# The circumference of the earth

Shannon and Ian Jacobs

In 240 BC Eratosthenes knew that the sun shone down a well at noon on one day of the year in Aswan, 800 km due south of Alexandria. He got someone to measure the shadow and height of a tower in Alexandria at noon on the same day. From that he got the angle the sun made with the vertical and worked out what fraction of the earth's circumference (C) equaled 800 km.


Me on the road outside my house at noon: 26 April 2019.

With the internet and GPS we can do what Eratosthenes did. I live in Khlong Luang just north of Bangkok at 14º North. My Aunt: Gwenda Muir, lives in Blenheim NZ, at 41.5º South. On the 26th of August the sun is directly overhead at noon at my house. My Aunt photographed the shadow of a vertical patchwork ruler at the same time.
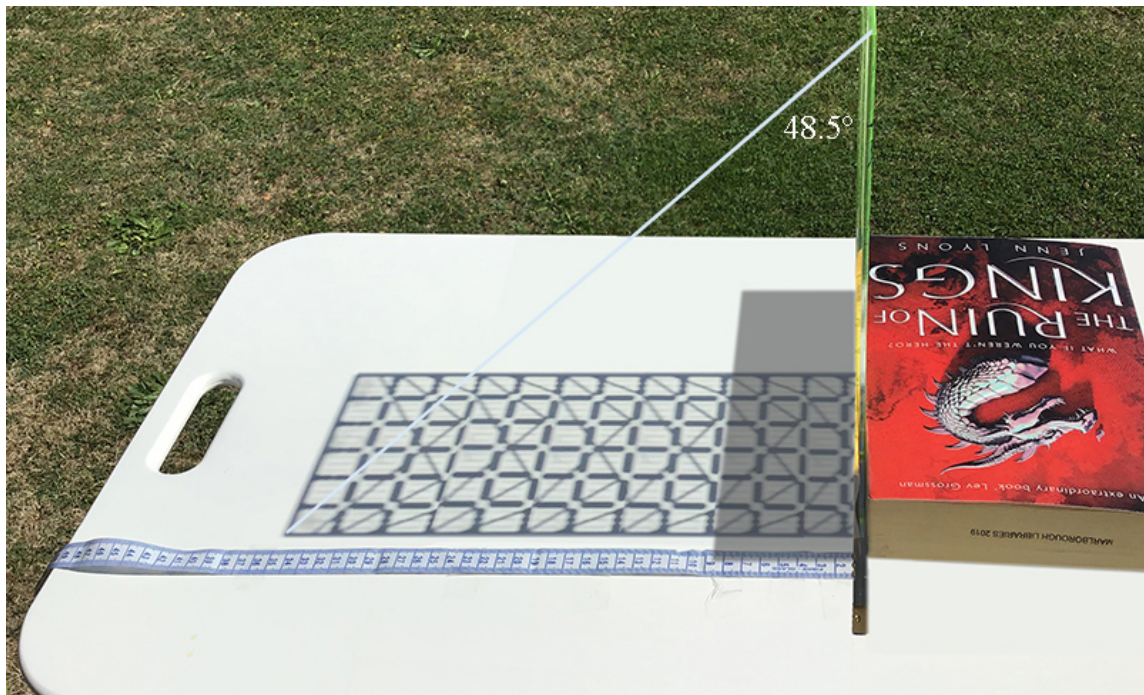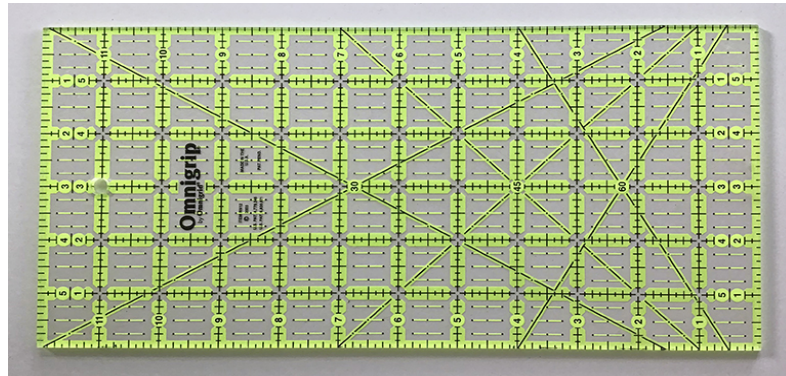
The 30 cm patchwork ruler is wide, has holes and lines on it, and the shadow looks like an apartment building. A white line has been added to complete the triangle to mark the angle the sun made with the top of the ruler (48.5º).

The earth is a sphere. Light rays from the sun come from the left. The diagram is not to scale.

The sun's rays are parallel because the sun is so far away.

Bangkok

48.5°
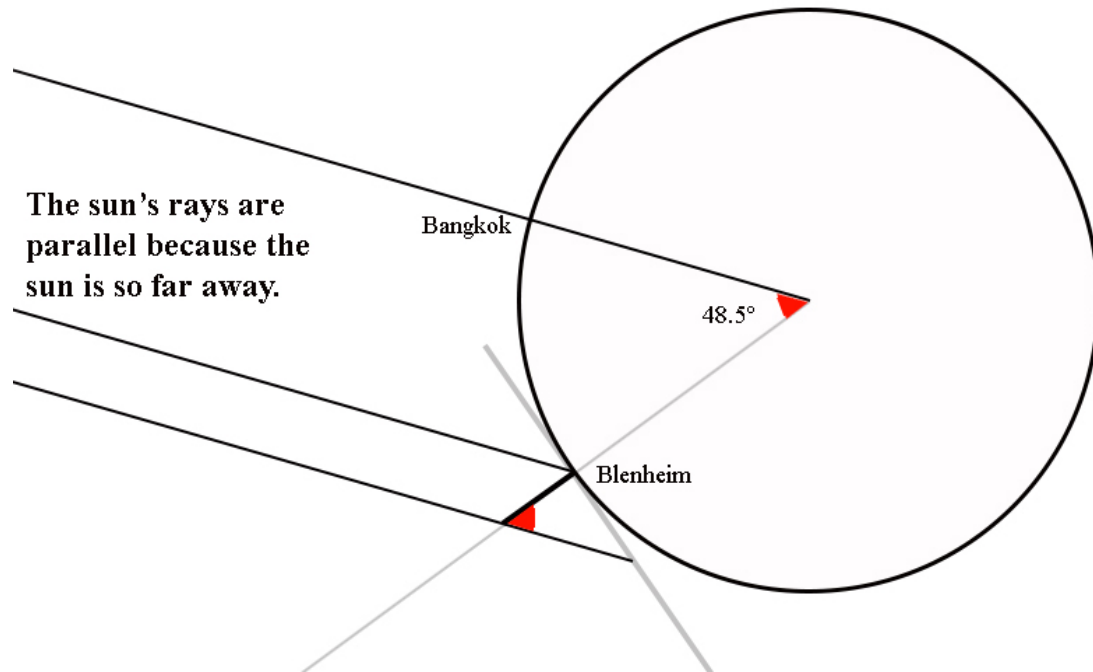
Blenheim

The measured angle, marked on the diagram in red, equals the angle *subtended* at the centre by Bangkok and Blenheim, that are separated by 55.5 degrees of latitude. Latitude lines are 110 km apart so 55.5° is 110x55.5 = 6100 km

6100 km is 55.5° … and …. C is 360°

$C = (360 \times 6100)/55.5$

$= 40\ 000$ km

There are small inaccuracies in the numbers used here but within 2% this is the right answer. We get the same answer Eratosthenes got in 240 BC.

You could search for Eratosthenes on the web and find out what else he did.