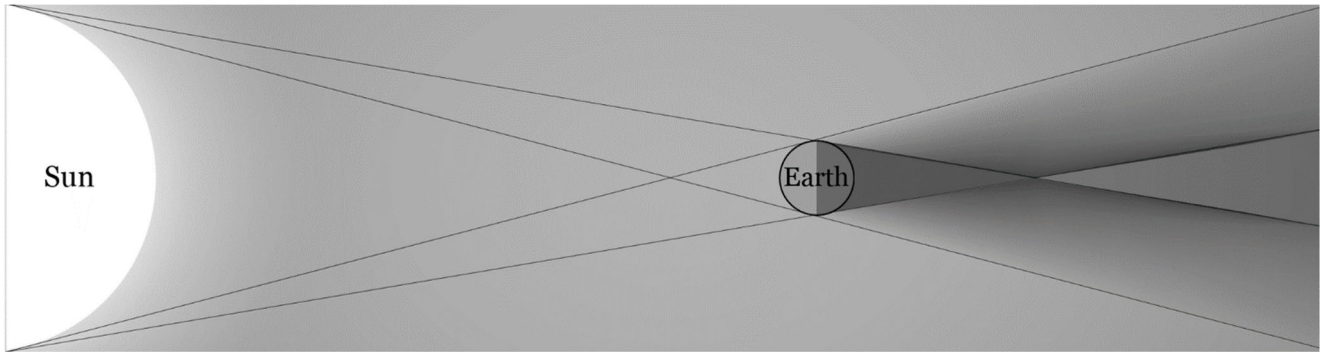


Astronomy Demonstration Video – Eclipses 1: Shadows & Scale – Worksheet

to follow viewing of the astronomy demonstration video at <https://www.youtube.com/watch?v=huVCQXYy4jc>

1) The diagram below (not to scale) provides an overhead view of the Sun-Earth-Moon system. The sun and Earth are shown as well as the shadow cast by Earth.

A) Add the position of the moon during a total lunar eclipse. Make sure the moon is drawn with the correct relative scale to Earth. Label the three types of shadow cast by Earth.



B) Add the position of the moon during a total Solar Eclipse. Draw in the shading on Earth and the moon and the umbra created by the moon.

2) Choose the best answer for each of the following multiple-choice questions and the justify your answers making reference to the diagrams you drew above.

A) During a lunar eclipse the phase of the moon is ...

- a. new
- b. full
- c. any phase is possible

Explain: _____

B) During a solar eclipse the phase of the moon is ...

- a. new
- b. full
- c. any phase is possible

Explain: _____

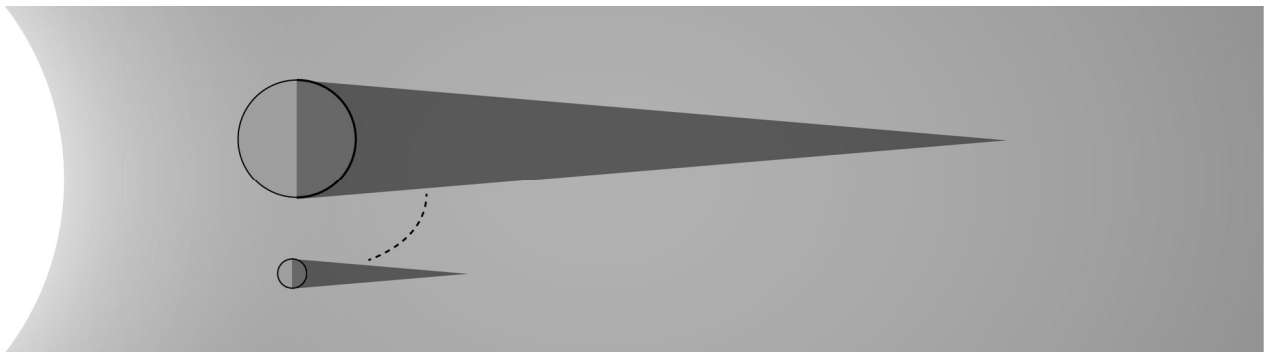
3) The moon orbits Earth in an elliptical orbit with an eccentricity of $e = 0.055$. Because of this the moon varies in angular size. The table on the next page lists the distance and angular size of the moon on a number of random dates.

Date	Earth - Moon Distance	Moon's Angular Size
Jan. 4th 1912	356375 km	0.558
April 23rd 1930	400267 km	0.501
Mar. 27th 1952	376697 km	0.532
Aug. 10th 1987	359861 km	0.557
Feb. 2nd 1988	405948 km	0.494
Sep. 12th 2018	403763 km	0.497
Feb. 10th 2019	397939 km	0.504
Dec. 25th 2020	404837 km	0.495
July 8th 2080	401871 km	0.499
Feb. 3rd 2125	406720 km	0.493

A) Using the table above and assuming the Sun consistently has an angular size of 0.5° , at what range of Earth-Moon distances is an annular eclipse possible? Explain your reasoning.

B) Is it possible to tell from the above table if an eclipse will occur on any one of these dates? Explain your reasoning.

4) The diagram below shows Earth, moon, and their umbras created by the sun (far left).



A) How do the umbras of Earth and the moon compare in size?

B) Why are there never lunar annular eclipses? Be sure to include the terms umbra and antumbra in your explanation.
