

Answer on question #54975, Physics / Astronomy — Astrophysics

Question Consider a Sun-like star, which is orbited by a planet with a period of 80 years. If the separation of the star and the planet appears to be 20 arc seconds, how far away is the star?

Solution First we find distance between star and planet from Kepler's law:

$$\frac{T_1^2}{a_1^3} = \frac{T_2^2}{a_2^3}$$

$$sa_2 = a_1 \left(\frac{T_2}{T_1} \right)^{2/3} = 1a.u. \cdot 80^{2/3} \approx 18.57a.u.$$

If 18.57 a.u. are 20 arcsecs, then distance is

$$d = a_2 \cdot \frac{1rad}{20arcsec} = \frac{18.57}{9.7 \cdot 10^{-5}} \approx 1.9 \cdot 10^5 a.u.$$