

3D Model of Earth-Moon: Make your own eclipse

Goal : Show how an eclipse works with a 3D model. This will help students understand why the eclipse occurs, as well as conceptualize the size of the Earth-Moon, their separation, as well as the equivalent size of the Sun in that model.

You can use many options for the Earth and Moon models, but if we want it to fit on a meter stick, we will want around a 1 inch ball for the Earth. We use a Ping Pong Ball and a marble, but anything that is roughly 4 to 1 scale will work. The “Earth-Moon” separation is 30 Earth radii, and the Sun is roughly 100 times larger and 109 Earth diameters away.

Possible supplies:

1 yard or meter stick

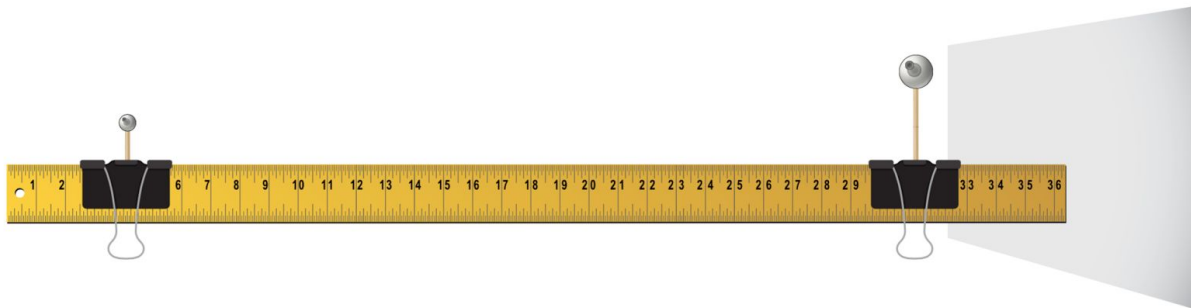
1” ball for the Earth

¼” ball for the Moon

Sticks to hold the Moon and Earth

Binder clips to hold the sticks to the meter stick

Put Earth at 1”-3” on yardstick and Moon at 30” away



Use Sun (Sun to left in the above image) or bright light source in a darkened classroom. Have students try to get alignment of the “Moon’s” shadow on the “Earth”. It has to be exactly aligned. It is harder than you think. If you want to make it easier, add a card at the end to help align the shadow.

One can also do a lunar eclipse-- use the Earth’s shadow on the Moon.

Discussions:

Why is it difficult to align the Moon’s shadow on the Earth?

Need nearly perfect alignment with the light source. This is why the Earth-Moon system must be aligned to witness an eclipse, and why it does not happen every month. Also, the Moon is smaller than the Earth, so it has a smaller shadow.

Why is the Moon's shadow not cover the entire Earth?

The Moon is smaller than the Earth, so it has a smaller shadow at that distance.

What happens if you move the Moon closer or farther away?

Shadow will get smaller or larger.

Who can see a solar eclipse? Who can see a lunar eclipse? Think of yourself on the Earth.

Solar eclipse is only seen by people in the full shadow of the Moon while a lunar eclipse can be seen by anyone who can see the Moon (50% of the Earth).

Reference: <https://eclipse.aas.org/sites/eclipse.aas.org/files/Miranda-et-al-SS-Oct2016.pdf>