Related to Lecture Tutorial: Kepler’s Third Law, p. 25

1) Consider an imaginary solar system which has a huge Jupiter-like planet, Moto, in orbit close to a Sun-sized star and a small Earth-like planet, in orbit much farther away. Which of the two planets do you think will have the shorter orbital period (moves around the star in the least amount of time)? (Circle one.)

   Moto Spec

Why?

5) increase decrease stay the same (Circle one.)

6) 

7) 

8) a) b) c) d) (Circle one.)

10) a) b) c) d) (Circle one.)

Explain your choice.
Calculations:

A. Suppose a newly discovered planet orbits a distant star with the same mass as our Sun at an average distance of 512 million km.
(a) Find the distance from the star in AU. [1 AU = 150 million km]

(b) Find the orbital period of the planet.

Kepler’s Third Law

\[ \left( \frac{R}{1 \text{ AU}} \right)^3 = \left( \frac{M}{M_{\text{sun}}} \right) \left( \frac{P}{1 \text{ year}} \right)^2 \]

(c) Suppose that another newly discovered planet orbits a different star at the same distance, but this star has a mass that is 3 times the mass of our sun \([= 3M_{\text{sun}}]\). Find the orbital period of the planet.

(d) **Bonus.** Suppose that a third newly discovered planet orbits a third star with the period calculated in part (b), but this star has a mass that is 3 times the mass of our sun \([= 3M_{\text{sun}}]\). Find the average distance from the planet to the star.