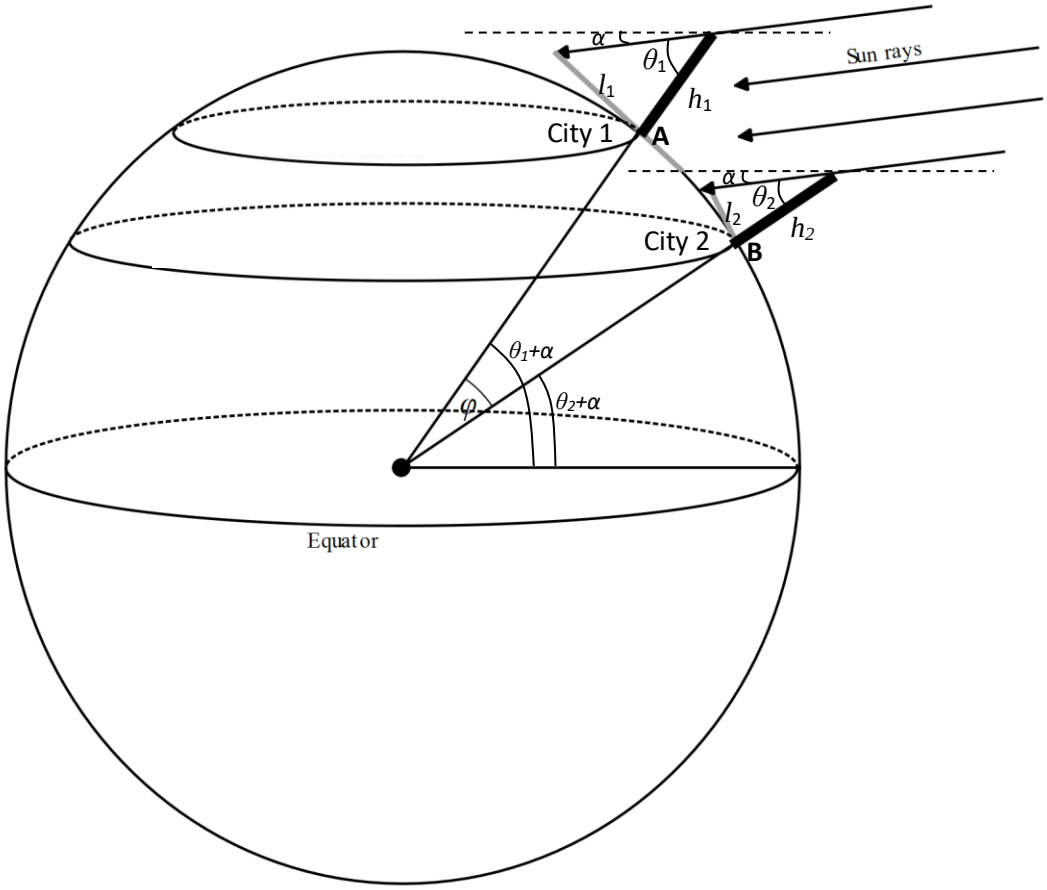
Instructions

for

The measurement of the Radius of the Earth



Prerequisites

When two or more schools are collaborating, the experiment can be done on any day around the year, weather conditions permitting. In our case, it will be implemented on the same day for all schools, during the week of 18 – 22 March 2019. Let me remind you that the spring equinox is on the 21st of March.

All three schools should commence at local noon, where the sun is at its highest point in the sky. You can find out what time this is, either using ***suncalc.net*** or ***stellarium*** from ***stellarium.org***, for the specific day of the action. Another idea is to find the time at which any object's shadow is minimum during the day. That would be local noon.

Because of its easternmost position, the 2nd Junior High School of Amaliada must perform the experiment first, whereas the Goethe High School of Kassel and Galileo Galilei Gymnasium in Genova one hour later, as the two schools lie roughly on the same meridian (*Fig.1 Eratosthenes_Maps.pdf*). At that time, the rotating Earth will carry the two schools at the same meridian as Amaliada was an hour ago.

The experiment

1. At local noon, a group of students should place a stick of known height ***h*** in a vertical position on the ground.
2. Measure the length of its shadow ***l***.

3. Calculate the angle theta θ, using the formula $\theta = \arctan\frac{l}{h}$ (*see figure above*).
4. Communicate with any of the two other schools, to obtain their relative angle θ.
5. Calculate the radial difference $\varphi = |\theta_1 + \alpha - (\theta_2 + \alpha)| = |\theta_1 - \theta_2|$.
6. Using **Google Earth** find the North – South distance **AB** between your school and the school whose angle θ you obtained earlier. The distances are given for comparison at *Fig.3 Eratosthenes_Maps.pdf*. By all means, you should let your students find themselves this data.
7. Calculate the circumference C of the Earth using the formula $C = \frac{\mathrm{AB} \cdot 360^o}{\varphi}$
8. Find the radius of the Earth $R_\oplus$ using $R_\oplus = \frac{C}{2\pi}$
9. Enjoy!!!