**Name:**

**Kepler’s Laws and Orbits: PhET Simulation—Google “Gravity and Orbits Phet”**

1. Is the orbit of a planet circular?

* Press the TO SCALE option at the bottom of the screen with only the star and planet chosen
* Turn on the path/grid option ON
* Allow the planet to move through one full orbit
* Turn on the measuring tape from the tool bar
* Measure the horizontal distance from the path line on the left of the star. Write the measurement in the table below
* Now do the same from the star to the path line on the right hand side.

|  |  |
| --- | --- |
|  |  Distance (miles) |
| Left side from path to star |  |
| Right side from path to star |  |

What do you notice about these distances? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which of Kepler’s Laws does this relate to? State the law.

2. Linking planetary orbits to Kepler’s Laws

* Leave the TO SCALE and open MODEL
* Click on sun and planet
* Turn path, gravity, and velocity ON
* Press play and immediately pause after one full orbit

What holds the planet in the orbit? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Turn ON the gravity force button

What direction do the forces face? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Turn the gravity (not gravity force) OFF

What happened to the planets and why?

* Increase the red velocity arrow very slightly in length
* Run simulation and observe

Did the planets orbit change in any way? If so, how?

* Increase the red velocity arrow substantially
* Run simulation and observe

What happened to the planet in orbit?

* Decrease the red velocity arrow substantially
* Run simulation and observe

How did the orbit of the planet change?

Can this be explained in terms of velocity and gravity?

* Make sure the only thing selected is the path and grid
* Hold the graph paper to the screen and draw the sun in the center of the paper
* Run in slow motion, pausing every 30 days and indicating the placement of the planet
* Once each month has been marked, mark the orbit path and draw a straight line from each planet to the sun
* Count the grid boxes within each month period

How do the areas covered during each month compare?

Which of Kepler’s Laws does this pertain to? State the law.