CENTRIPETAL FORCE & GRAVITATION

Unit 14 & 8 Dr John P. Cise

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Ninth Planet May Exist Beyond Pluto, Scientists Report

An artist's impression of a possible ninth planet. It would be quite large — at least as big as Earth — with a thick atmosphere around a rocky cor

INTRODUCTION: **The purpose of this application is to compute Mass of our sun using Kepler's third law with estimates of this 9th planet's period (T) and radius of orbit (R) around our sun. From the article below the average R = 60 X 10^9 miles and average period (T) is 15,000 years.**

HINTS: **Kepler's 3rd. Law: M =$(4\pi^2/G)[R^3/T^2]$**
G = 6.67 X 10^{-11} N $m^2/kg.^2$, 1610 m./mile
365 days/yr., 24 hrs./day, 3600 s./hr.

QUESTIONS: **(a) Convert 60 Billion miles to meters? (b) Convert 15,000 yrs. to seconds?**

There might be a ninth planet in the solar system after all, and it is not Pluto.

Two astronomers reported on Wednesday that they had compelling signs of something bigger and farther away — something that would satisfy the current definition of a planet, where Pluto falls short. "We are pretty sure there's one out there," said Michael E. Brown, a professor of planetary astronomy at the California Institute of Technology. What Dr. Brown and a fellow Caltech professor, Konstantin Batygin, have not done is actually find that planet, so it would be premature to start revising mnemonics of the planets. a paper published in The Astronomical Journal, Dr. Brown and Dr. Batygin laid out a detailed circumstantial argument for the planet's existence in what astronomers have observed: a half-dozen small bodies in distant elliptical orbits. What is striking, the scientists said, is that the orbits of all six loop outward in the same quadrant of the solar system and are tilted at about the same angle. The odds of that happening by chance are about 1 in 14,000, Dr. Batygin said.A ninth planet could be gravitationally herding them into these orbits. For the calculations to work, the planet would be at least an equal to Earth, and most likely much bigger — perhaps a mini-Neptune, with a small but thick atmosphere surrounding a rocky core and mass about 10 times that of Earth. That would be 4,500 times the mass of Pluto. Pluto, at its most distant, is 4.6 billion miles from the sun**. (((The potential ninth planet, at its closest, would be about 20 billion miles away; at its farthest, it could be 100 billion miles away. One trip around the sun would take 10,000 to 20,000 years.)))**"We have pretty good constraints on its orbit," Dr. Brown said. "What we don't know is where it is in its orbit, which is too bad." Alessandro Morbidelli of the Côte d'Azur Observatory in France, an expert in dynamics of the solar system, said he was convinced. "I think the chase is now on to find this planet," he said.AdvertisementContinue reading the main story This would be the second time that Dr. Brown has upended the map of the solar system. In January 2005, he discovered a Pluto-size object, now known as Eris, in the Kuiper belt, the ring of icy debris beyond Neptune.

QUESTIONS(CONTINUED): **(c) Find mass of sun using estimated averages of T & R for this projected existing 9th. Planet? (d) Mass of sun from NASA is listed as 2.0 X 10^{30} kg. How did your computation of M_{SUN} (using estimated averages of 9th. Planet's radius R and period T) compare to NASA measurement of sun mass?**

ANSWERFS: **(a) R = 9.66 X 10^{13} m. , (b) T = 4.73 X 10^{11} seconds , (c) M_{sun} = ~ 2.384 X 10^{30} kg.**
(d) AS you can see your computed value of M_{SUN} is not far from NASA value. And this computation was performed with "estimated" R & T from computer models at Cal Tech.