

Increase the Mass of the Sun

Now the mass of the sun is to be increased without changing the Newtonian orbit. Since the perihelion does not change, the following expressions for r_p are equal to one another:

$$r_{p0} = \frac{1}{2} \frac{k_0}{|E_0|} (1 - e_0)$$

Eq 43:

$$r_p = \frac{1}{2} \frac{k}{|E|} (1 - e)$$

Consequently, since the two eccentricities must also be equal:

Eq 44:
$$E = \frac{k}{k_0} E_0$$

Once the new value for E has been set, the requirement that the eccentricity be unchanged leads to the equations shown below.

$$1 + \frac{2l_0^2 E_0}{k_0^2 m_0} = 1 + \frac{2l^2 E}{k^2 m}$$

Eq 45:

$$\Rightarrow l = \left(\frac{km}{k_0 m_0} \right)^{1/2} l_0$$

Eq 44 and Eq 45 are used in the worksheet.