Acceleration of Moon /g

To calculate acceleration \( a_M \) of Moon towards Earth & to compare \( a_M \) with \( g = 9.8 \text{ m/sec}^2 \)

Need
- \( R_E = 6.37 \times 10^6 \text{ m} \): Radius of Earth
- \( R_{EM} = 3.84 \times 10^8 \text{ m} \): Earth-Moon Distance
- \( T_M = 27.3 \text{ days} \): Period of Moon
- \( \omega = 2.36 \times 10^{-6} \text{ rad/sec} \) or \( 2.36 \times 10^{-3} \text{ rad/day} \)

[Note: Mass of Moon is NOT needed, since formula provides acceleration which is independent of mass (Galileo!)]

\[
a_M = \left( \frac{UM}{R_E} \right)^2 = \left( \frac{2\pi R_{EM}}{T_M^2} \right)^2 \frac{R_{EM}}{R_{EM}} (2.36 \times 10^{-3})^2 = 2.72 \times 10^{-3} \text{ m/sec}^2
\]

\[
8 \frac{g}{a_M} = \frac{10}{2.72 \times 10^{-3}} = 5.60 \times 10^3 = 5600
\]

\[
8 \frac{g}{a_M} = \left( \frac{R_{EM}}{R_E} \right)^2 = (60)^2 = 3600.
\]