

1. Planet x is 265 earth orbital radii from the sun, what is the period of revolution in earth year?

Solution

According to the third Kepler's law we have:

$$\frac{P_{\text{planet}}^2}{a_{\text{planet}}^3} = \frac{P_{\text{earth}}^2}{a_{\text{earth}}^3}$$

Where

$$P_{\text{planet}}, P_{\text{earth}}, a_{\text{planet}}, a_{\text{earth}}$$

are the orbital period of planet, orbital period of Earth, radius of planet's orbit and radius of orbit of Earth.

We have

$$a_{\text{planet}} = 265a.u.$$

$$P_{\text{earth}} = 1 \textit{ year}$$

$$a_{\text{earth}} = 1a.u.$$

where a.u. is the astronomical unit (distance between Sun-Earth)

Hence we have

$$P_{\text{planet}} = P_{\text{earth}} \sqrt{\frac{a_{\text{planet}}^3}{a_{\text{earth}}^3}} = \sqrt{265^3} \text{ years} \approx 431389 \text{ years}$$

Answer:

Revolution period is

$$P_{\text{planet}} \approx 431389 \text{ years}$$