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F6 Gravity and Orbits

Mass of Earth = 5.98×10^{24} kg

Radius of Earth = 6400 km

- F6.1 The Earth takes a year to go round the Sun on an orbit with a radius of 1.50×10^{11} m. Calculate the Sun's mass.
- F6.2 Calculate the orbital time period for a planet going round the Sun in an orbit of radius twice that of Earth.
- F6.3 Calculate the height above the surface of the Earth of an orbit with a 24 hour time period.
- F6.4 The Moon's orbit round the Earth has a radius of 3.8×10^8 m. Calculate the Moon's speed in its orbit.
- F6.5
 - a) If you want something to orbit the Earth at a height of 200 km above the surface, at what speed must it travel?
 - b) What is the time period of the orbit?
- F6.6
 - a) Starting from $F = \frac{GMm}{r^2}$ and $F = \frac{mv^2}{r}$, derive Kepler's 3rd Law relating the radius of an orbit r to the mass of the planet M and the orbital speed v .
 - b) Repeating this analysis, relate r and M to the period T .