

Q- A distant star has two planets following circular orbits about the star with one planet four times the distance from the star as the other planet. If the planet closer to the star has a period of 2 years, determine the period of the planet farther from the star.

According to Kepler's law for planetary motion if T is the time period and r is the distance of the planet from the center of the star then

$$T^2 \propto r^3$$

Hence for the two stars we have

$$\frac{T_1^2}{T_2^2} = \frac{r_1^3}{r_2^3}$$

Hence if the distance from the star of the second planet r_2 is r then for first star it will be $r_1 = 4r$. Substituting the values we have

$$\frac{T_1^2}{T_2^2} = \frac{(4r)^3}{r^3} = 64$$

Or $T_1^2 = 64 * T_2^2 = 64 * 4 = 256$

Gives $T_1 = 16$ years.