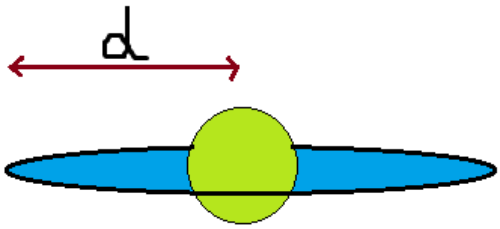
Answer on Question #74585, Physics / Mechanics | Relativity

Assuming that the earth momentum is at a distance 3.82 x 10^8 m away from the centre of the earth, calculate it's linear speed and it's period of orbit motion round the earth.

Solution:

d = 3.82 x 10^8 m
$M_{centre} = M_{Erth}$ = 5.98 x 10^{24} kg
G = 6.67 x 10^{-11} N m^2/kg^2



We will begin by determining the orbital speed using the following equation:

$$v = \sqrt{\frac{GM_{cen}}{d}}$$

$$v = \sqrt{\frac{6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{3.82 \times 10^{8}}} = 1.02 \times 10^{3}\ m/s$$

Finally, the period can be calculated using the following equation

$$\frac{T^2}{R^3} = \frac{4\pi^2}{GM_{cen}}$$

So,

$$T = \sqrt{\frac{4\pi^2 \times (3.82 \times 10^{8})^3}{6.67 \times 10^{-11} \times 5.98 \times 10^{24}}} = 2.35 \times 10^{6}\ s$$

Answer: $\mathbf{1.02 \times 10^3 \frac{m}{s}}$ ***and*** $\mathbf{2.35 \times 10^6\ s}$