**Motion Due to Gravity:** Although gravity is the weakest of the known forces, it dominates the Universe on large scales. The sub-atomic “strong” and “weak” forces work only over very small distances, and the electromagnetic force is weak because most mass in the Universe is electrically neutral. Understanding gravity is essential to understanding the Universe.

In the exploration, use the NAAP *Planetary Orbit Simulator* available from the University of Nebraska Lincoln at: <http://astro.unl.edu/naap/pos/animations/>.

**Part 3: Kepler’s Third Law *–*** Explore the relationship between a planet’s orbital period and its semi-major axis. The relationship is known as Kepler’s Third Law. The graph plots the orbital period (p) as a function of semi-major axis. Click the “up/down” buttons to explore what mathematical relationship that will fit the orbits of planets in the Solar System.

* Use the “clear optional features” button to remove the 2nd Law features.
* Open the Kepler's 3rd Law tab.

1. Use the simulator to complete the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Object** | **P (years)** | **a (AU)** | **e** | **P2** | **a3** |
| Earth |  | 1.00 |  |  |  |
| Mars |  | 1.52 |  |  |  |
| Ceres |  | 2.77 | 0.08 |  |  |
| Chiron | 50.7 |  | 0.38 |  |  |

1. As the size of a planet’s orbit increases, what happens to its period?
2. Start with the Earth’s orbit and change the eccentricity to 0.6. Does changing the eccentricity change the period of the planet?