

Solar and Lunar Eclipses – Student Activity



An **eclipse** happens when a planet or a moon gets in the way of the Sun's light. It is effectively a shadow. On Earth, we can experience two kinds of eclipses: **solar eclipses** and **lunar eclipses**.

Aim

Calculate the relative size of the Moon and the distance from Earth to the Moon.
To build a scale model of Earth and the Moon using a tennis ball and modelling clay.
To model eclipses of the Sun and Moon.

Materials per group:

- Tennis ball
- Plasticene, Blu tack or other modelling clay
- Ruler
- Torch
- Metre rule
- String
- Toothpick
- Piece of A4 paper

Method

1. Conduct an internet search for the following:

The diameter of Earth _____ km

The diameter of the Moon _____ km

The distance between Earth and the Moon _____ km

The distance between our Sun and Earth _____ km



2. Get your partner to help you find the diameter of a tennis ball by placing it between two flat sided, upright objects such as two pencils or boxes and measuring the gap.

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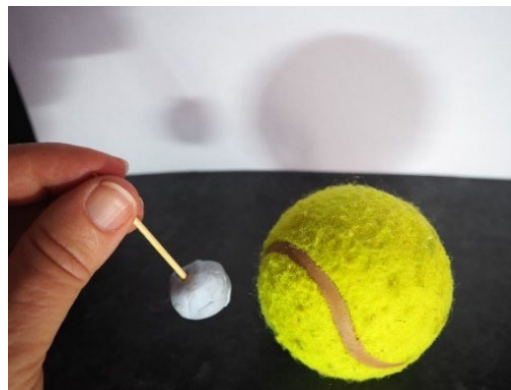


3. If the tennis ball represents Earth, calculate the size of the Moon at this scale.

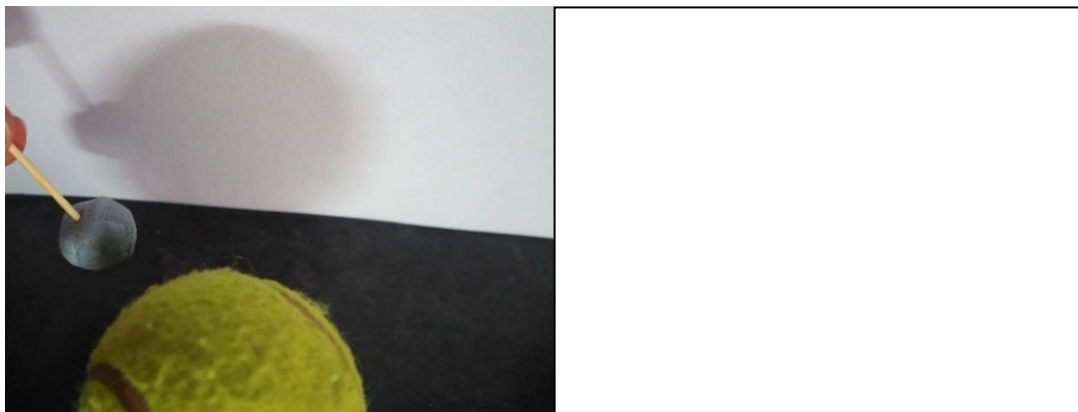
HINT: Diameter of Earth / diameter of the Moon _____

Now divide the diameter of the tennis ball by the calculated amount _____

- Use your calculations to create a plasticene (or similar) ball to represent the Moon at this scale.
- Repeat Method 2 to check the diameter of the scaled down Moon is accurate.
- Prop your torch so that it shines straight onto a paper screen about 60cm away. Stick a toothpick into your model Moon and rest your Earth on the desk just in front of the paper screen.
- Orbit your Moon around the tennis ball Earth just in front of the paper screen, so you can see shadows.



- What phase is the Moon in before the eclipse? _____
- Using the photo below, **draw the Moon** as it would appear at this point during a lunar eclipse.



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- In a solar eclipse, the Moon casts its shadow across Earth. Model this event then draw a labelled diagram in the observations box below.
- In a lunar eclipse, Earth casts its shadow across the Moon. Model this event then draw a labelled diagram or take a photo and paste it in the observations box below*.



Solar Eclipse



Lunar Eclipse

- In reality, the Moon and Earth are much further apart. Using the distance between the Moon and Earth (you researched earlier), calculate the distance between the tennis ball and the plasticene ball needed, to be in the correct scale.

- Cut a piece of string about 20cm longer than the length calculated in the step above. Hold one end of the string on the tennis ball Earth and have another student hold the other end of the string to the plasticene Moon.



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12. Model a solar eclipse, at the correct scale (for Earth and Moon distances), by standing in direct sunlight with your Earth on a flat, light-coloured surface. Hold the Moon the correct distance away by pulling the string tight. Now let the string go and holding on to the toothpick cast a shadow from your Moon onto your Earth.



- Does the Moon's shadow cover the whole Earth? Why?

- If you look closely at the photo above, there are two parts to the Moon's shadow. A lighter outer ring (penumbra) and a darker inner circle (umbra). In the box below draw the Earth with the Moon's shadow on it and label the different parts.



- Can every observer on the daytime side of Earth see the eclipse? Why?



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13. Now swap the Moon and Earth over and put the Moon on the ground and, holding the Earth, model a lunar eclipse.

- Can Earth's shadow cover all the Moon? Why?

- Can every observer on the nighttime side of Earth see the eclipse?

14. Your Earth and Moon models have so far used a torch to model the Sun. If you wanted to make your model include the Sun (torch) positioned at the correct distance from Earth, calculate how far away the torch would have to be from Earth.

15. Do you think the torch you have would work as a model Sun from your calculated distance. Why?

Discussion

Using your knowledge of solar and lunar eclipses, fill in the missing words below.

Solar eclipses occur when the _____ casts a shadow on the _____.

Lunar eclipses occur when the _____ casts a shadow on the _____.

Extra/ Alternative activities

*Take a series of photos as your Moon is eclipsed by your Earth and vice versa and turn it into a short looping video using iMovie or other movie making software.

Watch the [video](#) that accompanies this activity.