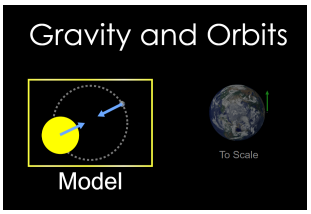
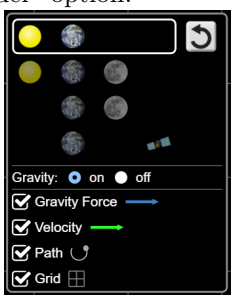
Name: Date: Period:

Orbital Motion PhET Lab

Go to `https://phet.colorado.edu/en/simulation/gravity-and-orbits`. Click on the "Play" button on the picture once on the appropriate page. When open, click on the picture for the "model" option.





1. For the first demo you should have a simple Sun-Earth system (the first option). Check "on" boxes for "gravity force," "velocity," "path," and "grid." Then click "play."
   (a) What force acting on the planet causes the centripetal force for this situation (think of forces we've talked about)?

   (b) If you look carefully, the Earth's path is not perfectly circular. You can tell by using the grid to help. This oblong circle shape is known as an *ellipse*. Explain why you think this orbit is not a perfect circle.

   (c) Adjust the velocity of the Earth by increasing and decreasing its velocity arrow. Explain how this changes its motion around the Sun.

   (d) Increase the mass of the Sun to "1.5" and describe how and why the path of the Earth changes.

   (e) While the Earth is orbiting the Sun, switch gravity to "off" and explain how and why Earth's path changes.

2. Click "reset" and switch to the Sun-Earth-Moon system. Make sure to turn back on the four checkboxes.
   (a) Allow the moon and earth to orbit for a little bit. Then, without stopping the animation, turn gravity "off" and explain the motion of both the Earth and the Moon.

   (b) Reset the Earth and Moon, and then drag the Moon away from the Earth. Can you make it orbit the Sun instead? Adjust velocity if needed. What differences do you see about the force of gravity on the Moon?

3. Click "reset" and select the Earth-Moon system.
   (a) Increase the mass of the Moon to "2" and click "play." Explain what you notice about the motion of the Moon and the Earth.

   (b) The moon isn't the only thing moving. The earth moves, too. Why is this? (*Think about Newton's Laws.*)