# CENTRIPETAL FORCE FROM GRAVITY

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## *China's Space Station May Crash to Earth on April Fools' Day*

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**INTRODUCTION:** **This Chinese space station was held in orbit by earth's gravitational force.** $F_{CENTRIPETAL} = m V^2/R = GmM/R^2$ **where** $V = R\omega = R\ 2\pi f = R\ 2\ \pi/T$ **, Thus,** $R^2\ 4\ \pi^2/T^2R = G\ M/R^2$ **,** $[4\ \pi^2/G]\ (R^3/T^2) = M_{EARTH}$
**In this application you will find the mass of earth using R & T Of this Chinese space station.**

**QUESTIONS:** **(a) Find the period T(in seconds) of this salellite with info below( f = 16 rev./day), (b) Find height of space station (h) above earth's surface in meters?, (c) R(from center of earth) of space station is =** $R_{EARTH}$ **+ h ? (d) Find** $M_{EARTH}$ **with :T & R for this Chinese space station?**

**HINTS:** **3600 s = 1 hr., 24 hrs./day,, 1.61 km./mile,** $R_{EARTH} = 6.371 \times 10^6$ **M.**

A rocket carrying China's first space station, Tiangong-1, lifted off on Sept. 29, 2011. China lost control of the station about two years ago.

The sky is falling. Again. **China's first space station, Tiangong-1, abandoned** and out of control, is expected to drop out of orbit around this weekend, with pieces of it likely to survive the fiery re-entry and crash somewhere on Earth.

Don't worry.According to space debris experts, the chances that you personally will be hit by of a chunk of space metal are essentially zero — less than one in a trillion."It's really very, very, very tiny odds," said Andrew Abraham, an analyst leading efforts to track and predict the demise of the space station at the Aerospace Corporation, a nonprofit that performs research and analysis for the United States Air Force. "I certainly would worry about things like crossing the street far more than debris from Tiangong."Tim Flohrer, a space debris analyst at the European Space Agency, said the risk is "significantly smaller than being hit by lightning."For people north of 42.7 degrees north latitude — that includes the residents of Seattle, Britain and almost all of Russia — the odds are even better: exactly zero. That's because the orbit of Tiangong-1 never passes that far north. The same is true for regions south of 42.7 degrees south latitude, but that part is almost entirely unpopulated except for the tip of South America, the bottom part of New Zealand and a few scattered scientific research stations on Antarctica.The European Space Agency just updated its forecast for Tiangong-1's demise, pinpointing its fall anytime from this Friday to next Monday.Aerospace offers a similar prediction: Sunday, give or take a couple of days.The projections have remained steady in recent days, with uncertainties shrinking. Still, it is impossible to determine where the station, which is **currently circling the Earth 16 times a day,** will come down. Experts will not have a good idea until the final hours. China launched Tiangong-1 — Tiangong translates as "heavenly palace" — in 2011 as essentially a proof-of-concept of technologies for future larger stations. It weighs close to 19,000 pounds and consists of two modules; one including sleeping quarters for two and the other housing thrusters, life support systems and solar panels.

**HINTS(con.)** $G = 6.67 \times 10^{-11}\ N\ m^2/N$ **,** $\pi = 3.1416$**,**

**ANSWERS:** **(a)** $T = 5.4 \times 10^3$ **s., (b)** $h = 2.08 \times 10^5$ **m., (c)** $R = 6.58 \times 10^6$ **m., (d)** $M_{EARTH} = \sim 6.354 \times 10^{24}$ **kg., COMMENT: NASA lists mass of earth as** $\sim 6 \times 10^{24}$ **kg., thus, using this chinese space station's R & T caused you to get** $M_{EARTH}$ **WHICH IS VERY CLOSE TO NASA NUMBER FOR EARTH MASS.**

This illustration shows Tiangong-1 in orbit. Even though this station is crashing toward earth, a successor, Tiangong-2, remains in orbit, and China is planning a third larger one. China originally planned to use the thrusters to guide Tiangong-1 to splash harmlessly into an ocean. But in 2016, an apparent malfunction ended communications with the spacecraft. (The Chinese have not been very forthcoming about that, either.)Since then, Tiangong-1 has gradually been dropping lower and lower as it rubs up against the wisps of the upper atmosphere. On Monday**, it was at an altitude of about 130 miles**, dropping more than a mile every day, and its descent is accelerating.It's difficult to make exact predictions; the atmosphere puffs up and deflates depending on the barrage of particles in the solar wind and how that phenomenon speeds or slows the rate of falling. If a calculation is off by half an hour, the predicted impact site could be on the other side of the planet. Earlier this month, a solar storm appears to have moved up the timetable for the crash by a few hours.