

# Solar and Lunar Eclipse Simulation

## Questions

1. From the simple two-dimensional model we have studied so far, it might seem like lunar and solar eclipses should happen quite frequently. In fact, if the moon, earth, and sun were really always in a common plane then eclipses should occur once per month. Specifically, a lunar eclipse would occur every time the moon is in its \_\_\_\_\_ phase, and a solar eclipse would occur every time the moon is in its \_\_\_\_\_ phase.
2. As you are no doubt aware, lunar and solar eclipses do not occur every month. To see why they don't, run the Solar Lunar Eclipse simulation. This program shows the earth orbiting the sun and the moon orbiting the earth. It also shows a view of the sky as seen from Earth (showing the moon, sun, and background stars). Does the plane of the moon's orbit line up with the plane of the Earth/Sun orbit, or is it tilted?
3. Explain why this means that the moon will not always be seen on the ecliptic.
4. Are there ever times when the moon is on the ecliptic? In the space below, sketch the moon's monthly path across the sky as seen from Earth (and as shown in the right window). Sketch the path of the Sun and Moon and mark the crossing points. Do these crossings always occur at the same time of day?
5. Explain why we don't have solar or lunar eclipses except when the moon is on (or at least very near) the ecliptic.
6. What two things must happen for a lunar eclipse to occur? Why don't these two things happen every month?
7. What two things must happen for a solar eclipse to occur? Why don't these two things happen every month?

## Advanced

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8. Use the Extra Options feature to change the tilt of the Moon's orbit and describe what eclipse cycle when the tilt is changed. When do eclipses occur when the tilt is zero? When the tilt is 90 degrees? Estimate the length of time that eclipses last in these two extreme cases? Note that the yellow and red rays are only accurate for the default 5.145 degrees tilt.