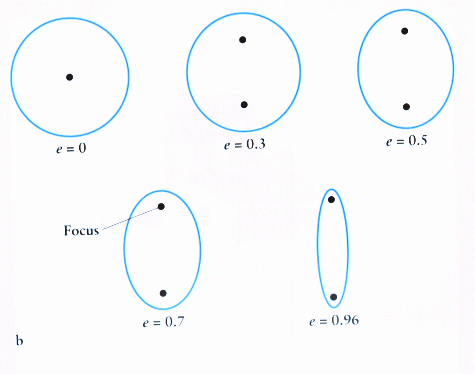
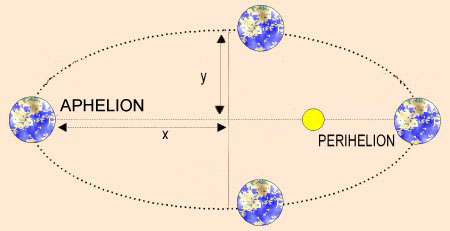
**The Solar System: Laws of Planetary Motion and Universal Gravitation**

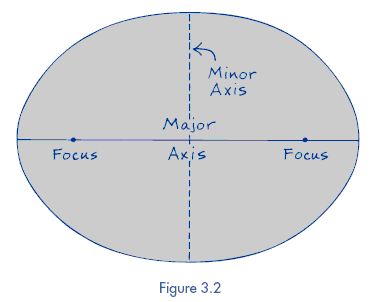
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**Kepler’s 3 Laws of Planetary Motion:**

**First Law: Law of Elliptical Orbits**

All celestial objects have \_\_\_\_\_\_\_\_\_\_\_\_\_\_ orbits, in which they have \_\_\_\_\_\_ focal points. The \_\_\_\_\_\_\_\_\_\_\_\_ is always one of the foci.

* Eccentricity is numerically how stretched out the planet’s orbit is. The further the focal points are in an ellipse, what happens to the **eccentricity**?\_\_\_\_\_\_\_\_\_\_\_
* What happens to the **shape**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Aphelion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Perihelion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How do we calculate eccentricity? Found on page 1 of the ESRT

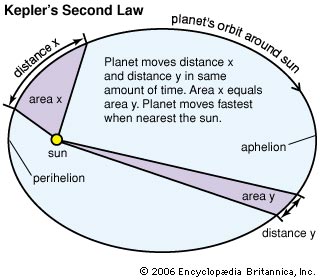
Eccentricity = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The major axis should always run through the \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Range for Eccentricity: \_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_

0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1: \_\_\_\_\_\_\_\_\_\_\_\_\_ -neither exist!

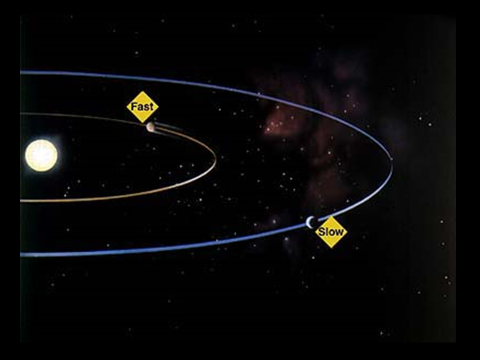
Which planet has the lowest eccentricity and of what value? \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_

Which planet has the greatest eccentricity and of what value? \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2nd Law of Motion: Varying Velocities**

* Speed will \_\_\_\_\_\_\_\_\_\_\_\_ as distance to the sun decreases (because gravity increases)
* When is earth moving the fastest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Slowest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Equal areas** of an ellipse will be covered in **equal amounts of time.** When a planet moves *slower*, it covers less *distance* along the orbital path, but an *equal area* of the orbit itself.

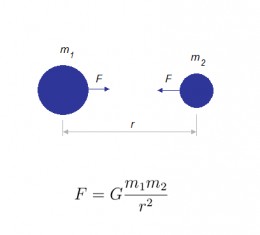
**3rd Law of Motion: Harmonic Law**

The further a planet is from the sun, the \_\_\_\_\_\_\_\_\_\_\_\_\_ its period of revolution

**Newton’s Law of Universal Gravitation**

**The gravitational strength between two bodies is due to the following two variables:**



**For mass (m), it states:**

**Simplified:**

**G=**

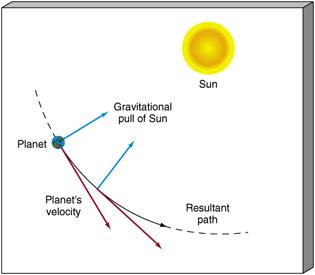
**For distance(r), it states:**

**Simplified:**

**Equation relationships: So if the mass of earth were to double….**

**Mass: G=**

**Distance: G= If the distance between the earth and sun were to double…**

**A planets orbit is the balance between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (velocity in a straight line motion) and \_\_\_\_\_\_\_\_\_\_\_ (inwards).**

**If the sun were to suddenly disappear, towards which direction would earth move in the diagram?**