

Name: \_\_\_\_\_

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## Modeling the Sun-Moon-Earth System Assessment

### Total Solar Eclipses and the Moon

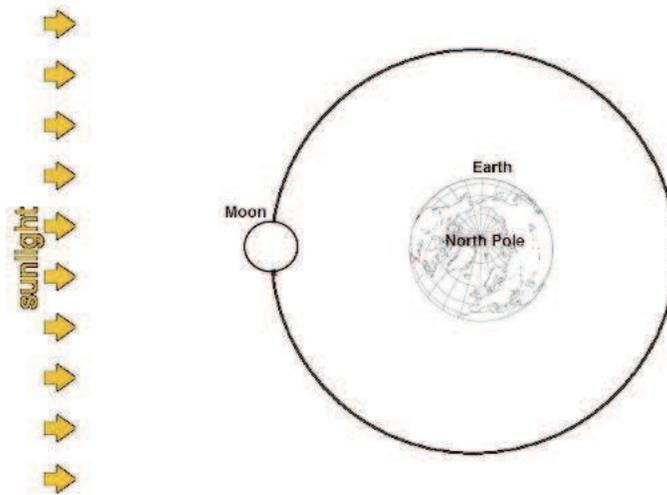
Since 2010, there have been 10 total solar eclipses viewable from Earth. A total solar eclipse occurs when light from the Sun is blocked out by the Moon-- usually for a couple of minutes--making everything dark.



Here are the dates of the eclipses and the stage of the Moon during each total solar eclipse.

Date of Total solar eclipse	Stage of the Moon
July 11, 2010	new Moon
November 13, 2012	new Moon
March 20, 2015	new Moon
March 9, 2016	new Moon
August 21, 2017	new Moon
July 2, 2019	new Moon
December 14, 2020	new Moon

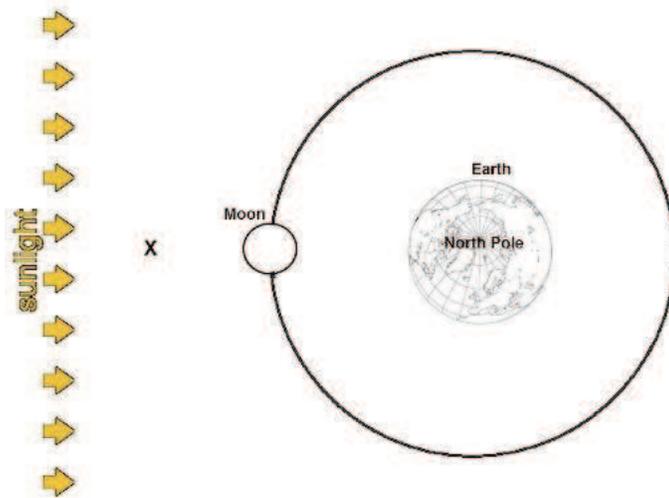
The data show that a total solar eclipse always happens when the Moon is new, as in the diagram below.



1. Add to this model to show where the Sun's light would be shining on both the Moon and Earth given their positions in the system.

2. Describe using pictures and words what portion of the Moon, if any, a person on Earth would be able to see an hour before the solar eclipse and why it would look that way.

3. Describe using pictures and words what the Moon would look like if you were in a spacecraft floating between the Moon and the Sun (in the location of the X below) and why it would look that way.



4. A full Moon will appear to be a fully lit circle from Earth, while no part of the Moon is visible from Earth when it is a new Moon. Use the model of the Sun-Moon-Earth system to explain why total solar eclipses only occur when the phase of the Moon is a new Moon.

**The following questions are nongraded. Share your current thinking. You may explain your thinking in words and pictures.**

- In a solar eclipse the Moon passes between the Sun and a place on Earth from which someone can see the eclipse. Do you think the Moon could ever cross in front of any of the stars in the night sky so that it blocks their light from reaching a place on Earth? Why or why not?
  
- A fundamental part of our Earth-Sun-Moon system models has been the orbit of the Moon around Earth and of Earth around the Sun . If the Moon did not move around Earth, there would be no lunar phases and no eclipses. Why do you think the Moon and other objects in the sky move the way they do? How long do you think they will keep moving this way? Why?