Aristarchus calculation of the "size" of the sun

Post by “Kalosyni” of December 7, 2025 at 7:07 PM

This is an interesting video:

https://m.youtube.com/watch?v=shkcVDHOvAI

Aristarchus of Samos proposed a heliocentric model, but this idea did not find wide acceptance among ancient philosophers, due to a lack of observable stellar parallax.

Post by “Cassius” of April 21, 2026 at 8:26 AM

The full video may explain this but if someone doesn't want to watch that Wikipedia says that Aristarchus' calculations led him to conclude that the sun was 18-20 times larger than the moon. It's not clear to me whether he had a size for the moon or whether he stopped at the relative size.

> Quote
>
> Aristarchus also reasoned that as the angular size of the Sun and the Moon were the same, but the distance to the Sun was between 18 and 20 times further than the Moon, the Sun must therefore be 18–20 times larger.

Post by “Eikadistes” of April 21, 2026 at 11:31 AM

Question for math friends:

1. *Given any, one planet in the observable universe*, what are the chances that this planet has both (1) exactly one moon, which is also (2) the exact same *apparent* size as that planet's parent star?

Another question along those lines:

2. *Under what conditions* could *ancient* humans have measured the sun *without* the moon?

I'm ultimately getting to this thought experiment:

3. *If you're a humanoid alien* on an Andromedan planet with no moon, once a sage from your species apprehends the relationships between local triangles, what observations need to be made (or what technologies need to be invented) to allow the them to make accurate, celestial measurements?

Post by “Joshua” of April 21, 2026 at 1:58 PM

I'm more familiar with measurements of the earth from my days in Land Surveying, and the classic experiments that I can recall are these;

- The Eratosthenes experiment; a fairly accurate measurement of the circumference of the earth.
- The Mason-Dixon Survey, which demonstrated that mountains exert gravitational pull
- The Schiehallion survey, which first calculated the mass of the earth
- The Cavendish experiment, which much more accurately measured the mass of the earth
- The Transits of Venus across the sun, which used this earlier knowledge to measure the Astronomical unit.

What you need is an accurate measurement of the planet you're standing on, so that you can observe celestial phenomena from many different known positions on that planet at the same time and collate the data.

I'm at lunch now, I don't have time for a more complete answer.

Post by “Martin” of April 22, 2026 at 2:57 AM

For questions 2 and 3: Once you have established the law of gravity and measured the gravitational constant with a laboratory scale setup, you can calculate the product M/r^3 (M = mass of the sun, r = radius of the circle for an approximately circular path around the sun) from the measured time it takes the planet for one round around its sun. If there is another planet, you can determine its product M/r'^3. By measuring its apparent diameter at different positions relative to the own planet, calculations for consistency should reveal M, r and r'. Then, you can calculate the diameter of the sun from the apparent size with r. With no other planet, no moon and no comets passing by, classical mechanics seems to be at a dead-end with M/r^3. With the capability to launch satellites, a satellite can be used instead of the moon for the needed additional measurements. Or a space probe can be sent to collect the needed additional measurements. If the path around the sun is not exactly circular and the axes of the elliptical path are sufficiently different and with knowledge of the neutron and after measurement of its half-life, the measured neutron flux density from the sun during one round around the sun can be used to determine values for the main axes of the ellipse which are consistent with the measured flux densities at the points closest and farthest from the sun on the elliptical path.