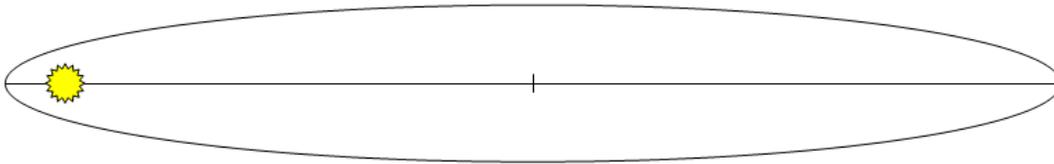


4. You seal a sample of pure radioactive Unobtainium-123 into a jar and leave it alone for 24 years. After 24 years you open the jar and find that $\frac{3}{4}$ of the Unobtainium has decayed into a stable isotope of Illudium. What is the half-life of Unobtainium-123?

5. A new comet has been discovered far out in the Solar System. The semimajor axis of its long elliptical orbit around the Sun is 100 AU. Its perihelion distance is 1 AU. Answer the following questions:

- a. On the figure below, label perihelion, aphelion, and the semi-major axis:



- b. What is the comet's aphelion distance in AU?
- c. How long will this comet take to complete one orbit around the Sun?
- d. How much faster does the comet move at perihelion compared to when it is at aphelion (hint: use Newton's version of Kepler's 2nd Law)?