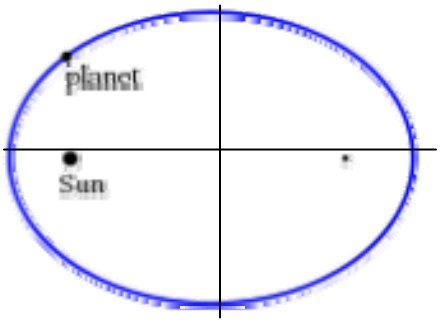
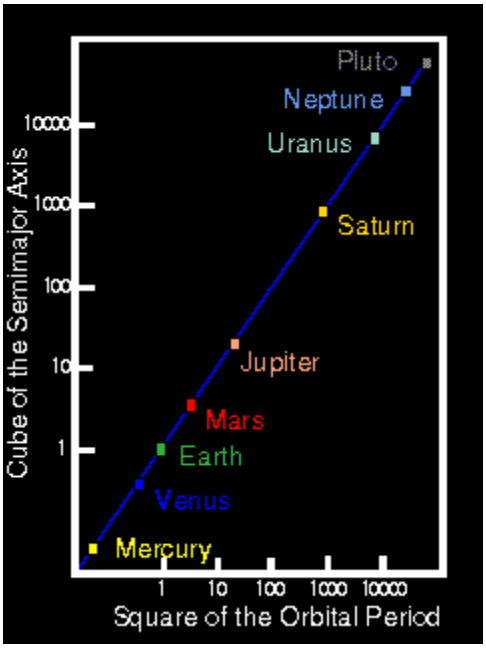
Kepler's First Law. Planets orbit in ellipses, with the Sun at one focus.

Kepler's Second Law. The line from the planet to the Sun sweeps out equal areas in equal periods of time. Simply, closer you are to the Sun, perihelion, the faster you move in your orbit. Conservation of angular momentum

Kepler's Third Law. The ratio of the square of the period, T (the amount of time to compete one full orbit), and the cube of the semi-major axis, a, of the orbit is the same for all planets in our solar system. When T is measured in years, and "a" in astronomical units, AU (1 AU is the average distance from the Earth to the Sun, 93,000,000 miles), then Kepler's Third Law is expressed as

$$T^2 = a^3$$





Object	Period T (Earth Years)	a (AU)
Mercury	0.241	
Venus	0.616	
Earth	**1**	**1**
Mars		1.524
Jupiter		5.203
Saturn	29.5	
Uranus	84	
Neptune	165	
Pluto		39.457
Haley's Comet	76	

Directions:
1. Complete the chart by calculation either T or a. Show calculations on back.

2. Plot a^3 vs T^2 and obtain a graph as above:

- Mercury, Venus, Earth, Mars, and Jupiter
- B) Saturn, Haley's comet, Uranus, Neptune, and Pluto.

Questions:

1. How does your graph relate to Kepler's 3rd Law?

2. State Kepler's 3rd Law in one sentence.

3. How does the conservation of angular momentum apply to Kepler's 2nd Law?