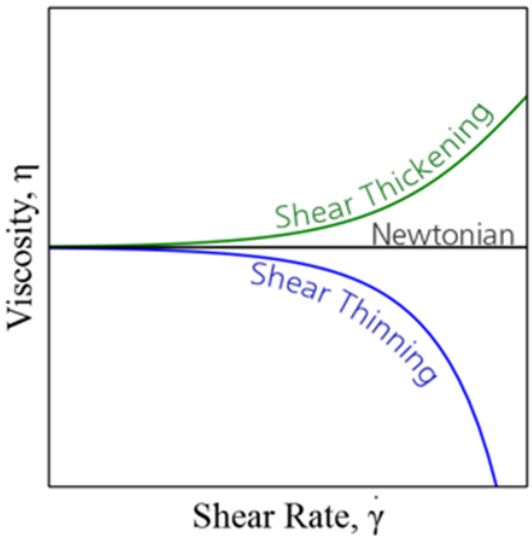


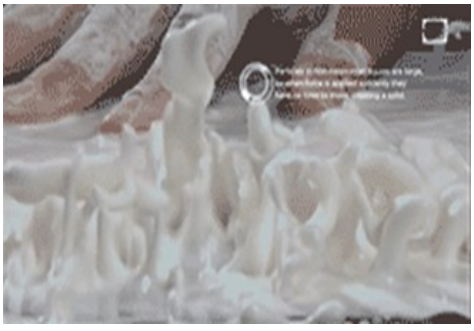


Miltiadous Petrina
Hadjiantonas Haris
Kourris Andreas
Kosta Antrea
Stavrou Ioanna
CYPRUS

Non-Newtonian Fluids:

In reality most fluids are nonNewtonian, which means that their viscosity is dependent on shear rate (Shear Thinning or Thickening) or the deformation history (Thixotropic fluids). In contrast to Newtonian fluids, non-Newtonian fluids display either a non-linear relation between shear stress and shear rate, have a yield stress, or viscosity that is dependent on time or deformation history (or a combination of all the above!).





Shear thickening

A fluid is shear thickening if the viscosity of the fluid increases as the shear rate increases. A common example of shear thickening fluids also known as *dilatant*, is a mixture of cornstarch and water. You have probably seen examples of this on TV or the internet, where people can run over this kind of solutions and yet, they will sink if they stand still.

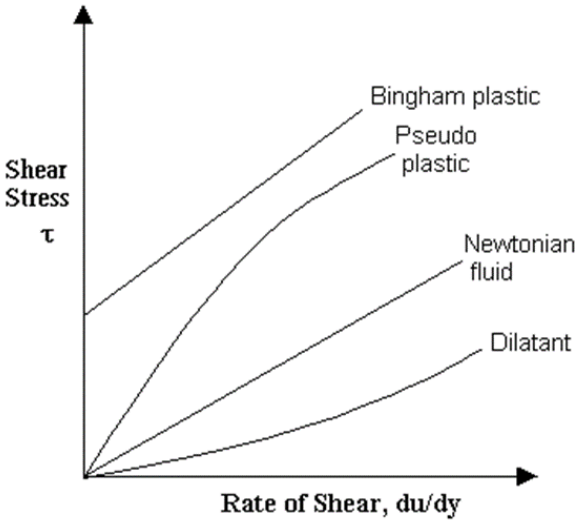
Shear thinning

Fluids are shear thinning if the viscosity decreases as the shear rate increases. Shear thinning fluids, also known as *pseudo-plastics*, are ubiquitous in industrial and biological processes. Common examples include ketchup, paints and blood.

Bingham plastic

Fluids that have a linear shear stress/shear strain relationship require a finite yield stress before they begin to flow (the plot of shear stress against shear strain does not pass through the origin). These fluids are called Bingham plastics.

But how does deformation depend on shear stress?



Bingham plastic

Shear thinning

Shear thickening

Applications of non newtonian fluids:

- bulletproof vests

Modern applications of these fluids are found in the manufacture industry. The requirement for vests that are lightweight, flexible and resistant to penetration has led the industry to develop products that are baseed on such non-Newtonian fluids.

- *oobleck bullet*

Another similar use of such fluids is the oobleck bullet that is same as plastic bullets. The purpose of such bullets is to repel furious crowds rather than causing their death

MEETING IN CYPRUS

21.11.-25.11.2016

Few glimpses into activities

Opening Ceremony at Saint Georgios Lyceum Lakatamia

21.11.2016

On the first day we visited the secondary school which took part in the Maths and Science Adventure project, and its students greeted us standing in rows and clapping. Two students wearing traditional clothing offered us a local delicacy and a small token as a gift. We listened to the national anthems of the participating countries. The ceremony continued with a very spectacular flag show accompanied by a Cypriot students' band playing music, and then we had the opportunity to watch a traditional Greek dance, which we had the chance to learn in the following days. After the tour of the school, each country's representative students introduced the main sights and attractions of their homelands and talked about their schools. The presentations made it possible to better acquaint with the representatives and the participating countries.

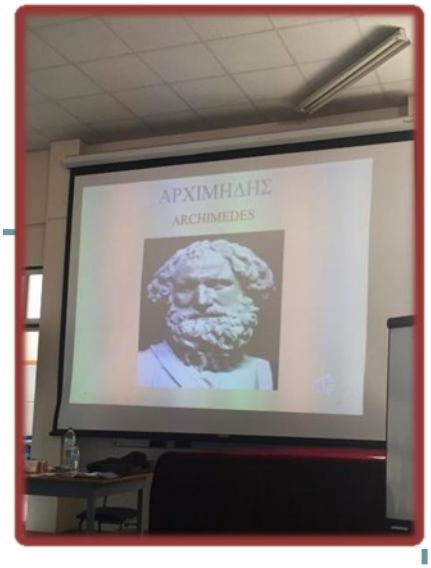
the Hungarian team

Maths-Science Theatre Performance

21.11.2016

We had the opportunity to watch a play about the “Discoveries of Archimedes” performed by the students of the Saint Georgios Lyceum Lakatamia. The theater was performed in Greek with simultaneous translation in English through computer subtitles. It was very interesting and well executed.

Archimedes of Syracuse was one of history's foremost scientists and inventors. More than a millennium ahead of its time, his work laid the foundation for branches of mathematics, physics and engineering. The students explained his achievements range from calculating a remarkably accurate approximation for *pi* number.



The scene in which Archimedes was asked to determine whether a crown was solid gold was also shown. Archimedes made his legendary discovery that a solid displaces a volume of liquid equal to its own volume, supposedly causing him to leap from his bath and run naked through the streets crying "Eureka!" (I have found it).
Archimedes was killed by a Roman soldier during the conquest of the city in 212 B.C., which gave Rome dominion over all of Sicily.
The public followed the play with great interest.

the Portuguese team

Logo competition

21.11.2016

It's important for a project to have a good logo, so that is why we had a logo competition during our first school meeting in Cyprus. Making the logo was an interesting task, which required a lot of creativity. Most students used the computer for making their logo, so it also taught them computer skills.

Before coming to Cyprus, all the countries had made at least two different logos, which would illustrate the project and the partner countries. In Cyprus, all the logos chosen for the logo competition were put on display, so that everyone could take a look at them and choose their favourites. The logos had already been on Twin Space before that, but since some countries had made more than two logos, only the ones chosen for the competition were on display in Cyprus.

Each country got to choose two of their favourites and vote for those logos. However, we weren't allowed to vote for our own logos, of course. After the first round, two logos were chosen for the "super final" and each country had to vote for either logo. Both of the logos were very good and the competition was tough! In the end, the beautiful logo made by the Hungarian team was voted the best one.

the Finnish team

Breaking the ice—Students' walk down Ledras and Onasagorou streets

21.11.2016

On this afternoon, we arranged for the Erasmus+ students to meet and take a stroll down Ledras street, the main shopping street in the old town within the walls. Our teenagers were just starting to get to know each other and this was an opportunity for them to socialize and interact. The walk down Ledras was very pleasant as it is a pedestrianized street, filled with busy cafeterias, small restaurants and shops. We had a very interesting stop which quite surprised everyone. The tallest building in this street (Shacolas Tower) has an observatory on the top floor from which the visitor can enjoy an amazing view of Nicosia, observe maps which highlight some of the old town's landmarks and also spot them from above! The students realized where exactly they were in relation to the old town within the Venetian Walls with the characteristic circular shape. They also became aware of the division of the town where they could have a clear view of buildings in the occupied part of Nicosia, as well as the Kyrenia mountain range North of Nicosia. The whole setting aroused their curiosity and they had many questions to

the Cypriot team

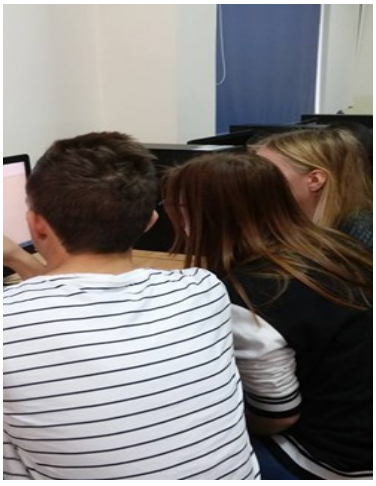
Workshops on Calendar

21.11.2016

During our trip to Cyprus we had a chance to not only experience Greek culture but also to take part in different activities, such as making a calendar. We were divided into groups made up of multiple nationalities and got to work. Everyone had to choose one picture which showed off the landscape of the country where he/she's from and additional things, like the background that would fit in with the picture.

On the one hand it was a competition, but on the other hand it was great entertainment for all who took part. Teamwork is not only a learning exercise but it also lets the people working together have fun while doing so. After working we had to decide which calendar we liked the most. Choosing the best calendar was a really difficult decision because all of the works were beautiful and deserved praise in their own right. Every country got a Winner Calendar in the later part of the trip.

The calendar is a wonderful souvenir from my trip as it reminds us of the enjoyable time and unforgettable moments we shared. Furthermore, it encourages us to travel and visit our friends from other countries.



Agnieszka Balska, POLAND

Our trip to Larnaca 22.11.2016

Our trip to Larnaca was on 22 November. It is an area of outstanding beauty - endowed with numerous attractions, waterfronts and scenic vistas as well as some of the islands most outstanding beaches. It is located on the southernmost coast of Cyprus and is the coucounthird largest city and home to the second try's largest commercial port.

Larnaca Salt Lake is a distinctive landmark located to the west of the town of Larnaca. It is home to migratory birds and is a perfect place to gaze at the alluring plant kingdom .

Natalia Boteva and Aneta Spasova, BULGARIA

Physics experiments and mathematical quizes

23.11.2016

The participants did some experiments to learn about the cool physics going on behind the scenes in our everyday life. They explored the matter – what is it made of? How does it behave? What laws or equations describe it? They discovered how the laws of force and motion work. They were really amazed to experience how static electricity made their hair stand up and were able to prove for themselves that two results of static electricity are sparks and a crackling sound. Everybody could touch and experience the models Cypriot students and teachers provided for them. The demonstrations engaged all of us in a fun and exciting manner.

Natalia Boteva and Aneta Spasova, BULGARIA

Greek dance 23.11.2016

by Agnieszka Balska, Poland

Greek culture is known all throughout the world and has a big influence on many things we do today. One example of Greek culture is a specific dance, which we learned during our time in Cyprus.

Thanks to the Erasmus+ project we had the chance to be a part of Greek culture. At the school we visited in Cyprus, we could learn the basics of this great dance – Sirtaki (Zorba). The moves, music and happiness we discovered while taking part were thrilling and fun! Everyone who has learnt Sirtaki enjoys it so much. Before we started learning, we watched a part of "Alexis Zorbas", which showed us how the dance looks. *O*nce that was done, we started practicing. In spite of some initial difficulties, thanks to our great teacher and the students of the school in Cyprus, we achieved our goal.

Dancing together and cooperating let us appreciate a specific part of Greek culture and also meet friends from other countries.

Thanks to this lesson we could share our dance at a later stage during the trip.

24.11.2016

Guided tour of Nicosia

During our visit, we got the chance to take part in a guided tour of Nicosia, the capital city of Cyprus. We had an excellent guide who told us so many interesting facts about the history and the monuments of the city. We started our tour at the at the Liberty Monument, which represents the moment when Cypriots gained their independence in 1960 and were no longer under the British rule. There were flags on both sides of the monument; the Cypriot flag on the left-hand side and the Greek flag on the right-hand

side and the Greek flag on the right-hand side. It was interesting to hear that the orange colour on the Cypriot flag symbolizes copper, which Cyprus is famous for. It is said that the name of the country itself was derived from the Latin word for copper, "kuprum". The olive branches symbolize peace. As to the Greek flag, the influence of Greece has been strong in Cyprus and the Greeks first came on the island as early as about 1000 years BC. The majority of the population on the island are Greek Cypriots and they speak their own dialect of Greek. The northern part is occupied by Turks.In the course of history, Cyprus has been influenced by many different rulers and nations. After the Greeks, the Romans came to Cyprus, and in the 4th century Cyprus became part of the Byzantine Empire, followed by the French (Lusignans) rule from the 13th century to the 15th century, the Venetian rule from the 15th to the 16th century, the Ottoman rule from the 16th to 19th century and the British rule from the late 19th century up to 1960. Cyprus is rich in copper and it is situated in a strategically excellent spot, close to Europe, Africa and the Middle East, so that is why so many invaders have been interested in it. The Lusignans built a wall around Nicosia, but when the Venetians arrived, they built a new and stronger one. It has 11 heart-shaped bastions. Next we were taken to Archbishop's palace where the famous archbishop and the first president of Cyprus, Makarios, had lived. In the front yard, there is also a statue of him. He sought to find peace between the Turkish and Greek populations, but some groups were not happy about it, so in 1974 there was a coup and Makarios was overthrown. One of the conditions of gaining independence was to accept the intervention of "guarantor powers" (Greece and Turkey) in cases of conflict. Turkey took advantage of the situation and occupied the northern part of the country. About 200 000 thousand Greek Cypriots became refugees and had to leave their homes in the north, and Turkish Cypriots in the south had to move north. According to the deal, the guarantors had to leave the country after the situation had been settled, but Turkey still remains in the north and the country remains divided. About 38 % of the area is under Turkish occupation. There is a so called green line that divides the north and the south. Even the capital, Nicosia (the international name) or Lefkosia (as Cypriots call it), is divided. In order to get to the Turkish side, one has to show an ID card or a passport. The northern part is only recognized by Turkey and the situation remains complicated. Hopefully negotiations will lead to reunification!Next to Arcbishop's palace, there is Saint

John's cathedral, which was built during the Ottoman rule. In those days, it wasn't forbidden to build Christian cathedrals, but they had to be quite modest. On the other side of the street we could also see Pancyprian Gymnasium, the

oldest high school in Cyprus.In addition, we saw another old school, Faneromeni school, which was originally founded as an all-girls school in 1852. Greek Orthodox Church and Faneromeni church played a big part in founding the school.Faneromeni church lies actually very close to the school.

Even though the majority of Cypriots are Christian Orthodox, there is a Muslim minority and mosques in Cyprus, also in Nicosia. Actually, some of the old cathedrals built by the French Lusignans had been transformed into mosques during the Ottoman rule.Opposite to the mosque, there is a building, which used to be the Turkish baths, but is now a modern spa. In the old days, it was important to have baths close to the mosque, because people had to wash themselves before they went to pray. Baths were also a place for relaxation and gossiping!Below you can see a view over the beautiful town of Nicosia. The main street with restaurants and shops is called Ledra and it can be seen in the photo with the colourful pieces of cloth above it. At the end of our tour, we visited a fascinating museum called Leventio Museum with costumes and artefacts from the very early days of Cyprus from about 3900 BC to our days. The tour was amazing and we learned so many new things about the colourful history of Cyprus!

the Finnish team

Our trip to Lefkara, 24.11.2016

On the 24th of November we went to Lefkara. Lefkara is located on the south-eastern slopes of the Troodos mountains at 650m above the sea level, some 45km from Nicosia, 30 km from Larnaca Airport and just 12 km from the Nicosia Limassol motorway. The name Lefkara comes from the colour of the limestone that surrounds the village: "Lefka(Greek for white) + ori (Greek for mountains, hills) +Lefkara".

Lefkara is home to the traditional

Cypriot embroidered lace, the well known "lefkaritiko". It is said that the famous Renaissance artist Leonardo da Vinci visited Cyprus at the end of the 15th century and came to Lefkara, where he bought a large ornate tablecloth, which he gifted to Milan Cathedral.

In addition to Lefkara lace, another craft that has thrived here for decades is silversmithing. Hand –made jewels, spoons, censers and other ecclesiastical implements, candle burners, processional staffs, crosses etc. are made locally, while silver and gold are also used to coat icons and bibles.

Lefkara is a large settlement whose main architectural characteristic is the fact that buildings are concentrated in a dense area and are mostly terraced. The houses are built from stone with tiled roofs, balconies and inner courtyards, filled with flowers.

The roads are narrow and often lead to a dead end, with balconies so tightly close that they almost appear to merge one into another. Several of the narrow picturesque alleyways

are paved and blend in with the stone walls of the buildings.

There are many chapels in Lefkara. This is because of the religiousness of the locals, who contributed to the construction of eighteen chapels in many neighbourhoods of the village and the surrounding area, some of which are superb examples of Byzantine architecture.

the Cypriot team

25.11.2016 *Trip to Paphos*

The last day of the project was spent visiting the harbour town Paphos. The trip there was long but eventful. We sang, chatted and took lots of pictures. We were accompanied by a tour guide who told us about all the most interesting trivia.

Our first stop was near Kurion not far from Limassol. Here we had the chance to see an ancient stone theatre which had been uncovered by the Pennsylvanian University between 1935 and 1950. We also saw the noble Eustolos house and learnt about the history of its mosaic tiled floor. Two Cyriot students played on their gutars while we rested on the steps of the theatre and ejoyed the view of the sea. After a light snack we started towards the cliffs of Aphrodite. According to legend, it was here that Aphrodite, goddess of love and beauty, rose from the waves. I will never forget the pebble covered beach and its magnificent huge waves. We took the rest of the way to Paphos along the shore to watch the beauty of the sea and seaside.

Paphos is famous for its temple to Aphrodite and the well preserved mosaics which were uncovered in the Dionysus house.

We spent our free time strolling along the shore. The weather was fine and clear, the shining sun and the blue sea invited us to go for a little swim. After our bathing in the sea we had a local delicacy dried on the shore enjoying the warmth of the sun and we had to say goodbye with a heavy heart.

This day was fantastic. It was the highlight of the week. We returned with marvellous sights in our memories and lots of photos. We will never forget Cyprus.

The Hungarian team

The Portuguese team

Evening in tavern, 23.11.2016

In Cyprus we had a great dinner at Tawern, a local restaurant. The waiters welcomed and served us with the traditional food like halloumi, mezze and moussaka, and some bread.

The dinner was followed by typical music and dances, like "Zorba", and everyone was enjoying the moment.

We had a great time knowing Cypriot culture, and it was a good way to experience their environment.

It amazed us to see how nice and kind people were, and it made us to wish to come back soon.

USEFUL WORDS AND PHRASES IN GREEK

Καλημέρα!=Kalimera! = Good day!

(In Greek we don't have different word for these first two phrases)

Καλημέρα!=Kalimera! = Good morning!

Καλησπέρα!=Kalispera! = Good evening!

Καληνύκτα!=Kalinikta! = good night!

Γεια σας!=Gia sas! = Hello!

Ευχαριστώ! = Efharisto!=Thank you!

Ναι.=Ne. = Yes.

Οχι =Ohi= No.

Συγνώμη=Signomi = Sorry.

Καλωσορίσατε =Kalosorisate= You're welcome.

MEETING IN FINLAND

2702.2017– 03.03.2017

Few glimpses into activities

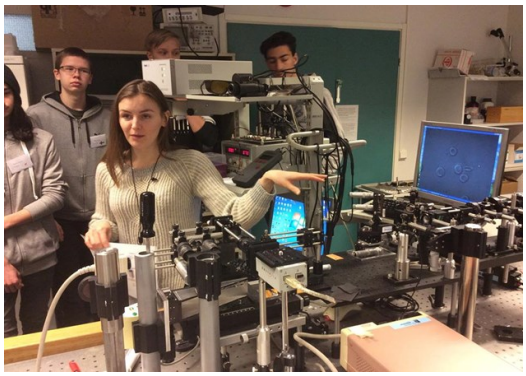
Tour of the University in Oulu

27.02.2017

On the first day of our meeting, we met the Erasmus group in Oulu, the capital of northern Finland and the largest city in northern Finland. We spent a lot of time in the UNIVERSITY OF OULU, which is one of the largest universities in Finland and it was founded in 1958.

We had an interesting tour in the university. The University of Oulu is ranked among the top international universities in the world with an excellent reputation in research and teaching. In their laboratories, the research students explained to us some of their themes in the following focus areas: Optical trap for the blood cells being explained, digital solutions in sensing and interactions, Cosmic Rays and the Earth.

Optical trap for the blood cells



Digital solutions in sensing and interactions

We liked the friendly and welcoming atmosphere in the Oulu University and we believe it is a great choice for an exchange student for the bachelor's or master's degree because of the inspiring programs and the achievement of full academic potential. Also another good reason is that there are no tuition fees for EU students.

The Cypriot team

27/202/017, Observatory – Oulu cosmic ray station

On the first day of our trip to Finland after exploring the university of Oulu, we visited a cosmic ray measuring station. The observatory was built between 1964 and 1965 under the International Quiet Sun Year. The pyramidal shape of the building's roof is to prevent the buildup of snow. We have learnt that cosmic radiation consists of extraterrestrial high energy particles whose kinetic energy encompasses 14 powers. These can originate from the reactions in the Sun or even from the furthest reaches of Space. Previously, cosmic radiation was thought to have come from the radioactive isotopes of Earth. This theory was debunked by Victor Franz Hess for which he received the Nobel Prize in 1936. Presently there are 52 cosmic ray measuring stations in the world for example in Armenia, Thailand, America, Canada, Russia and here in Oulu.

The Hungarian team

Zoological Museum

27.02.2017

On February 27 we visited the museum, which is located in the biology department of the University of Oulu. Due to its geographic location and area of operation, the Museum's activities center around northern issues.

At present there are about 50000 vertebrate and about two million invertebrate specimens in the museum. Besides the Museum's own collecting activity, authorities and private citizens bring to the Museum wild animals that they have found dead. The material collected in students' thesis research also becomes part of the Museum's collections.

The museum forms an integral part of an international network of natural science museums functioning as a repository of knowledge and an expert body on biodiversity-related issues.

Through its **public exhibition gallery**, the Museum offers a fresh perspective on Finnish fauna and zoology. In the 1000 m^2 gallery there are about 1300 vertebrates and well over 3000 invertebrates. Lining the walls of the gallery, a 53 m diorama illustrates the geographical location of Finland and the country's varying natural environments during the changing seasons all the way from the Bay of Finland to the Arctic Ocean.

In the glass cabinets and vitrines of the gallery, specimens are arrayed in accordance with their taxonomic relationships. Together with the collection hosted in the reading room, this systematic collection forms **a teaching collection**, aimed at providing an insight into the identification of species and animal taxonomy. Thus, this collection offers a rich learning environment for schools and kindergartens as well as for anyone with an interest in nature and animals.

The Portuquese team

27/02/2017 Tietomaa Science Center

The highlight of our first day was the science center of Oulu where one can explore the mysteries of science through games and fun activities. The facility is highly recommended to people of all ages. The exhibits mix entertainment and learning in an interactive way. Physics, mathematics, geography and biology are all represented here in a variety of ways. We can meet dinosaurs, try airplane and roller-coaster simulators, do interactive quizzes. You can build your own sailboat, or with the help of a little sand and small shovel: your own 3D map. The center's special sight is the 35-meter-high glass elevator, which provides a breathtaking view of Oulu.

The Hungarian team

Opening ceremony and tour around the school

28.02.2017

The guests were welcomed to our school by our headmaster Kari Oikarinen. After the welcoming speech, the first year students sang the Finlandia hymn and Antti Pekkala gave a presentation on Finnish stereotypes including how Finland has the best education an is the best at winter sports. After the opening ceremony we were divided into ten groups and the Finnish students showed the guests around the whole school. After this we took a group picture.

The Finnish team

Amathsing race

28/02/2017

Here are some photos, along with the group photo, and glimpses from the amathsing race with checkpoints in the school. At each checkpoint there was a guide (a Finnish student), who gave instructions. All the students were divided into blue and white teams. After all the teams had done all the checkpoints, they gathered in the auditorium, where they had their last competition. Also the points of every team were checked there and the winners were given an award.

Checkpoint 1-Game of wits (Blockers mini game)

The idea of the game is to get the players of the team to their home base quicker than the opponent does. Each team had 3 peasants and one king/queen. They must choose one player of their team to be the king/queen, the other three will be peasants. The team must work together to win the game.

On checkpoint 1 the winning team will win by getting their pieces to their home base first. The other team will then take X amount of turns to take their pieces to their home. The winning team gets X amount of points. If the game is unfinished when the time runs out, then the guide will decide which team was closer to winning, and award them by 3 points. If the Guide thinks its very close to a tie, then both teams get 1 point.

Checkpoint 2- Milestones of technology (A4-paper)

On checkpoint 2 there are 3 small competitions, from which you can get 2 points each, 6 points altogether. If it's a tie, both teams get 1 point instead.

Checkpoint 3- Queue to the airport (sequence guessing)

On checkpoint 3 there will be 8 small questions for each team. If the team gets their guestion right, they will earn 1 point, so each team can get a maximum of 8 points.

Checkpoint 4 – Cooling down (thermometers)

On checkpoint 4 there will be 3 competitions, and each competition will give 3 points to the winning team. If the other team is very close to the other team (within 3 degrees or 10 seconds), they will get 2 points.

Checkpoint 5- Half measures (glass estimations)

On checkpoint 5 there are 2 competitions, in which the team must go as close to a certain limit as possible. The team which gets closer gets 5 points, the other team gets 3 points. If the team goes over the limit, then that team fails and gets 0 points. The maximum amount of points a team can get in this checkpoint is 10.

At the last competition there were 10 questions, which give 2 points each.

Only the quickest team will get the point, wrong answer gives -1 points! Each team can answer the

The Cypriot team

Physics demonstration 01.03.2017

The physics demonstrations took place on 1 March in the morning at a few places at school. The experiments were divided into 5 checkpoints.

The first checkpoint was related to magnetic interaction between a constant magnet and different types of tubes – a cardboard one and a copper one. The difference of interaction was distinguished and videotaped.

At checkpoint #2 an elecrostatic experiment was shown with a machine, called the Flying stick, that produces a positive charge at its ends. An aluminium foil was first charged with the stick and then the stick repels the foil because of the electrostatic interaction between two positively charged objects. As a result, the aluminium foil can “fly” above the stick.

At checkpoint #3 the kinetic properties of warm air from a candle were shown. Due to the warm updraft a “turbine” above it starts to spin. Another aspect of this experiment was lighting again the candle as soon as it snuffed, using the smoke coming from it.

The next trick at this checkpoint was putting

The Bulgarian team

match tips in a bottle full of water. The match tips have a small amount of air trapped within, so when the bottle is squeezed, the match tips sink because of air pressure.

Checkpoint #4 presented some peculiar mechanical tricks. The first trick was taking a string with heavier and lighter weights in the ends and holding it in a certain way. When the lighter one was let go, it started swinging towards the center, and the heavier one fell straight down. But the string that is between the finger and the lighter weight got shorter, as the heavier weight fell down. This causes the lighter weight to go faster, and when done right, swing over the finger. It included multiple tries.

The second trick was spinning a gyroscope.

At checkpoint #5 sound resonance was demonstrated with a few metal rods and forks attached to metal plates. Same sized metal forks resonated when one of them was hit with a rubber hammer. Then one of the forks was tuned with a blocker in order to change its frequency just a little bit to create a "beat" effect.

Shingle Church 01.03.2017

Kärsämäki is a small village, but it still has a few beautiful places to visit. One of them is Shingle Church, which is known even outside Finland. During our visit to Finland we had the opportunity to see it. Firstly, we saw a movie about it and learned that it was built in 2004 by volunteers, in the place where the first church in the village was built.

Then we went for a walk and enjoyed the beauty of the nature that was surrounding us. After the arrival we could ring the church bell. A kind lady told us a little bit more about the history of the church, and we could finally enter the temple. It was small and cold but it had a lot of its own charm. Then Finnish students welcomed us by singing a song and we learned about the techniques of building the church. Even though it was very cold inside, I think it was a nice visit because the Shingle Church is very unique and it's a precious place to all residents of Kärsämäki.

Anna Zakrzewska, Poland

Walk to Haliwilivau, games, baking and sauna

1/03/2017

After a visit in the church, it was time to have some fun! We all walked to a typical Finnish cottage for the rest of the day. It was filled with cushions, beds and tables. The main goal of this activity was to simply rest and chill out with everyone.

Some students played games, cards or just talked with each other. We also had a chance to bake typical Finnish Christmas cookies, which we ate later. We were in Christmas mood (even though it was already March), so… Santa Claus paid us a visit.

Each group got a little gift but firstly they had to sing one of their Christmas songs. We also had an opportunity to enter a typical Finnish sauna! For me it was the best part of the program because we could

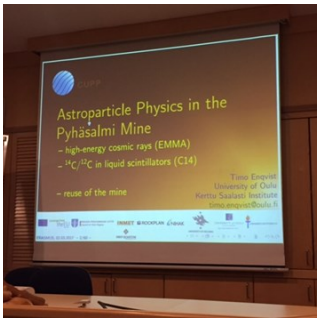
Anna Zakrzewska, Poland

talk with each other and get to know each other better. We spent many hours there, but I wasn't bored at all. We also tasted many local specialties and familiarized ourselves with Finnish traditions. And while walking back to the hotel in the evening, some of us were able to see beautiful northern lights!

Pyhäsalmi mine and Centre for Underground Physics in Pyhäsalmi (CUPP)

04.03.2017

On March 2, the students and the teachers visited the Pyhäsalmi mine in Pyhäjärvi, Finland, which is the deepest operational base-metal (copper and zinc) mine in Europe. It provides excellent opportunities for the research of underground physics by having very stable bedrock, low background radiation level, modern infrastructure, and good traffic conditions all around a year. The mine extends down to 1440 metres at the moment.



The students were given a presentation, in which they learned about the aim of the CUPP-project.

It is to construct a large underground laboratory in the Pyhäsalmi mine, which is particularly attractive for future long-baseline neutrino experiments, since the distance to major accelerator centres is very interesting (Pyhäsalmi – CERN 2288 km) and it is technically possible to construct the halls required to host very large-volume detectors. An experiment measuring multiple muon events is starting at the shallow depths. The single-

muon flux will be measured down to the 1440-level also during the summer. The flux has already been measured for a long time at the shallow depths, also the neutron fluxes have been monitored. EMMA (Experiment with MultiMuon Array) is a cosmic-ray experiment taking place in CUPP. Participants were divided into two groups to visit the depth level of 1440m. They went down in an elevator with a speed of 12m/s. It was a very interesting, didactic and exciting event for everyone.

Everyone was impressed by the Pyhäsalmi mine with its existing and modern infrastructure, which offers unique possibilities to carry out sensitive and low-counting-rate experiments as all the experiments in detecting neutrinos.

The Portuguese team

04.03.2017

Dance event/Disco

The dance event/ disco took place on 2nd March in the gym of the school. Disco lights, nice food, drinks and quality sound were provided. Students (or teachers) could choose the song they wanted from a laptop. All students and teachers participated and had a lot of fun. Besides freestyle dancing, a few guided dance games took place, which students and teachers both enjoyed playing.

The Bulgarian team

Magic tricks of Maths, Physics and Chemistry

5/3/2017

On Friday, at the end of our Erasmus+ week in Finland, the Finnish teacher Antti Pekkala had prepared some magic tricks to show. These tricks were based on mathematics, physics and chemistry, and they were filmed.

Antti started with a few traditional card tricks, finding the right card from the deck of cards.

After some card tricks Antti took out an unopened box of candies and played a game with it. He did not only win the game, but he had also anticipated by how many candies he would win it, for he had written the result of the game on a paper and placed it in the classroom beforehand.

Most of the magic tricks needed an assistant for the trick. Luckily there were plenty of students to volunteer! Unluckily for the students, they always seemed to be losing the games and the bets! Some of the tricks turned out to be quite messy, like when you transfer bubbles from a very well shaken can to another can, and then it explodes in your eyes!

Amidst the tricks Antti explained some of the science behind them. Antti governed some propability mathematics, density physics, and some lab safety about flammable materials. Most of the tricks however, were to remain as a mystery, but the students had some good guesses on some of the tricks.

The recorded videos were shared with our Erasmus group, so

The Finnish team

Materials from the meeting in Finland

Initial test of physics for the students

Answer these questions together as a team.
Only one option is the right answer.
1.Gyroscope is
A. similar to certain kinds of toys, like beyblades and yo-yo's.
B. a n optical device, using a rotating mirror.
C. a magnifying glass.
D.a device that turns electrical energy to kinetic energy.
E. a theoretical device, that once started will never stop.
2.During winter in Finland, all the major roads get some salt on the roads.
This is done so that
A. the salt increases friction, making it easier to drive.
B. the temperature of the ice gets higher, and melts away.
C. the animals keep away from the roads, because the salt tastes bad.
D. the melting point of the water gets lowered.
E. the cars get a protective layer from the snow, and they wont rust so quickly.
3.A magnet gets dropped inside a metal tube. The magnet falls through it slowly.
A. This is because the magnet is attached to the metal.
B. This is because the earth makes a magnetic field inside the tube, which slows the magnet down.
C. The motion of the magnet repels itself, because the tube is made of metal.
D. None of the previous options are correct.
4.Electromagnetic induction can be used
A.to lower the speed of trains without any friction.
B. to push objects away from each other without them touching.
C. to detect metal objects buried in the ground
D. to all of the previous options.
5.Burning candle transforms the chemical energy of the wax to light and heat.
A. The heat released can be transformed into kinetic energy.
B. Most of the heat from the candle gets wasted.
C. The smoke from the candle is parts of the wax that cannot burn.
D.All of the previous options are correct.
6.Electric field
A. is the same field that wifi-routers use to share wireless internet.
B. can be used to only move objects that have an electrical charge.
C. is the same as magnetic field.
D. can be formed without any technical devices.
7.Resonance is a phenomena
A. that causes similar objects to transform energy between each other.
B. in which vibrations can move from one place to another.
C. that causes objects to vibrate in a harmful way.
D. that applies to all of the previous options.
8.If the frequency of 2 tuning forks is almost the same, then
A. there is no resonance between them.
B. their sounds will interfere with each other.
C. when they are played at the same time, you can't hear that their frequencies are different.
9.Pendelum is basically a weight attached to a string that has been pushed. A pendelum oscillates back and forth in a certain time.
A. If the string is longer, then the speed of the oscillation is bigger.
B. If the string is longer, then the time for one oscillation is longer too.
C. If the string is longer, then the time and speed stay the same.
D. None of the previous options are correct.

Antti Pekkala, Finland

Amathsing race - the mixed group of the students' competition PART 1

Checkpoints

1.Game of wits (Blockers mini game)

2.Milestones of technology (A4 paper)

3.Queue to the airport (sequence quessing)

4.Cooling down (Thermometers)

5.Half measures (Glass estimations)

At each checkpoint there is a guide, who will give you the instructions. You have 20 minutes to finish each checkpoint and to move to the next checkpoint, as instructed by your guide.

All the teams are divided into blue teams and white teams. You will know which you belong to by checking your name tag. Blue teams will change checkpoints in normal order, 1,2,3, and so forth. White teams will go the other way around, 4,3,2, and so forth.

For example, if you are on the white team starting from checkpoint number 2, the order of the checkpoints is 2,1,5,4 and 3.

After all teams have done all the checkpoints, we will meet back in the auditorium. In there, we will have the Points are rewarded as follows:

On checkpoint 1 the winning team will win by getting their pieces to their home base first. The other team will then take X number of turns to take their pieces to their home. The winning team gets X number of points. If the game is unfinished when the time runs out, then the guide will decide which team was closer to winning, and award them by 3 points. If the Guide thinks it's very close to a tie, then both teams get 1 point.

On checkpoint 2 there are 3 small competitions, from which you can get 2 points each, 6 points altogether. If it's a tie, both teams get 1 point instead.

On checkpoint 3 there will be 8 small questions for each team. If the team gets their question right, they will earn 1 point, so each team can get a maximum of 8 points.

On checkpoint 4 there will be 3 competitions, and each competition will give 3 points to the winning team. If the other team is very close to the other team (within 3 degrees or 10 seconds), they will get 2 points.

On checkpoint 5 there are 2 competitions, in which the team must go as close to a certain limit as possible. The team which gets closer gets 5 points, the other team gets 3 points. If the team goes over the limit, then that team fails and gets 0 points. The maximum number of points a team can get in this checkpoint is 10.

In the last competition there are 10 questions, which give 2 points each. Only the quickest team will get the point, wrong answer gives -1 points! Each team can answer the questions, but only once for each question.

last competition, check every teams points, and award the winner.

Checkpoint 1 – Game of wits

Instructions for the guide

The guide reads out loud (and shows examples at the same time on the board):

Kings and peasants

The idea of the game is to get your players to your home base quicker than the opponent does. Each team has 3 peasants and one king/queen. You must choose one player of your team to be the king/queen, the other three will be peasants. The team must work together to win the game, but since the king/queen is the leader of the team in this game, they must ultimately make the decision about which player moves and where.

Teams take turns in moving their players by jumping or walking. Jumping means you jump over a peasant, landing into an empty square. You can jump over one or multiple peasants. It doesn't matter which teams the peasants are in, they can always be jumped over, as long as there is an empty square behind them. Once a player's jump has landed on an empty square, they can jump again, if there is a possible spot to jump in. You can jump both straight and diagonally along the squares. Peasants can only jump forward, either straight or diagonally, but never backwards. Kings/queens can also jump, but in ANY direction that they want. Once the moving player has jumped as many times as they can or want decided by the king/queen, the team's turn ends. No player can jump over the king/queen.

If the team doesn't want any player to jump anywhere, they can always walk. Walking means that you move to the empty square next to you. When you walk, you can only walk one square, and it ends the team's turn straightaway. Again, peasants can only walk forward, towards their home base, but kings/queens can move in any direction

The game is finished when BOTH teams have got their players in their home base. The team which gets their players in home first, wins the game, and they get as many points from winning as it takes from the opposing team to reach their home base AFTER the other team wins. For example, if the winning team takes 20 turns to reach their home base and the other team takes 25 turns, then the winning team gets 5 points. I will count the turns and mark the points accordingly.

Start the game by choosing your king or queen, and then we will throw a coin to decide which team starts.

The white team will go to checkpoint 5

and the blue team will go to checkpoint 2

Checkpoint 2 – Milestones of technology

Instructions for the guide
The guide reads out loud (and shows out what is to be done at the same time):

In this checkpoint you will be discovering the wonders of one of the world's most important inventions: paper. This checkpoint has three parts, in which we will use paper.

In the first part your team has to go through an A4-sized paper. You can do this by cutting the paper, there are scissors over there. For example, I've cut a paper like this, so that my hand can fit through (laita käsi ensimmäisestä leikatusta lapusta läpi), and cutting it like this I can fit my head through (laita pää toisesta leikatusta lapusta läpi). If you break your paper, like this (hajoita ensimmäinen lappu repäisemällä aukko auki), then you will fail the first part and get no points. The team which manages to get all of their team members through the paper first without breaking the paper, wins 2 points. You have a maximum of five minutes to do this, and you can start now.

In the second part we will be folding a paper to show some specific angles. For example, the angle at the corner of the page is 90 degrees. But if we fold that, we will get 45 degrees, like this. There are two angles that I will tell next. The team

who manages to show the right answer first gets 1 point. You may not use any devices or equipment in this other than pen and paper.

The first angle is 135 degrees.

The second angle is 60 degrees.

In the third part we will be folding a paper more simply, just like this (taittele paperi kahtia). I will next ask you a question, and the team which gives me the right answer will get 2 points. If neither of you get it right, the team which was closer will get 2 points. If it's a tie, you will both get 2 points. You may use any tools provided in here, including your phones and internet. Note that there is a free wifi here at the school, called "vieras". You have 5 minutes to solve this question.

How many times do you have to fold the paper, that the paper is thicker than the tallest buildning in the world Burj Khalifa (828m)?

The white team will go to checkpoint 1

The blue team will go to checkpoint 3

Antti Pekkala, Finland

What we have learned in FINNISH...

Päivää! = Good day!

Huomenta! = Good morning!

Iltaa! = Good evening!

Hei!/Terve!/Moi! = Hi!

Kiitos. = Thank you.

Kyllä./Joo (spoken language). = Yes.

Ei. = No.

Anteeksi. = Sorry.

Riddles

1.You are served a hot cup of coffee and room-temperature cream at a restaurant. You want to wait a few minutes before you drink the coffee, and you want it to be as hot as possible when you drink it. Should you pour the cream in the coffee:
A) Immediately
B) Just before you drink it
C) It doesn't matter

2.It is the son of the water but when the son returns to parent, it dies. What is it?

3.There are four gears with the following specification:
* Gear A has 60 teeth
* Gear B has 40 teeth
* Gear C has 20 teeth
* Gear D has 60 teeth
* Every minute, Gear B makes 15 complete turns.
What is the relative speed of Gear A and Gear B?

4.You are lying on a beach with a wine bottle enjoying the bright sun. After it goes empty, you friend secures the mouth of the bottle with a cork. You can see a metal ring inside the bottle that has been suspended by a string. He asks you if you can think of any way to drop the metal ring inside the bottle without touching the bottle or the cork. Can you think of any way?

5.You are given two metal rods and then taken into a room. You are left there to identify which one of the metal rods you have is a magnet. Now you have no other metal object in the room with you. Also, the two rods are exactly similar to each other in looks. What method will you use to determine which one of the rods is actually a magnet ?

6.You are given a ball and you are asked to throw it as hard as you can but it must return back to you. It is an open ground and you can't find any wall or object in your vicinity. There is no one around to catch your ball and throw it back to you. Also, you can't attach any string or rope with the ball.
How will you achieve it then?

7.On a boat, there is a 15 inch brick of gold and a 15 inch brick of iron. If both of them are dropped into the water, which one of them will make the water level higher?

8.Assume a situation. There is an earthquake which is one point higher on the Richter scale than another earthquake which is ten times powerful. Now how much powerful do you think the earthquake will be if it was just 1/2 a point higher on the Richter scale?

9.Suppose we drop a 50 kg metal ball and a 40 kg ball of silk from a height of 100 meters. Which will reach the ground first ?

10. H, Be, F, S, Mn, Kr, In, Gd, Tl, ? What's the next in the sequence ?

11. Agarkar was going to bleach his socks because they had gotten muddy the day before.

As he was pouring the bleach into the washing machine, he spilled some on the floor. He got some cleaning fluid and mopped it up with a rag. Minutes later Agarkar was dead. What killed Agarkar?

Selected by Anna Zakrzewska, Poland

Dear Readers,

This magazine is the final product realized for the "Maths and Science Adventure" Erasmus+ project.

Your opinion is very important for us, so we will appreciate your feedback regarding the content of our magazine.

We are waiting for your opinions and suggestions at:

http://www.facebook.com

M.S.A .group

Maths and Science Digital Magazine

Digital Magazine is seeking submissions for the next edition. We accept materials on any subject related to Mathematics, Physics, Chemistry, ICT or their applications. Submissions are subject to editorial review. Please send all submissions to us at liceum@lo17.wroc.pl. Don't forget to tell us your name and your school.

We will publish the best ones in our next issue.