Answer on Question #45874 – Physics – Astronomy | Astrophysics

For solving this problem we need 3rd reduced Kepler's law: if there is two planets are rotating around the same star, we can express ratio between mean distances planet-star and its' orbital period for them

$$\frac{D^3{}_{m1}}{D^3{}_{m2}} = \frac{T^2{}_1}{T^2{}_2} \qquad (1)$$

Where T – period, D_m – mean distance planet-star. For Mars we get

$$D_M = 1 + D_{Mars-Earth} = 1 + 0.5 = 1.5\ a.u.$$

For Jupiter

$$D_J = 1 + D_{Jupiter-Earth} = 1 + 4 = 5\ a.u.$$

Transforming formula (1)

$$T_j = T_j \sqrt{\frac{D^3{}_J}{D^3{}_M}} = 687 \times \sqrt{\frac{125}{3.375}} = 687 \times 6.086 = 4181.08\ days$$