7. Kepler's Third Law states that the cube of the radius is proportional to the square of the period. This means that the quantity T^2 / r^3 is a constant. This allows us to equate one set of such values for an orbit about the Sun to another set of values or

$$T_1^2 / r_1^3 = T_2^2 / r_2^3$$

We multiply both sides of the equation by r_1^2 to obtain T_1^2 alone

$$T_1^2 = (T_2^2)(r_1^3) / (r_2^3)$$

$$T_1^2 = (T_2^2)(r_1 / r_2)^3$$

$$T_1^2 = (1\text{ yr})^2 \left[(2 \times 1.5 \times 10^{11}\text{ m}) / (1.5 \times 10^{11}\text{ m})\right]^3$$

$$T_1^2 = 1\text{ yr}^2 [2]^3 = 8\text{ yr}^2$$

We now take the square root of both sides of the equation to obtain the time for the orbit as

$$T_1 = 2.83\text{ yr}$$

Thus it would take 2.83 years for a planet located at twice the distance from the Sun that the Earth is located to complete one rotation about the Sun.