ONLINE OBSERVATORY

STUDENT GUIDE

HOW BIG IS THE EARTH?

Material List:

Sticks of different lengths

Pen and paper

Calculator

Other:

A school north or south of your school for collaboration.

Outline

In this exercise, we will measure the circumference of the Earth using the same procedure as Eratosthenes did 240 BC. To do this, we need to measure the height of the sun in two locations directly north-south of each other. Are you able to get answers close to the result we have today?

Procedure

1. Find the length of shadows

Find sticks of varying length (e.g. 2-10cm in length). Stick them into the ground and measure their height and the length of their shadows. Write down your results in this table:
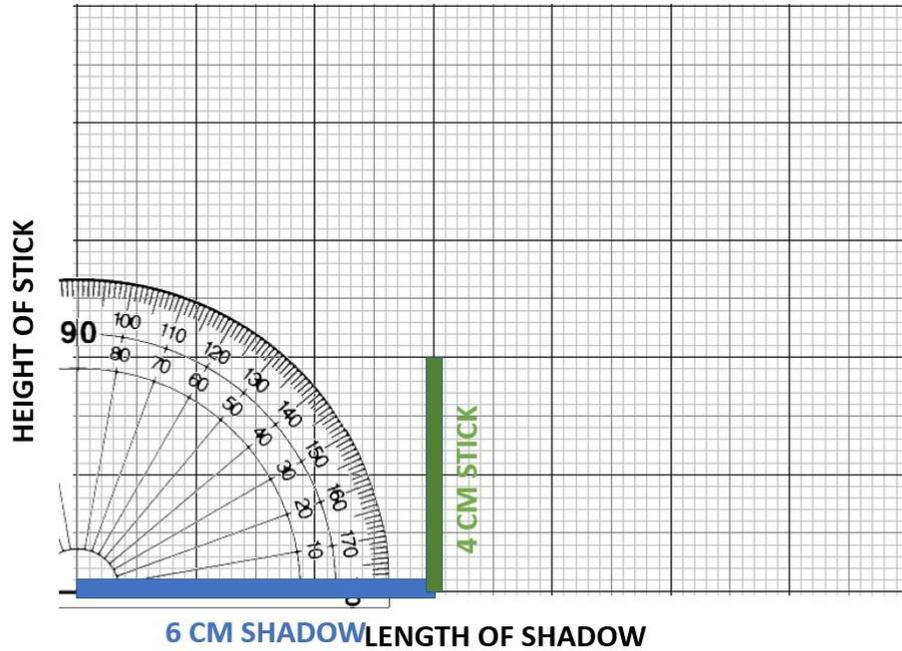
	Height	Shadow's length
Stick 1		
Stick 2		
Stick 3		

2 Plot each stick and shadow into the diagram

Use the empty diagram on the next page to plot the values from the table in point 1, using the procedure shown here:

HEIGHT OF STICK

90 100 110 120 130 140 150 160 170 80 70 60 50 40 30 20 10

4 CM STICK

6 CM SHADOW LENGTH OF SHADOW

3 Draw a line from bottom-left corner

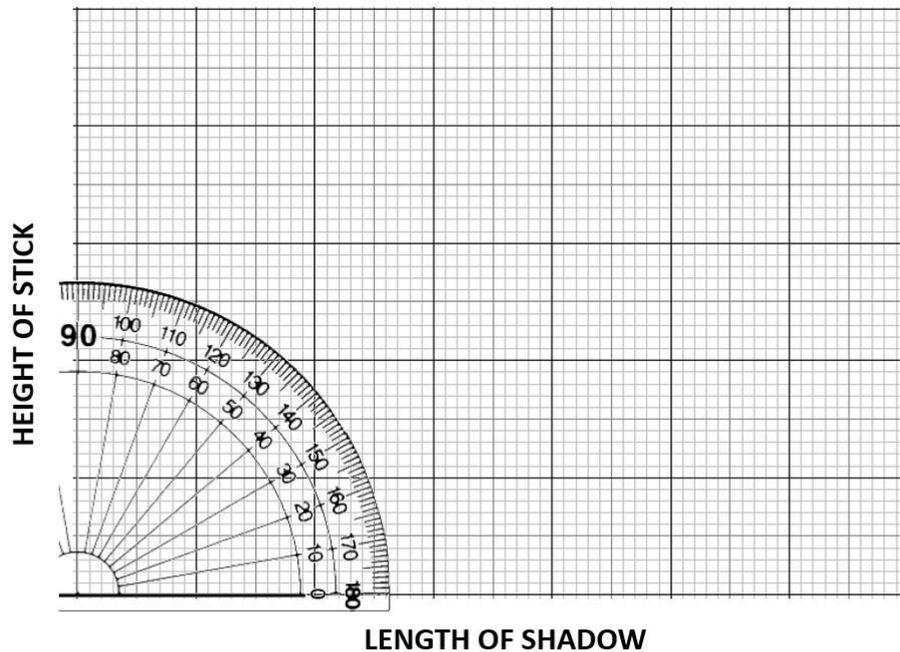Draw a line through origo and the tip of all sticks in your diagram, as shown here:

HEIGHT OF STICK

90 100 110 120 130 140 150 160 170 80 70 60 50 40 30 20 10

LENGTH OF SHADOW
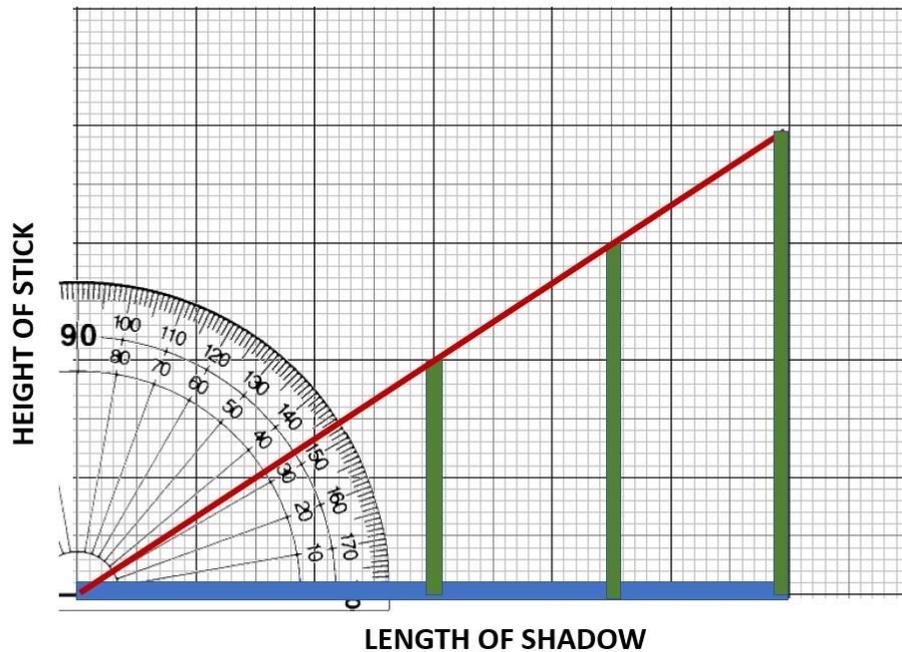
4 Find the solar height

Mark the stick heights and shadows lengths as described in point 2-3 here:

LENGTH OF SHADOW

Use the angle scale given in the bottom left corner to find the solar height. Write your result here:

Solar height:	

5 Compare your results with your partner school

Ask your fellow students at your partner school for the solar height measured at their position at noon, preferably on the same date. If you do not have clear skies on the same date, you can compare measurements taken a few days apart. Remember to give them your result, in case they are also working on the same assignment.

Use a map to find the distance between your schools:

Distance:	

6 Calculate the circumference

Solve the following equation for R, where *a* is the difference in measured solar heights between the two schools, and *d* the distance between the two schools.

$$\frac{d}{C} = \frac{a}{360^0}$$

The online observatory collaboration consists of the following partners: Baldone Observatory, Brorfelde Observatory, Cardiff University, Harestua Solar Observatory, Helsinki Observatory. See onlineobservatory.eu for more activities and information.

	Here, C is the circumference of the Earth.
	Circumference:	

Compare your result with other student's. Are your answers similar or equal? Look up the answer in your text book or ask your teacher. Is your result similar to this?

7	## Discussions: Is the world round?
	Imagine your fellow student is a member of the flat earth society, who is asking you for proof that the world is round. Explain how the observations performed here, or other observations you know how you would perform, to prove that the world is round.

Further Resources/Activities

Assessment: