Task:

The acceleration of moon with respect to earth is 0.0027 $\frac{m}{s^2}$ and the acceleration of an apple falling on earth surface is about 10 $\frac{m}{s^2}$. Assume that the radius of the moon is one fourth of the earth's radius .if the moon is stopped for an instant an then released , it will fall towards the earth.

1. What is the initial acceleration of the moon towards the earth
2. The acceleration of the moon just before it strikes the earth?

Solution:

$$F_{gravitational} = G\frac{m_1 m_2}{d^2}$$

Gravitational acceleration with respect to Earth *is* $G\frac{M}{d^2}$, where

$G -$ gravitational constant

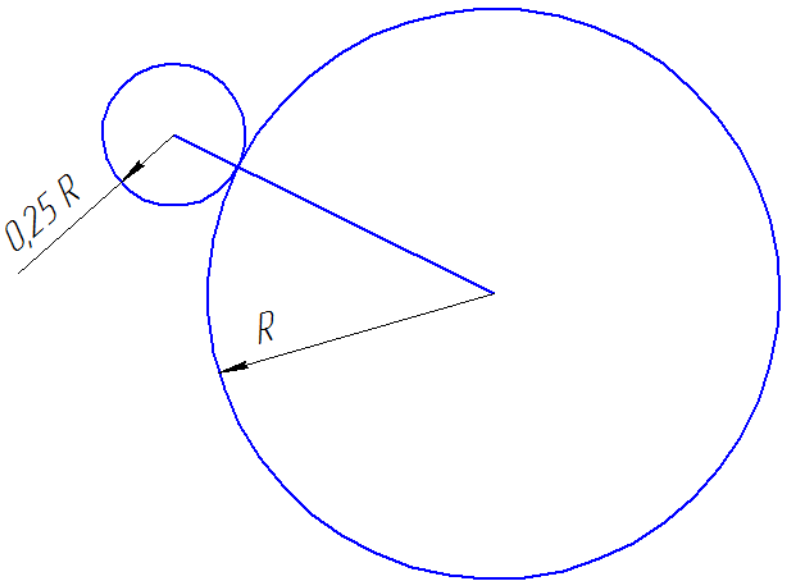
$M -$ mass of the Earth

$d -$ distance from the center of the Earth to the center of the object

Given:

$G\frac{M}{\rho^2} = 0.0027\frac{m}{s^2}$, where ρ is the distance between Earth and Moon

$G\frac{M}{R^2} = 10\frac{m}{s^2}$, where R is the radius of the Earth



When the Moon is just about to strike the Earth

$$G\frac{M}{d^2} = G\frac{M}{(R+0.25R)^2} = \frac{G\frac{M}{R^2}}{1.5625} = \frac{10\frac{m}{s^2}}{1.5625} = 6.4\ \frac{m}{s^2}$$

Answer:

1. $G\frac{M}{\rho^2} = 0.0027\frac{m}{s^2}$
2. $G\frac{M}{d^2} = 6.4\ \frac{m}{s^2}$