# Problem 9.36

Determine the *center of mass* of the earth/moon system.

The *center of mass* relationship in this one-dimensional situation asks you to determine the *x-coordinate* of a mass in the system, then multiply that coordinate by the mass itself. Weight all the coordinates in this way, sum up the products, then divide by the total mass in the system. Doing this for this situation yields:

m_e

m_m

$x_e = 0$

$x_m = 3.84x10^8$ m
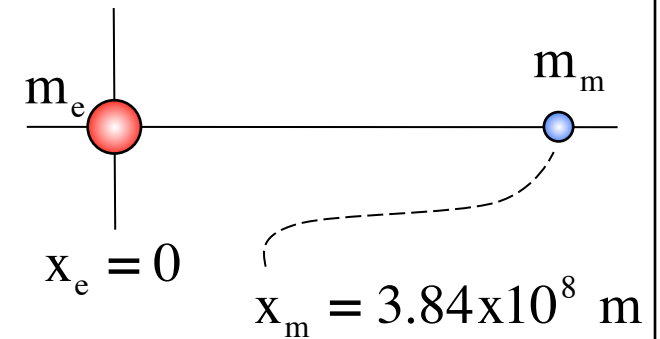
$$x_{cm} = \frac{\sum m_i x_i}{m_{total}}$$

$$= \frac{m_e x_e + m_m x_m}{m_e + m_m}$$

$$= \frac{\left(5.97x10^{24} \text{ kg}\right)\left(0 \text{ m}\right) + \left(7.35x10^{22} \text{ kg}\right)\left(3.84x10^8 \text{ m}\right)}{\left(5.97x10^{24} \text{ kg}\right) + \left(7.35x10^{22} \text{ kg}\right)}$$

$$= 4.76x10^6 \text{ m} \qquad \text{(this is from the earth's center)}$$