

Καλώς ορίσατε

Welcome

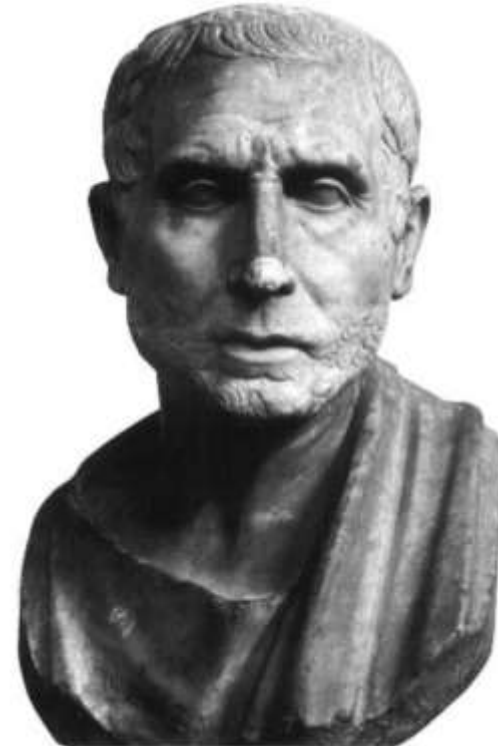
Vitejte

Bine ati venit

# Calculating the circumference of the earth

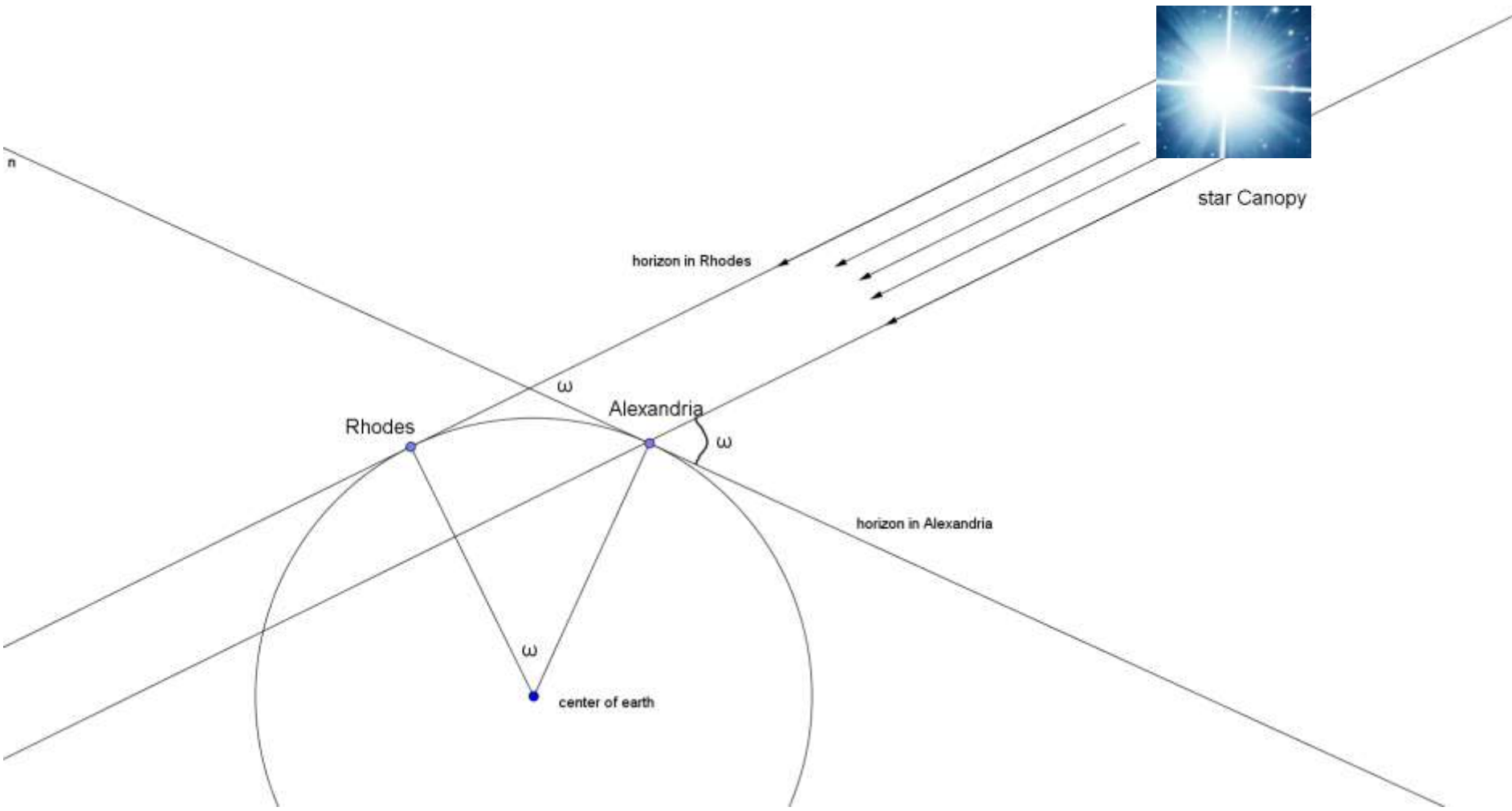
In ancient times people believe that earth is flat .  
But many astronomers about 200 b.C  
noticed that earth must have spherical shape.  
One try to find out the earth's circumference was  
from Posidonios of Apamia  
(135- 51 b.C.)

Posidonios was a philosopher  
geographer ,  
astronomer and  
principal of school of Rodos  
School of Rodos was a  
university of ancient times.



As he lived in Rhodes he observed that in some days of the year the star **Canopy** observed that the star appeared in a tangential direction to the horizon but when he was in Alexandria observed the star at an angle  $\omega$  with respect to the horizon.

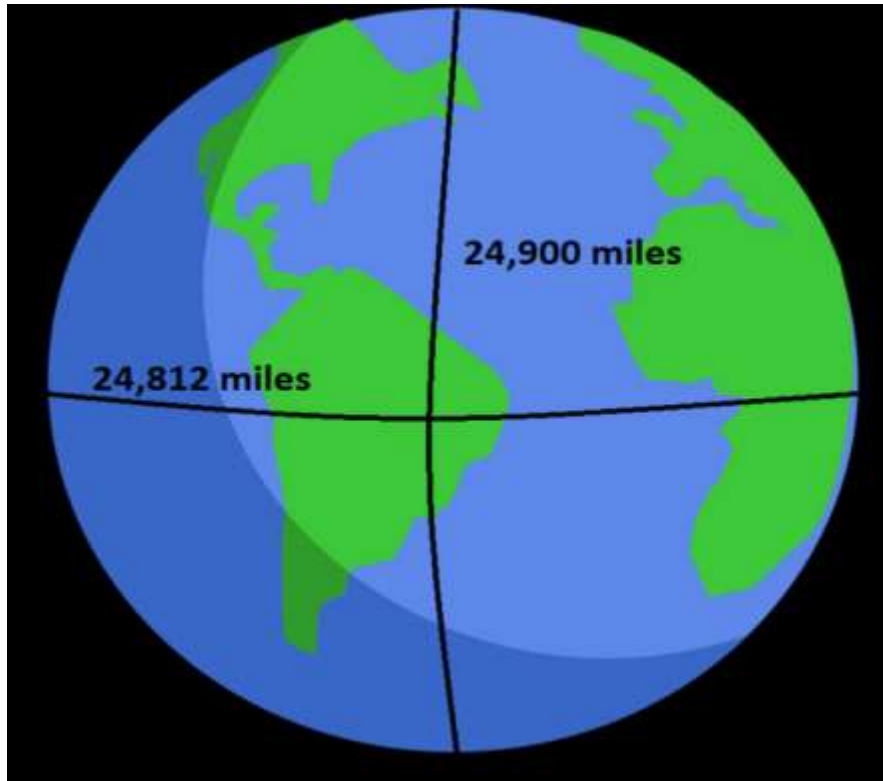




Unfortunately , Posidonios estimate the perimeter of earth in 37.800 Km

Now we know the perimeter of earth is 40.075 Km .

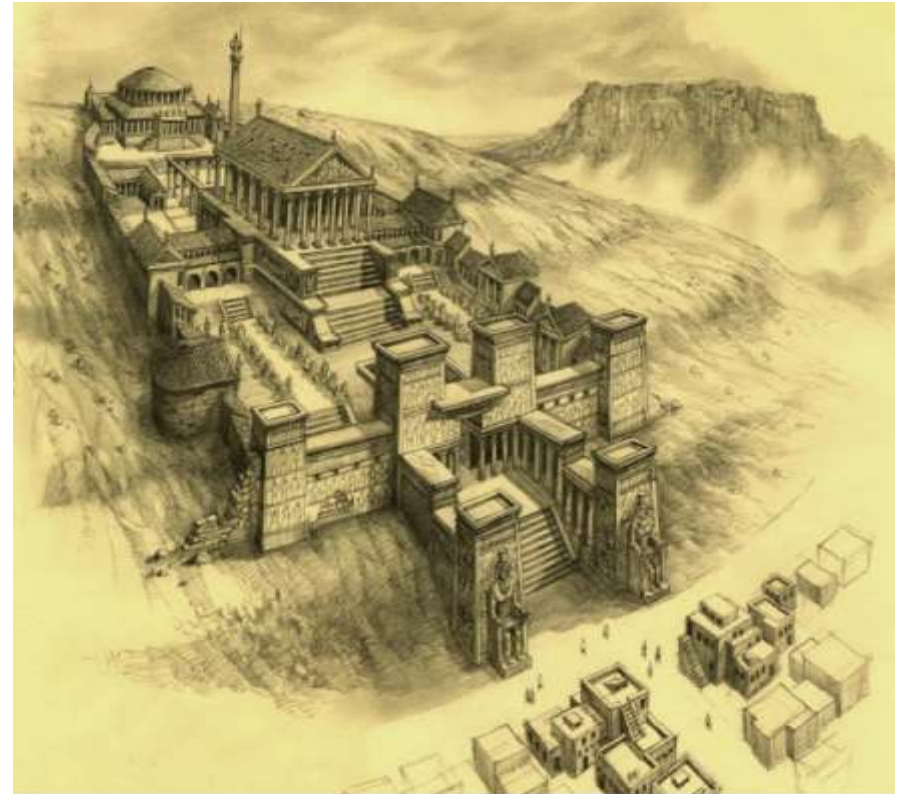
So Posidonios failed to find the perimeter of earth.



# The Great time

## Eratosthenes' measurement

Eratosthenes was born in Cyrene of Libya at 276b.C. He worked and died in Alexandria at 194 b.C. He was chief librarian of the library of Alexandria



The library of Alexandria according to archaeologists

Also he was mathematician geographer , astronomer, poet and music theorist. He is best known for being the first person known to calculate the circumference of the Earth in great accuracy.



The library of Alexandria today



Here plays a video from Youtube

<https://www.youtube.com/watch?v=G8cbIWMv0rI&t=6s>

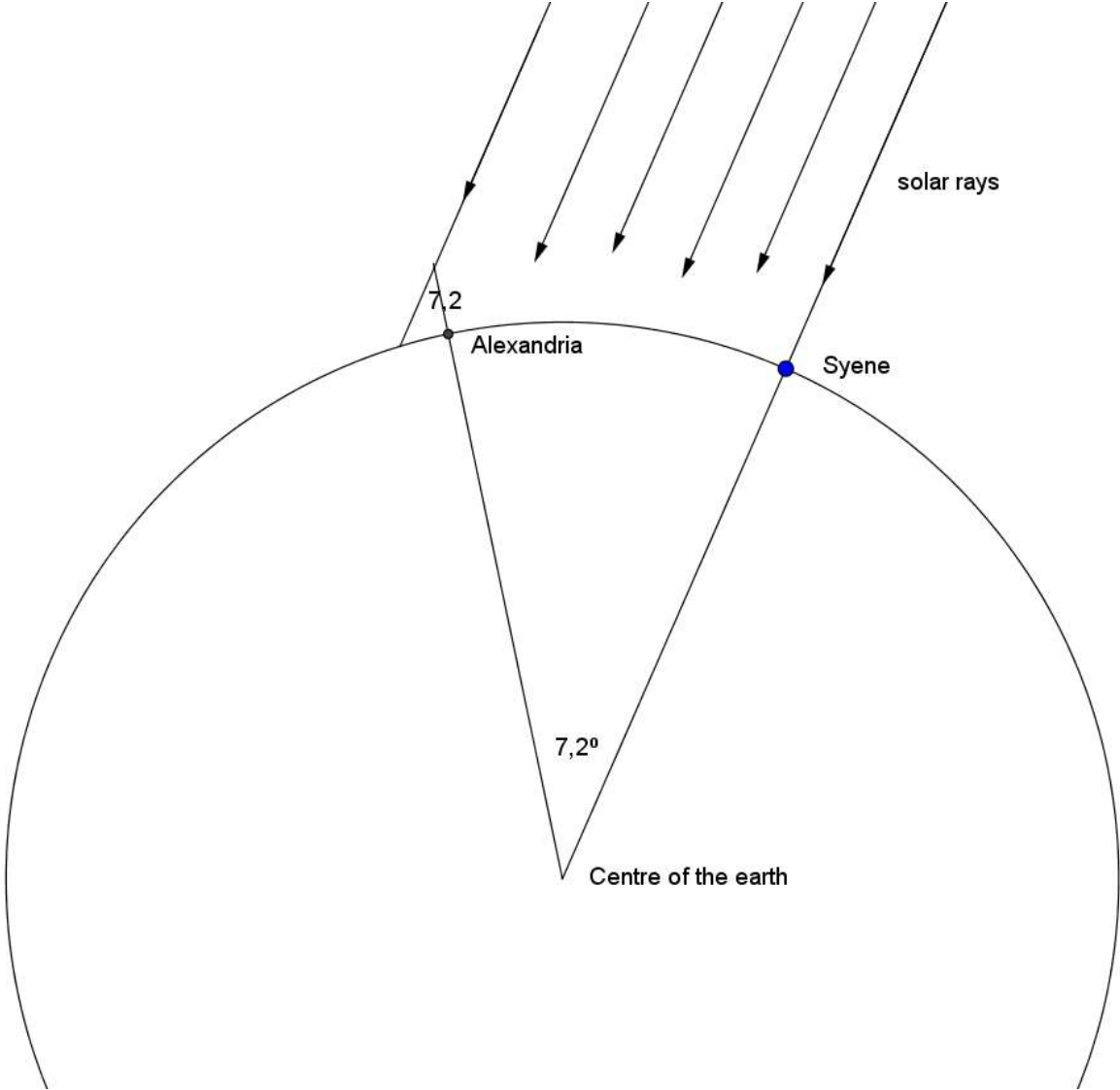
After that plays another video

<https://www.youtube.com/watch?v=Mw30CgaXiQw>

## FUNDAMENTALS ASSUMPTIONS IN ERATOSTHENES CALCULATIONS

- ❖ ALEXANDRIA AND SYENE (NOW ASWAN) ARE IN THE SAME MERIDIAN
- ❖ SUN RAYS ARE PARALLEL IN WHOLE AREA
- ❖ EARTH IS A SPHERE.

# Geometric figure

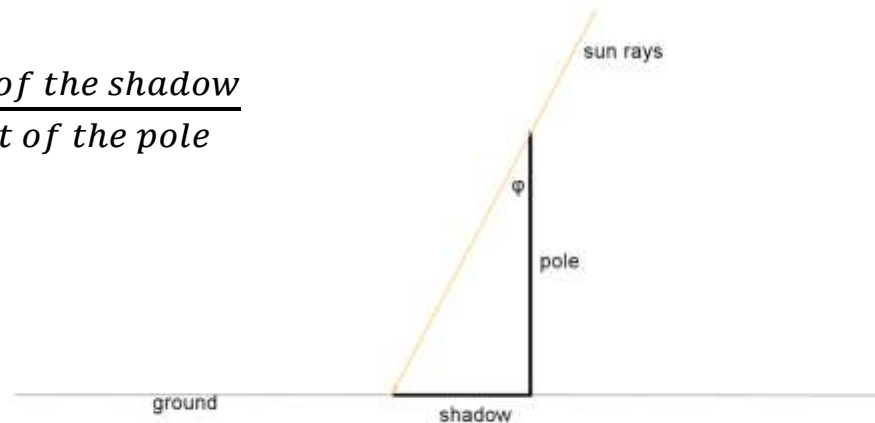


What will you do today???

1. You must separate in two teams
2. Each team of you will cooperate with one greek team
3. Each team place a pole perpendicular to the ground
4. Each team from Checzech and Romania will cooperate with a team in Greece

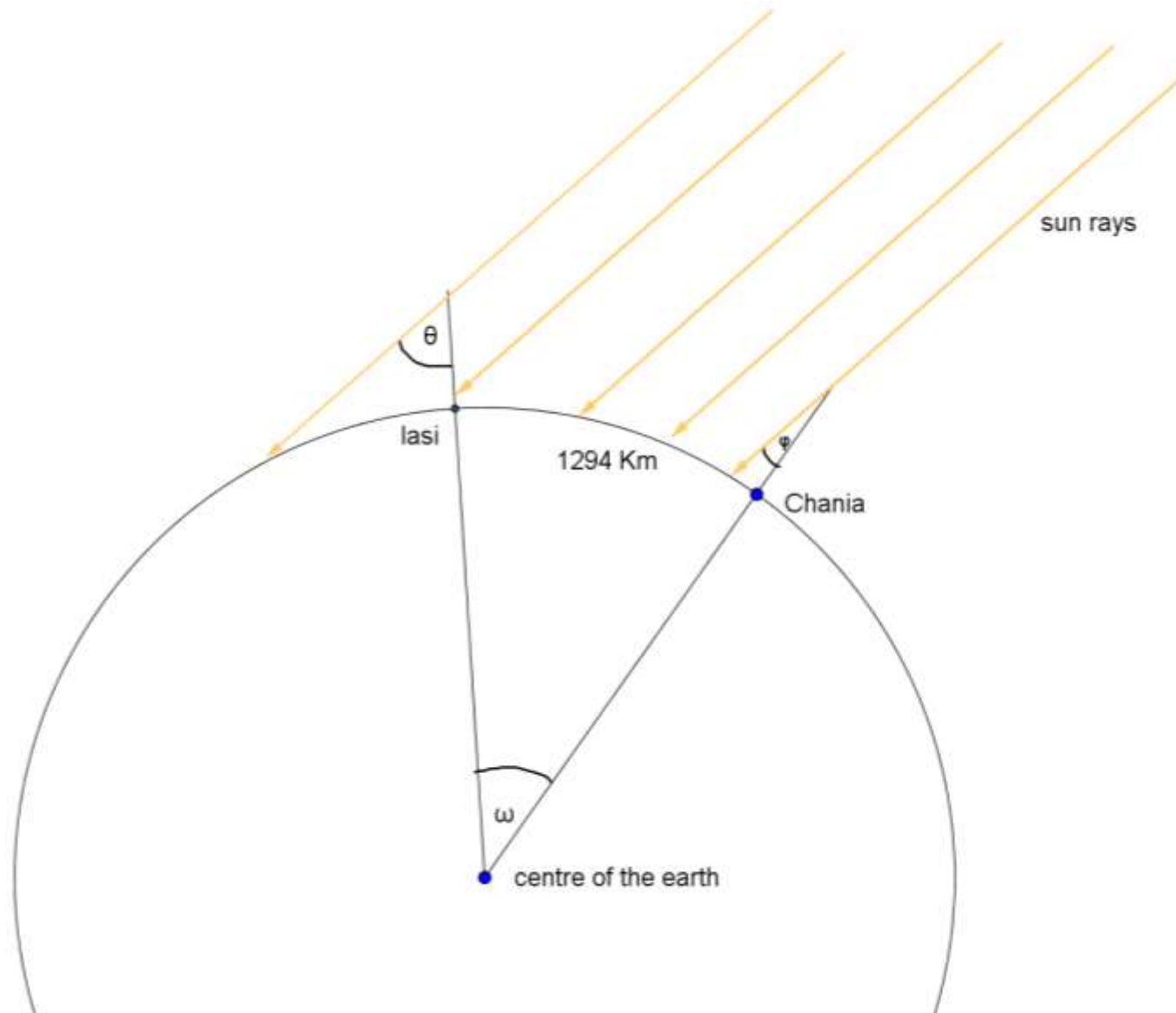
5. First Romanian groups measure the shadow and the height of the pole. After that they calculate the tangent of angle  $\phi$ . At the same time they call Greek teams to start. The measurement in Greece must be made 15 minutes after the measurement in Romania. Greeks do the same. After that Greeks call Czech teams to start. The measurement in Czech must be made 23 minutes after the measurement in Greece.

$$\tan\phi = \frac{\text{length of the shadow}}{\text{height of the pole}}$$

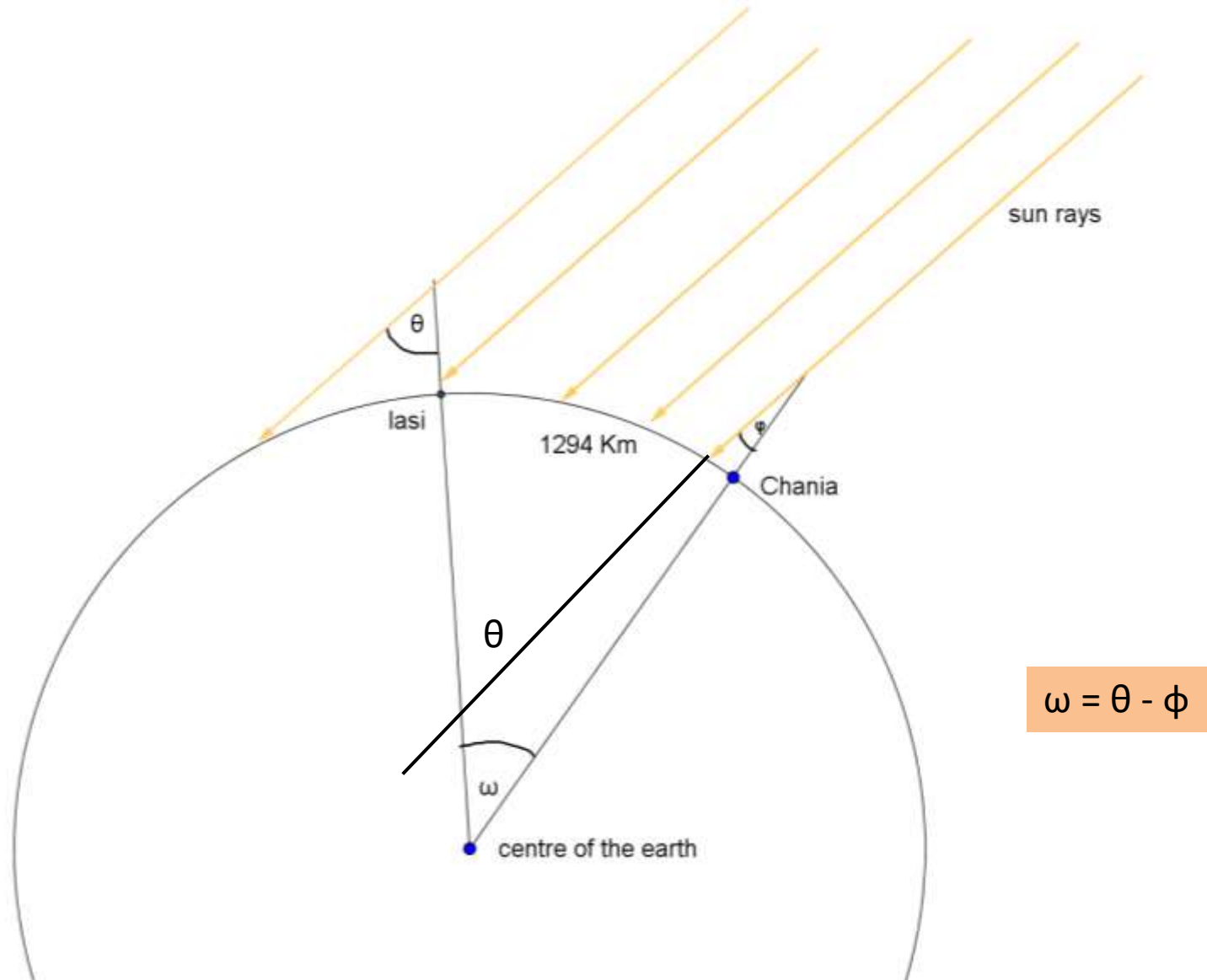


But why are there such time differences in measurements?  
Because the cities where the measurements are made are at different longitudes. So if they were done at the same time we would have an error in the measurements of the angles due to the different position of the sun in the sky.

# Geometric figure for Romanian + Greek team

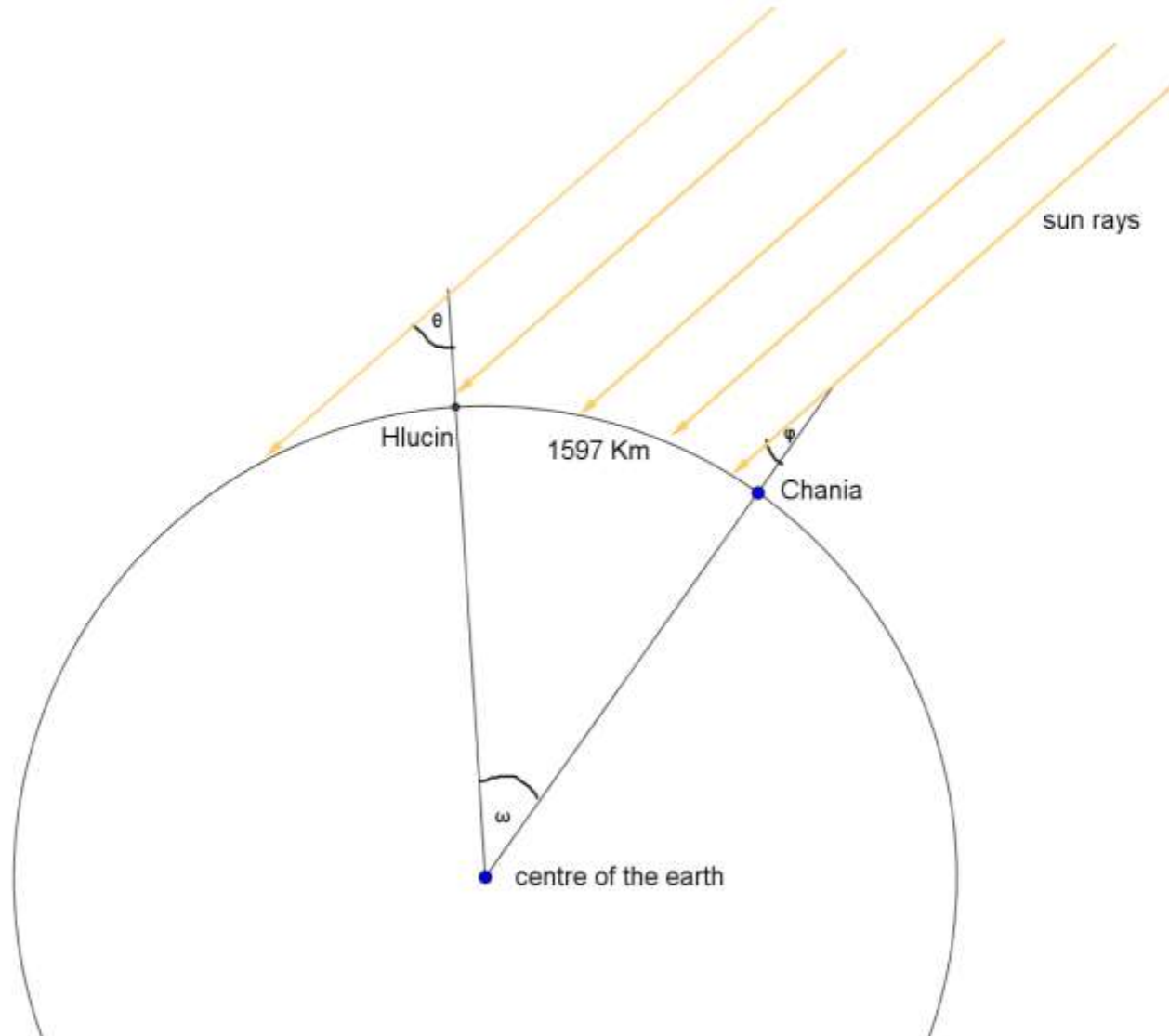


# Geometric figure for Romanian + Greek team

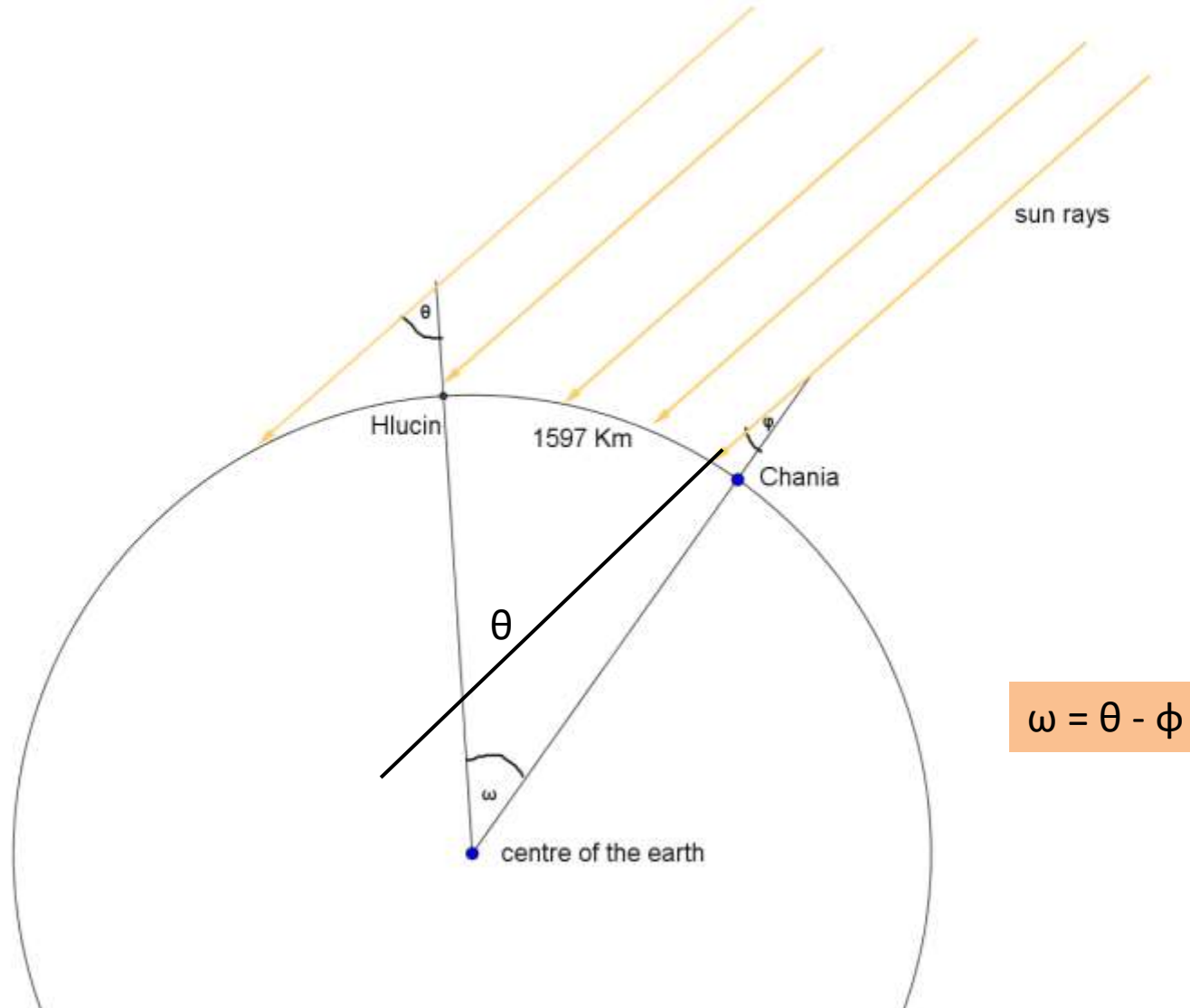




# Geometric figure for Czech + Greek team



# Geometric figure for Czech + Greek team



6. After the teams find the angles  $\phi$  and  $\theta$ , they

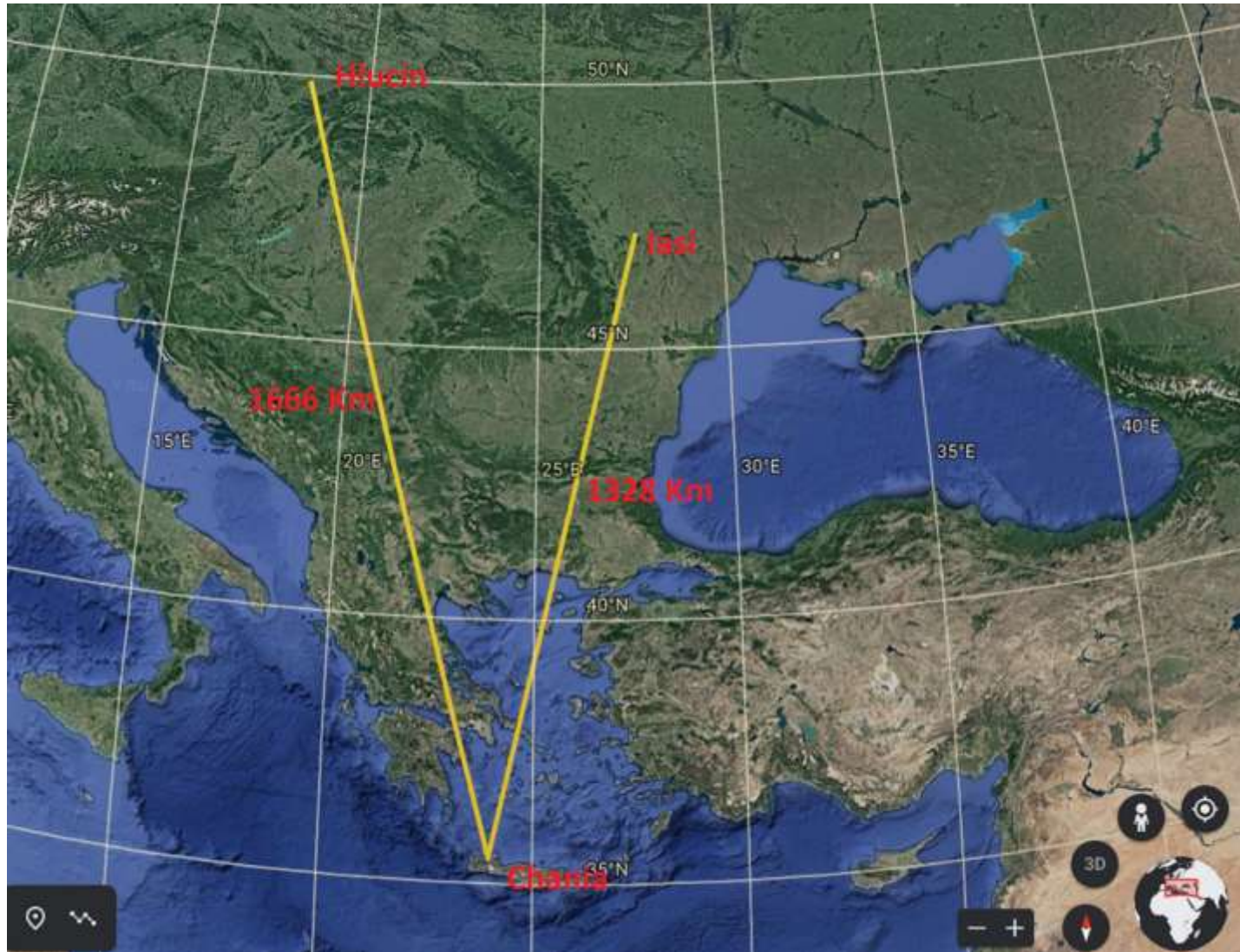
calculate angle  $\omega$

7. At the end they calculate the circumference of earth

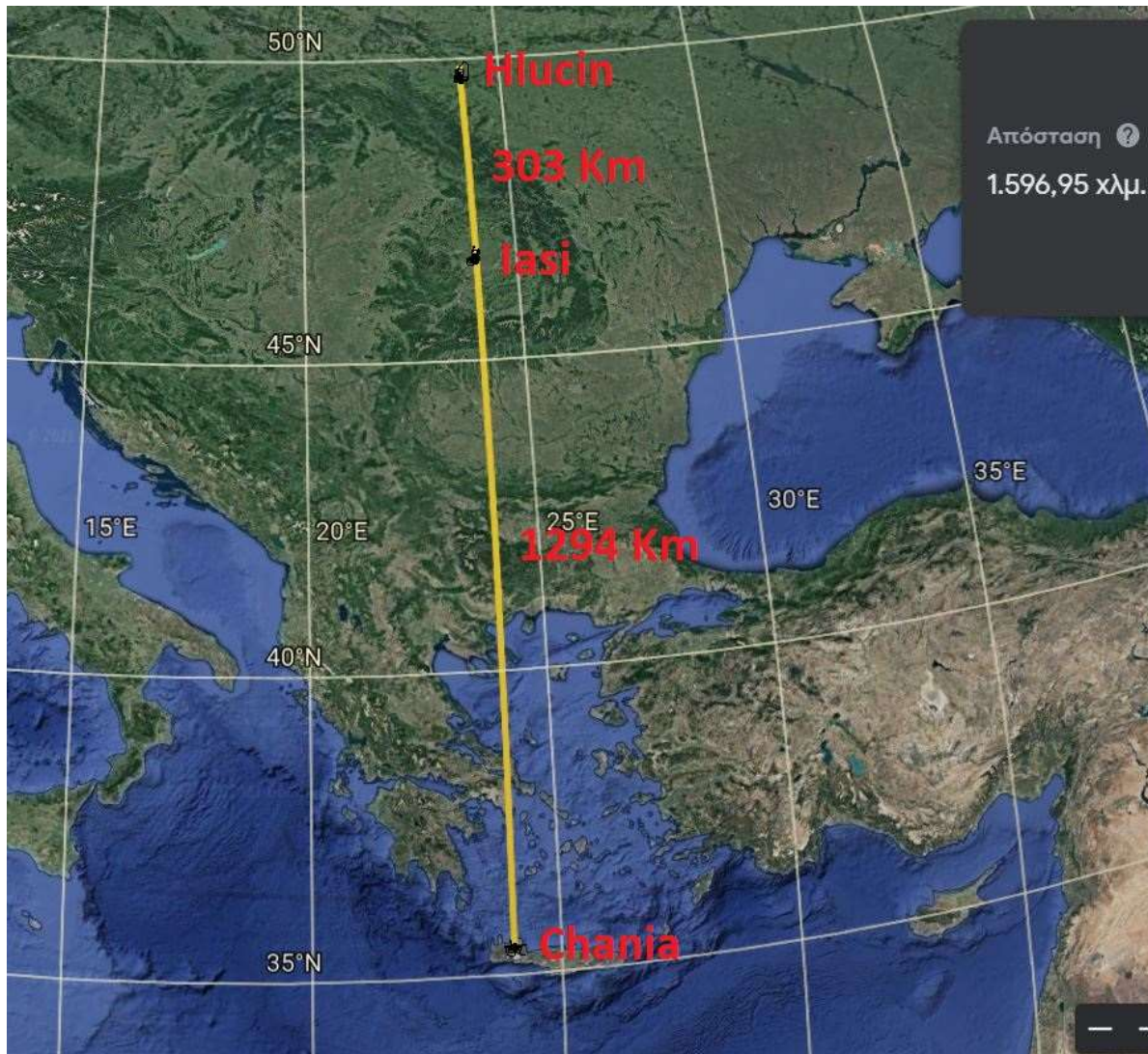
using the simple type:

$$\frac{\omega}{360} = \frac{\text{distance between the cities}}{\text{circumference of the earth}}$$

The real situation . The actual location on the map



The hypothetical situation. The cities are located in the same longitude.



# Results

Greek – Romanian 1 :

Greek – Romanian 2 :

Greek – Czech 1 :

Greek – Czech 2 :

Καλό απόγευμα !

Good afternoon !

dobré odpoledne !

bună ziua !

