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Understanding the shape of the Earth and measuring its size

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Most elementary students have problems and misconceptions regarding the shape of the Earth. Teachers often contribute to this confusion telling the students that the Earth is almost spherical, but not explaining to them, how the Earth can be spherical while it appears. It would be helpful for students to understand how humanity came with the idea of the spherical Earth (to be precise the Earth is ellipsoid). Historically, most cultures describe the Earth as flat. That changes with the ancient Greek culture. We don't know exactly how the Greeks first understood the spherical shape of the Earth, but some Greek philosophers give some arguments why the Earth must be a sphere. We can discuss these arguments and observations with the students.

First, if someone travels in the south, he can see the southern constellations rise higher above the horizon. We can give students pictures of the night sky in southern regions and compare them with observations of ''their" night sky.

Second, in the lunar eclipse we can see the round shadow of the Earth.

Third, whenever a ship is on the horizon, his low part is invisible . This is known as "hull-down". Moreover, the low part of mountains is invisible from the sea, due to the curvature of the Earth. It is always better to make these observations in real life but it can also be done via videos and pictures.

The realization of the spherical shape of the Earth was sine qua non for the first good measurement of its size. In the second part of the project, following the ancient mathematician Eratosthenes's steps, students can measure the size of the Earth, , find pleasure in doing experimental work and realize how important mathematics is in everyday life.

Two sticks, situated a long distance away from each other, can give us approximately the circumference , the radius and the diameter of the Earth. Eratosthenes used geometry combined to the knowledge of ancient Greek culture that the Earth is spherical (360°). He knew the distance between two cities in the same meridian arc., namely Alexandria and Syene. In Syene the sun is directly overhead, at noon, during the summer solstice. On solstice, in Alexandria, he measured the angle of elevation of the sun using the shadow of a vertical long stick. This angle is 7°12' and it is the central angle of the arc Alexandria-Syene, approximately 1/50 of 360°. Then with a multiplication (the distance of Alexandria-Syene times 50) he calculated the circumference of the Earth.

Inspired by Eratosthenes' method, students can use a similar experiment to measure the size of the planet, using (at the same time) two different sticks in two different cities in the same meridian. This entails that two different schools or groups need to cooperate, in order to measure and compare the angle between the sun and the stick and hence, calculate the circumference of the Earth.