

GIMNAZIJA DR. MATE UJEVIĆA U IMOTSKOM

SCIENCES AND MATHEMATICS INTO
LEARNING ENGLISH

S.M.I.L.E.

Erasmus+ project KA229



Erasmus+

PLANETS-MAGNETISM

APRIL 2022

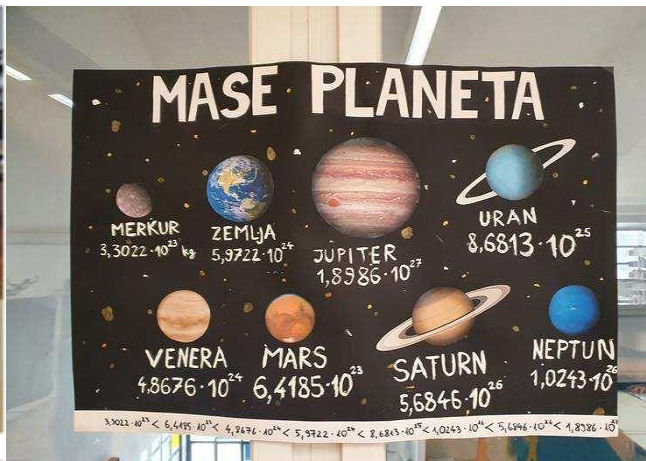
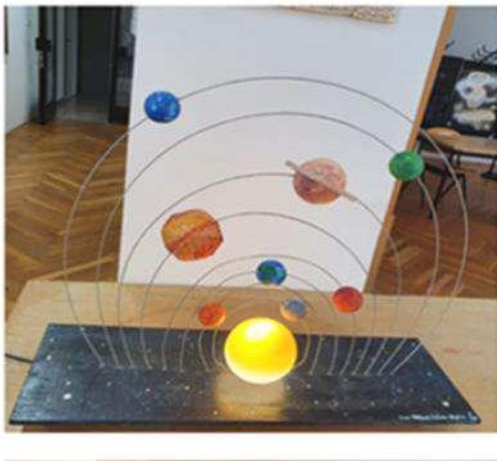
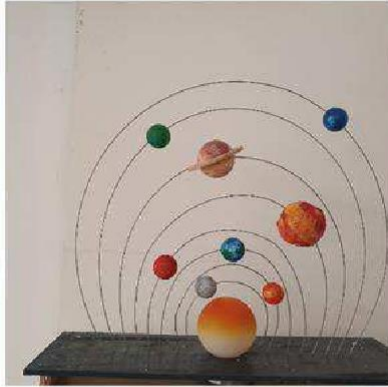
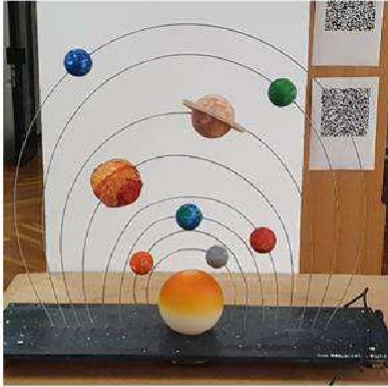
School subject	Teachers	Research groups: class	Our activities
Philosophy	Slavenka Markota	4b, 4e	We have explained the philosophical view of the cosmos, explaining what the planets are and how the first philosophers from Thales, Plato, Aristotle, and Pythagoras understood the cosmos.
Biology	Marijana Vuković	3b, 3c	We have explained the origin of the Universe and the events after it, we compared conditions on Earth in the past and today and presented abiotic synthesis.
Mathematics	Ana Mendeš	4b	We have made a model of the solar system and explained it. We have presented the units of measurement needed to express values in physics and astronomy, we also compared the masses of individual planets with the help of made posters and then showed how Eratosthenes measured the circumference of the Earth.
Physics	Mate Jonjić	3c	We have performed experiments on permanent and electric magnet.

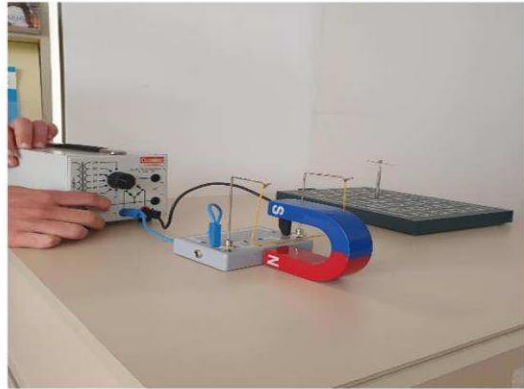
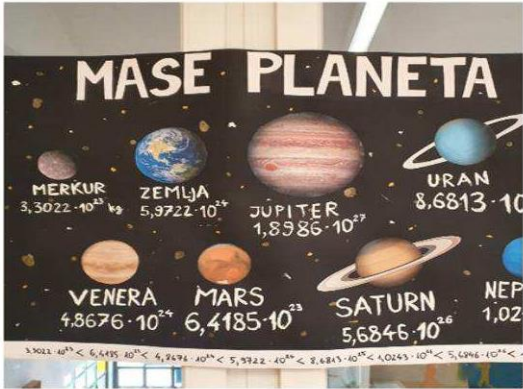
We have made a presentation of student's works in our school on Erasmus Day, on October 15, 2021.

http://www.gimnazija-mujevica-im.skole.hr/?news_id=1607#mod_news

[https://www.erasmusdays.eu/news mp/erasmusdays-back-to-the-2021-edition/](https://www.erasmusdays.eu/news/mp/erasmusdays-back-to-the-2021-edition/)



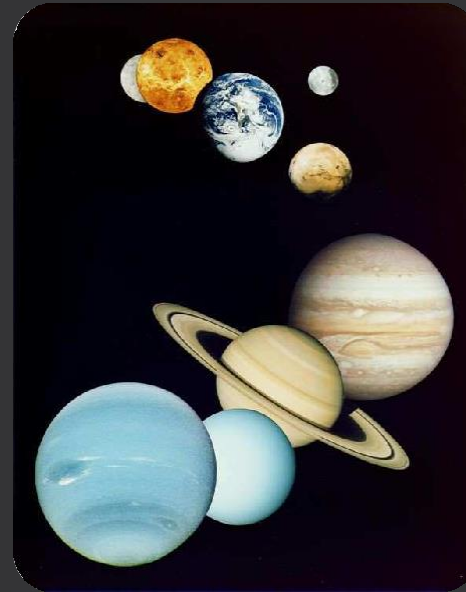




The oldest of all is God, because He wasn't born; The most beautiful is world (cosmos), because it's God's creation; The biggest is space, because it is encompasses; The fastest is the mind, because it runs through everything; The strongest is the necessity, because it rules everything; The wisest is the time, because it finds everything. -*Thales*

Planets-Magnetism My planet preferred

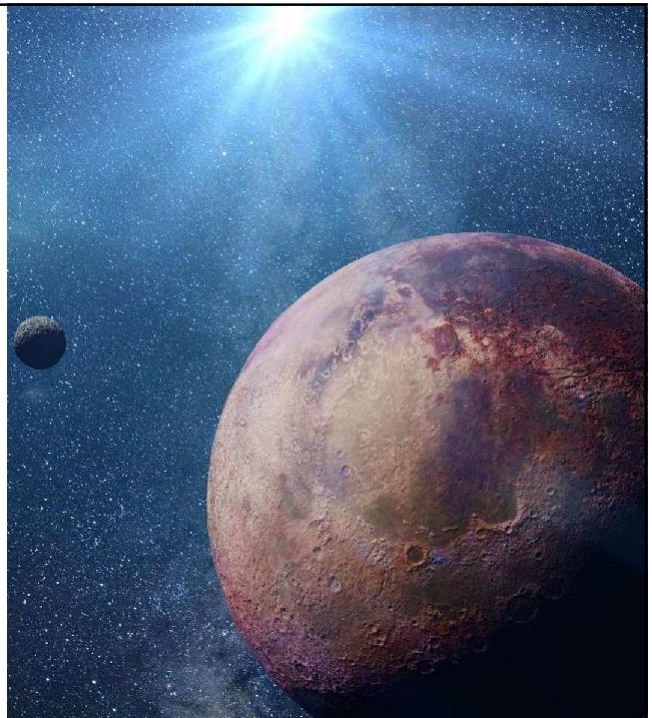
Erasmus day – 15th of October 2021.



What is a planet?

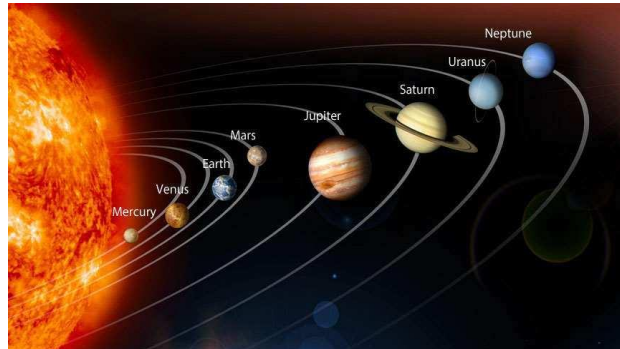
- A planet is a celestial body orbiting a star (in our solar system it is the Sun) and moving in an elliptical orbit around the star.
- It is large enough to be shaped by its own gravity, illuminated by the reflected Sun light and can have its own natural satellites.
- Unlike stars, planets do not have their own source of energy, that is, nuclear fusion does not occur inside them.

<https://theconversation.com>



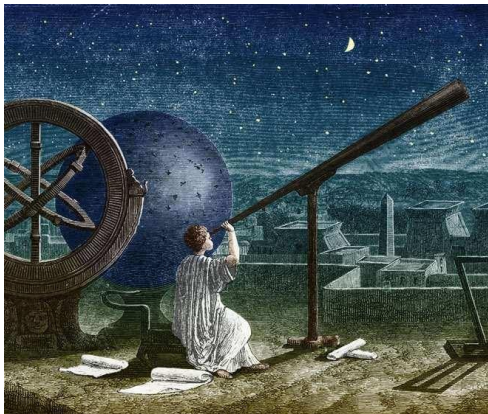
Planets in Solar System

- Today, there are 8 planets in the Solar System, while Pluto is classified as a dwarf planet, such as Ceres, Eris, Haume and others.
- There are, arranged in the order of the mean distances from the Sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
- Planets in the Solar System are divided into two main types: large low-density giant planets, and smaller rocky terrestrials.
- Six of the planets are orbited by one or more natural satellites, the two exceptions being Mercury and Venus.



<https://skyandtelescope.org>

The planets in Early Greek Astronomy

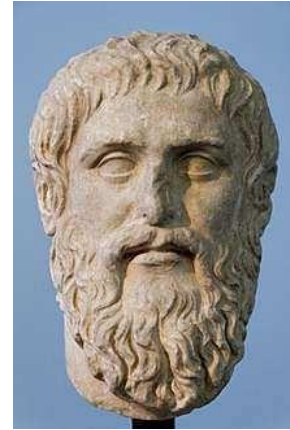


<https://id.mathigon.org/>

- The name "planet" comes from the Greek term πλανήτης (*planētēs*), meaning „wanderer”.
- Five extraterrestrial planets can be seen with the naked eye: Mercury, Venus, Mars, Jupiter, and Saturn, the Greek names being Hermes, Aphrodite, Ares, Zeus and Cronus.
- In classical Greece, astronomy was a branch of mathematics
- Astronomers sought to create geometrical models that could imitate the appearances of celestial motions

Plato

- He was an Athenian philosopher during the Classical period in Ancient Greece, founder of the Platonist school of thought and the Academy, the first institution of higher learning in the Western world.
- Plato's main books on cosmology are the *Timaeus* and the *Republic*. In them he described the two-sphere model – a geocentric model that divides the cosmos into two regions, a spherical Earth, central and motionless (the sublunary sphere) and a spherical heavenly realm centered on the Earth, which may contain multiple rotating spheres made of aether – and said there were eight circles or spheres carrying the seven planets and the fixed stars.
- He advocated a non-geocentric model of the universe: at the center of the universe is a large fire orbiting the Earth, Anti-Earth, Moon, Sun, Mercury, Venus, Mars, Jupiter and Saturn.



<https://commons.wikimedia.org>

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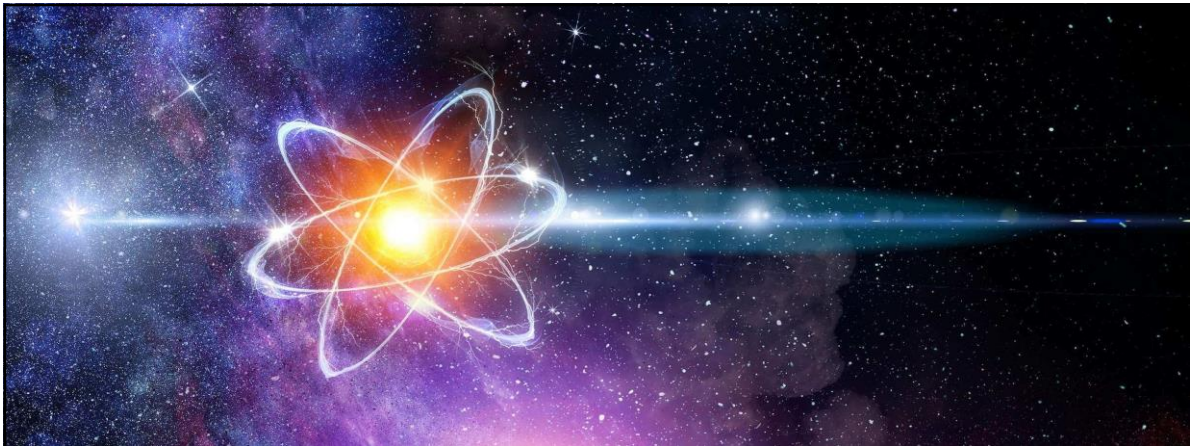


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- Aristotelian cosmology envisioned spheres carrying the planets around the Earth—solid crystalline spheres, according to some, which provided the physical structure of the universe. Late in the 16th century, Tycho Brahe observed comets moving through the solar system. This fact shattered the crystalline spheres.
- Since they [the Pythagoreans] think that the number 10 is perfect and encompasses the whole nature of numbers, they claim that there are ten bodies wandering in the sky, but because they see only nine, they invent Anti-Earth as the tenth. -*Aristotle*

Sources:

- H. Jurić, K. Stupalo, „*Filozofija*, Školska knjiga Zagreb 2021.
<https://en.wikipedia.org/wiki/Planet>
- https://en.wikipedia.org/wiki/Solar_System
- https://en.wikipedia.org/wiki/Ancient_Greek_astronomy
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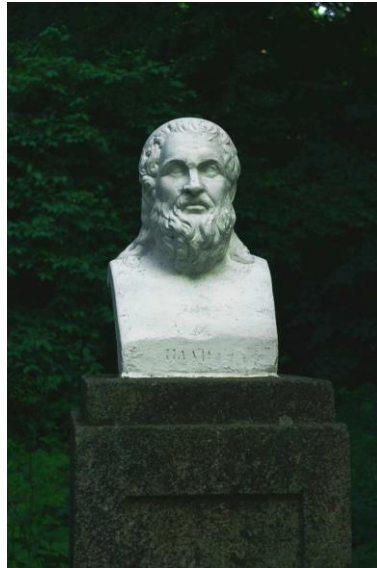


<https://www.livescience.com>

**Thank you for your
attention!**

- M. Kujundžić, 4.e
- L. Dujmušić, 4.e
- A. B. Kujundžić, 4.e

"LOVE OF
WISDOM"
ERASMUS DAY S.M.I.L.E.



A. Jukić, K. Kuštra, I. Ćubić,
M. Ribičić, I. Udiljak, 4.b

Thales of Miletus

- 640 or 624 BC - around 547 BC
- Greek mathematician, astronomer and pre-Socratic philosopher from Miletus in Ionia, Minor Asia
- He is often considered the Father of Science
 - Aristotle wrote about him
- He almost established the seasons and divided the year into 365 days
- He "discovered" Ursa Major



"The Medes and the Lydians once fought a night battle: when they transferred the war to the sixth year with a draw, it happened that, while the fight was going on, the day suddenly turned into night.

Thales from Miletus prophesied to the Ionians that such a change of day should take place, determining the exact year in which the change took place. When the Lydians and the Medes saw that night had come instead of day, they ceased the battle and preferred to hurry to make peace with each other. "

-Herodotus

"He was also the first to determine the movement of the Sun from solstice to solstice."

-Diogenes Laërtius



SOLAR ECLIPSE

Anaximander



- **610 BC - 546 BC, member of the Miletus school**
- **He introduced Greeks to the sundial.**
- **Anaximander made the first geographic map.**
- **He is often called the Father of Cosmology and founder of astronomy.**

Anaximander used to believe the universe we live in has not always existed. He claimed that everything was created from one primordial infinite matter called Apeiron. Everything we can sense in the universe had grown from it.

Anaximander realized that the Earth floats freely without falling and he figured out that the Earth is spherical .



Anaxagoras



- 500. BC– 428. B Cor 624. BC - around 547. BC
- He goes to Athens in his early childhood
 - Aristotle wrote about him
 - He observed celestial objects
- It is difficult to present Anaxagoras' theories of the universe in an understandable way

He thought the Earth was flat and floated supported by 'strong' air under it and disturbances in this air sometimes caused earthquakes.

He was the first to give a correct explanation of eclipses, and was known and known for his scientific theories, including claims that the Sun is a mass of red-hot metal, that the Moon is terrestrial, and the stars are fiery stones.



Anaxagoras tried to explain the eclipse, rainbows and meteors.

"The purpose of life is the investigation of the Sun, the Moon, and the heavens."- *Anaxagoras*

Pythagoras of Samos



570 BC - 495 BC

- **Ancient Ionian Greek philosopher and the eponymous founder of Pythagoreanism**
- **He also explored the sphericity of the Earth and the identity of the morning and evening stars as the planet Venus**
- **He was an excellent mathematician**

In the Pythagorean view, the universe is an ordered unit . For the universe to be formed, the "limiters" and "unlimited" must harmonize and be fitted together.

In astronomy, Pythagoras taught that the Earth is a sphere at the center of the Universe. He also recognized that the Moon's orbit is at an angle to the equator. He was also one of the first to notice that Venus as an evening star was the same planet as Venus as a morning star.

The Pythagorean astronomical system explains that The Central Fire is in the center of the universe. It is around this point that all heavenly bodies were said to rotate.

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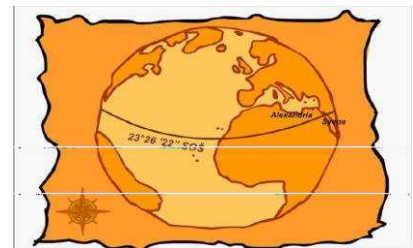
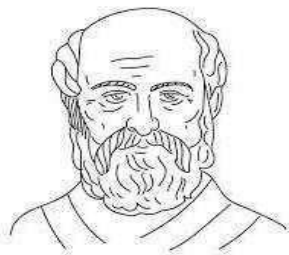
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ERATOSTHENES' CIRCUMFERENCE OF THE EARTH

Eratosthenes was an ancient Greek mathematician, geographer, travel writer and astronomer.

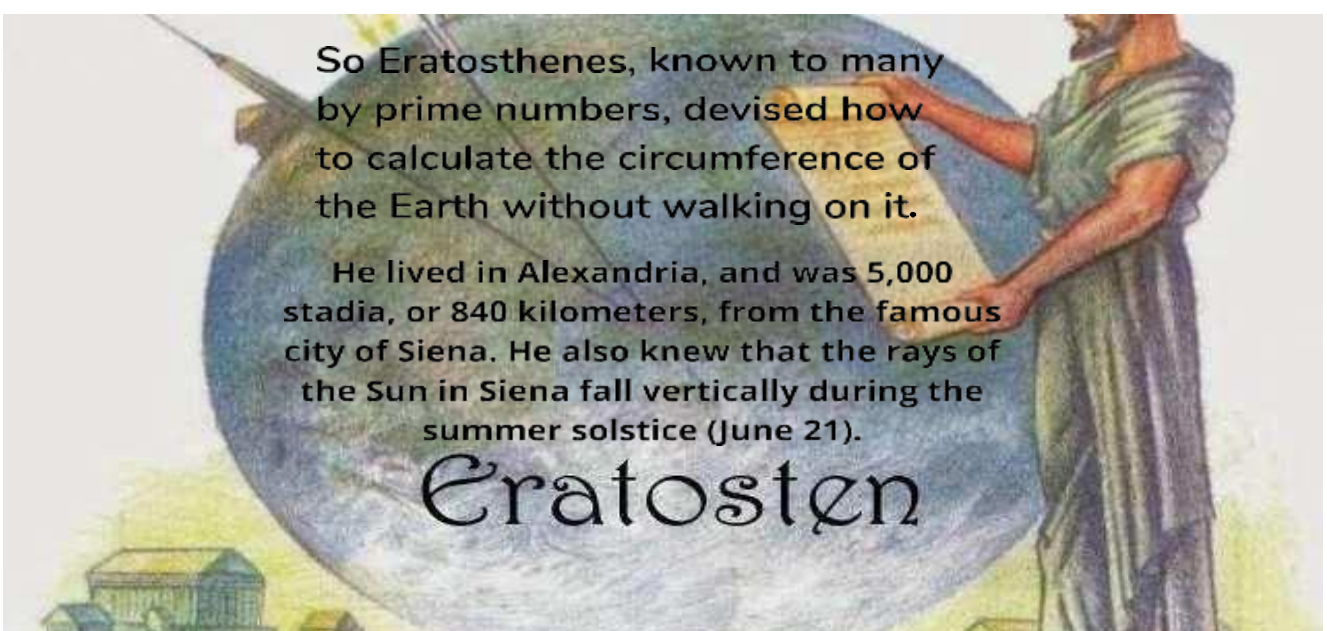


He became famous for measuring the circumference of the Earth.

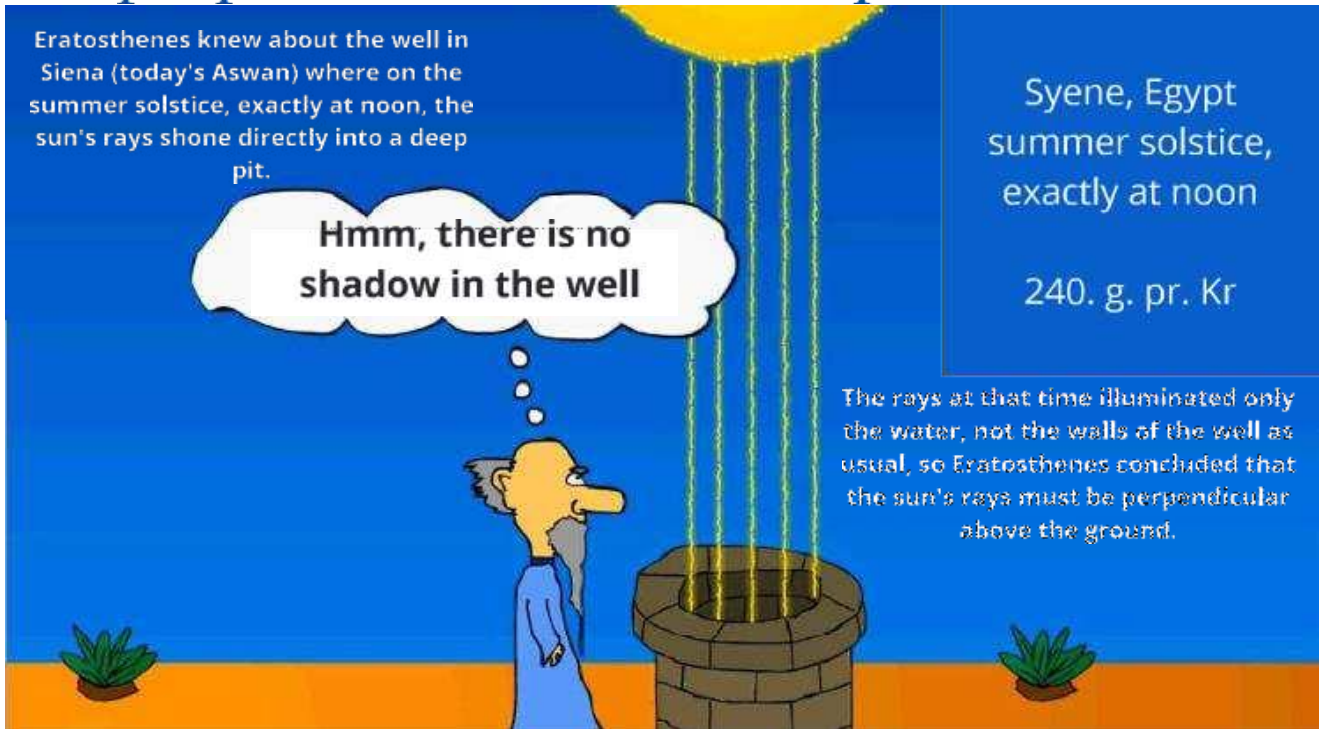
So Eratosthenes, known to many by prime numbers, devised how to calculate the circumference of the Earth without walking on it.

He lived in Alexandria, and was 5,000 stadia, or 840 kilometers, from the famous city of Siena. He also knew that the rays of the Sun in Siena fall vertically during the summer solstice (June 21).

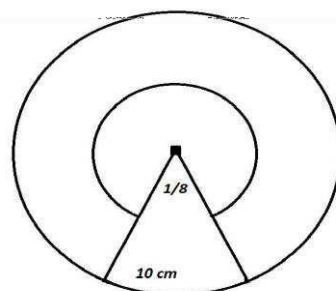
Eratosten



How did he know that on the summer solstice the sun's rays fall perpendicular to the scalp?

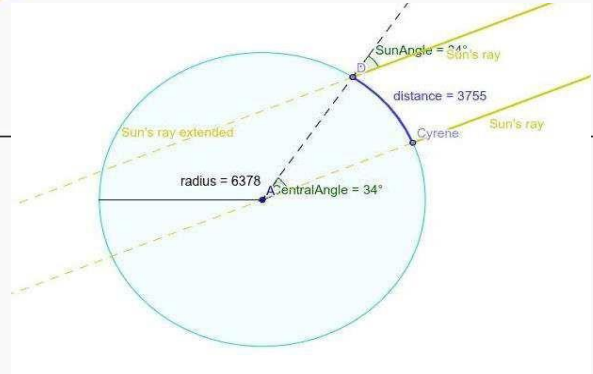
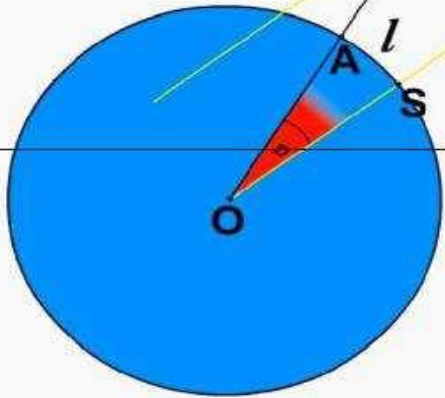


Why did he need an angle?

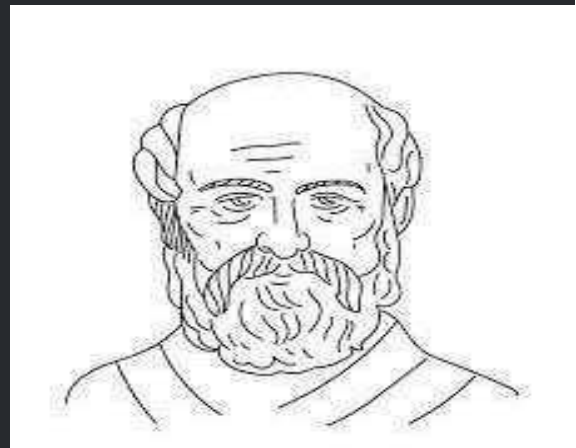


Distance from Siena to Alexandria.

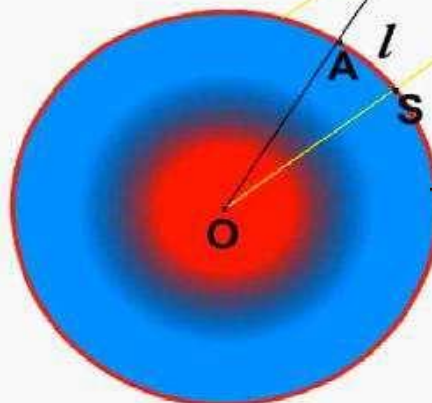
He calculated the angle between the rod and the sun's rays to be 7.2 degrees. Having a good background in geometry, he knew that this angle was also on the other side of the transversal (the extension of the rod line represents the transversal, and the sun's rays represent parallel directions).



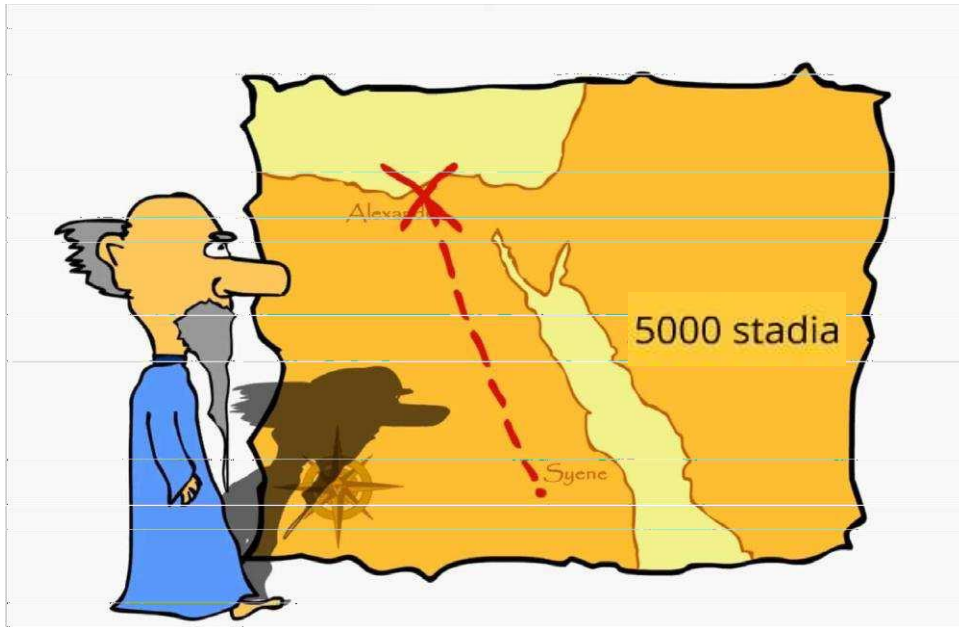
When he went back to Alexandria, he realized that the sun's rays were not falling vertically, but at a certain angle. He realized that the obelisk creates a shadow and calculated that the angle in the shadow is 1/50 of a full angle.



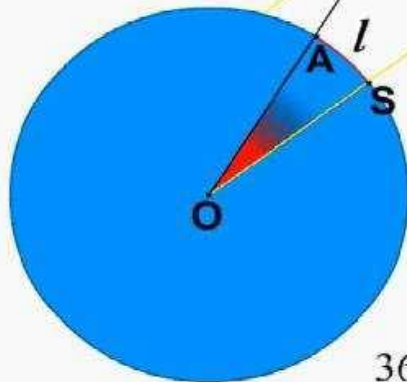
He then divided 360 degrees by that magnitude and got the number 50, and concluded that this clip is the 50th part of the Earth's full circle. He then sent people to measure the distance between Alexandria and Siena, which he would multiply by 50 and thus gain the circumference of the Earth.



$$\frac{\text{the circumference of the Earth}}{\text{circular arc}} = \frac{360^\circ}{\alpha}$$



The distance between Siena and Alexandria was 5,000 stadia (then units of measure, approximately 1 stadium = 157.5 m). Very simply, $5000 \times 50 = 250000$ stadia, or 40 000 km and Eratosthenes got the circumference of the Earth.



$$\frac{o}{5000} = \frac{360^\circ}{7,2^\circ}$$

$$o = \frac{360^\circ}{7,2^\circ} \cdot 5000 = 50 \cdot 5000 = 250.000$$