The period of the dwarf planet can be found utilizing Kepler's Third Law. The force of gravity on an object is given by:

$$F = G\frac{Mm}{R^2}$$

Where *M* and *m* are the masses of the two interacting objects and *R* is the distance between them. Here, assume *M* is the mass of the star being orbited by the asteroid and dwarf planet.

We also know the orbits are circular, so:

$$F = ma = m\frac{v^2}{R}, \text{ with } v = \frac{2\pi R}{T}$$

Then $F = \frac{4\pi^2 mR}{T^2} = G\frac{Mm}{R^2}$

Rearranging this equation, we find that $\frac{R^3}{T^2} = \frac{GM}{4\pi^2}$

This is the basis of Kepler's Third Law. Because both the asteroid and dwarf planet orbit the same mass *M*, then the ratio of the cube of the radius to the square of the period is constant.

$$\frac{R_A^3}{T_A^2} = \frac{R_{DP}^3}{T_{DP}^2}$$

We know that $R_{DP} = bR_A$, so $T_{DP} = b^{3/2}T$