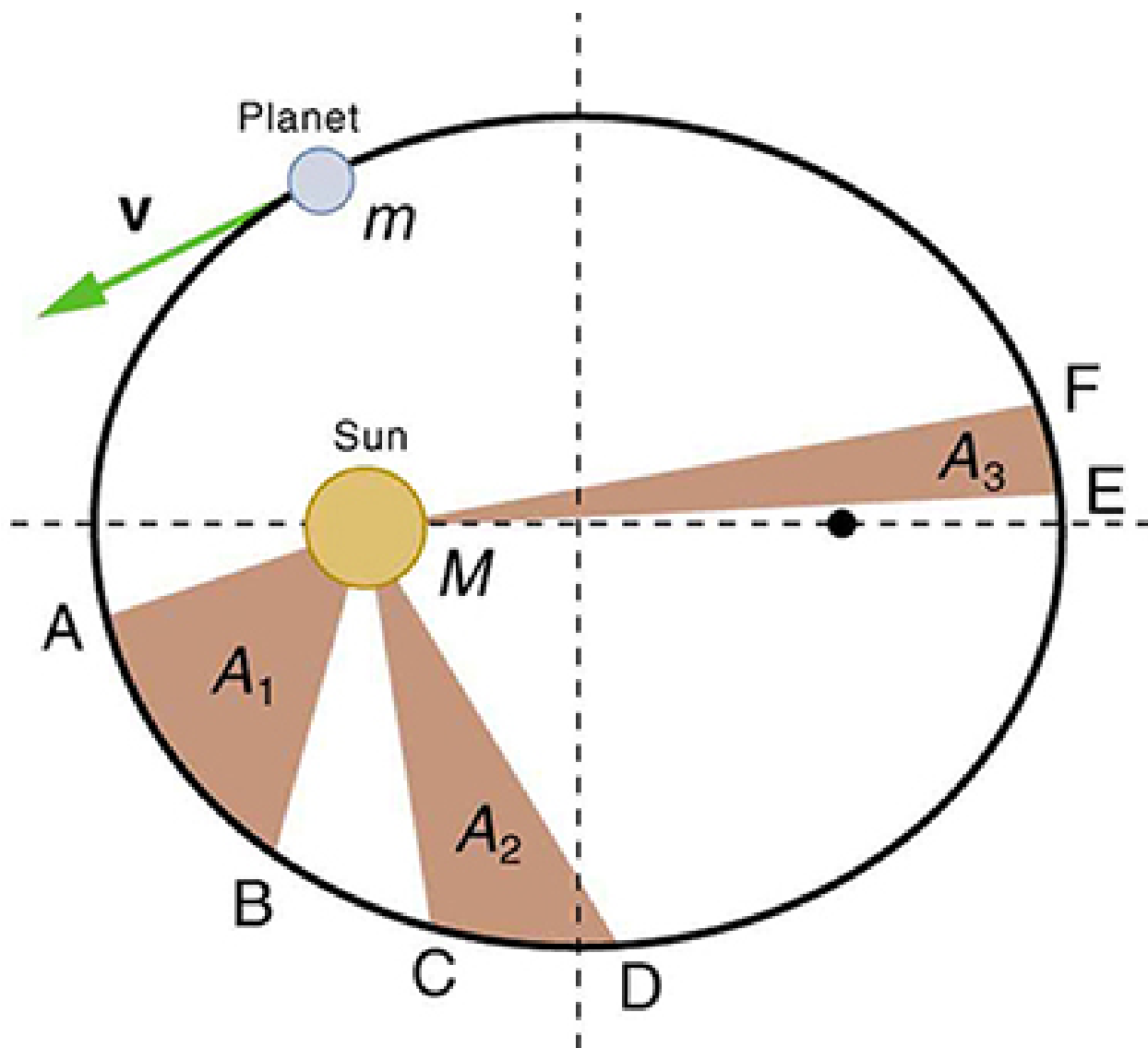**Critical Thinking Items**

7.1 Kepler's Laws of Planetary Motion   11.

In the figure, the time it takes for the planet to go from A to B, C to D, and E to F is the same.

Compare the areas A_1, A_2, and A_3 in terms of size.

    a. A_1 A_2 A_3
    b. $A_1 = A_2 = A_3$
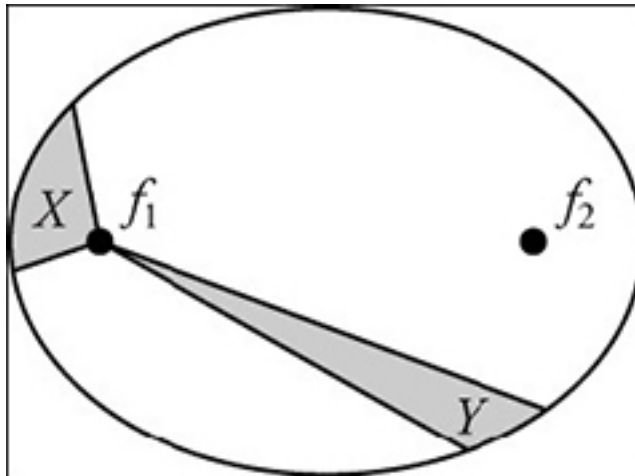   c. $A_1 = A_2 > A_3$

d. $A_1 > A_2 = A_3$

12.

A moon orbits a planet in an elliptical orbit. The foci of the ellipse are 50, 000 km apart. The closest approach of the moon to the planet is 400, 000 km. What is the length of the major axis of the orbit?

    a. 400, 000 km
    b. 450, 000, km
    c. 800, 000 km
    d. 850, 000 km

13.

In this figure, if f_1 represents the parent body, which set of statements holds true?

    a. Area X < Area Y; the speed is greater for area X.
    b. Area X > Area Y; the speed is greater for area Y.
    c. Area X = Area Y; the speed is greater for area X.
    d. Area X = Area Y; the speed is greater for area Y.

7.2 Newton's Law of Universal Gravitation and Einstein's Theory of General Relativity   14.

Rhea, with a radius of 7.63×10^5 m, is the second-largest moon of the planet Saturn. If the mass of Rhea is 2.31×10^{21} kg, what is the acceleration due to gravity on the surface of this moon?

    a. 2.65×10^{-1} m/s
    b. 2.02×10^5 m/s
    c. 2.65×10^{-1} m/s^2
    d. 2.02×10^5 m/s^2

15.

Earth has a mass of 5.971×10^{24} kg and a radius of 6.371×10^6 m. Use the data to check the value of the gravitational constant.

    a. 6.66×10^{-11} $\frac{\text{N} \cdot \text{m}}{\text{kg}^2}$, it matches the value of the gravitational constant G.

    b. 1.05×10^{-17} $\frac{\text{N} \cdot \text{m}}{\text{kg}^2}$, it matches the value of the gravitational constant G.

    c. 6.66×10^{-11} $\frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$, it matches the value of the gravitational constant G.

    d. 1.05×10^{-17} $\frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$, it matches the value of the gravitational constant G.

16.

The orbit of the planet Mercury has a period of 88.0 days and an average radius of 5.791×10^{10} m. What is the mass of the sun?

    a. 3.43×10^{19} kg

    b. 1.99×10^{30} kg

    c. 2.56×10^{29} kg

    d. 1.48×10^{40} kg