CENTRIPETAL FORCE & GRAVITATION

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By Kenneth Chang. Please send me an e-mail on how you used this application. Thanks! Dr Cise

For NASA, Return Trip to Jupiter in Search of Clues to Solar System's Origins

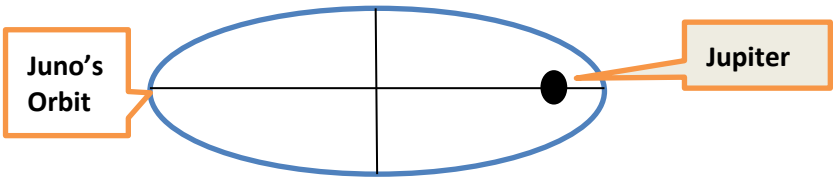
The last time we saw Jupiter up close, it was 16 years ago, when a probe from NASA's Galileo spacecraft took a death plunge through the cloud tops and radioed back tantalizing data that all but screamed, "To be continued..."

The spacecraft Juno at Cape Canaveral on Thursday. It will make a five-year voyage to Jupiter and then orbit it for a year

Multimedia

NASA Launches Probe to Jupiter

INTRODUCTION: The radius of Jupiter is **R_J ~ 70,000 km** according to NASA. The purpose of this solution is your using Kepler's third law that T^3/R^2 = constant **in your producing the Mass of Jupiter** with data given in this article(**33 orbits/year**) + Jupiter data from NASA …. Juno's Perigee =39 R_J , Juno's apogee = 1.06 R_J . Since the orbit of Juno is quite elliptical we will take the **Mean orbital radius** to be R = $(39R_J + 1.06R_J)/2$ **= ~ 20R_J**



Using Newton's law of gravitation as the producer of the centripetal force which keeps Juno satellite in orbit about Jupiter…… we have Kepler's 3rd law**: $R^3/T^2 = GM_J/4(pi)^2$**

QUESTION: (a) Find orbital period(T in seconds) of Juno satellite? (b)Find mean orbital radius R of Juno satellite about Jupiter in meters? (c) **Find mass of Jupiter M_J ?**
HINTs: 1000 m = km, 365 days/yr, 24 hrs/day, 3600 s/hr , G = gravitational constant = 6.67 X 10^{-11} Nm^2/kg^2 .
ANSWERS: (a) ~ 9.556 X 10^5 s (b) 140 X 10^7 m (c) ~ 1.8 X 10^{27} kg
Note: NASA lists the mass of Jupiter as ~ 1.9 X 10^{27} kg

Now NASA is headed back to the big planet, looking for the clues to help answer pressing questions about the early days of the solar system. Because whatever was in Jupiter at the beginning — more than 4.5 billion years ago, when the solar system was formed — is still there, scientists say, hiding in a mysterious gas giant made up of dust and gas left over by the Sun.

A spacecraft named Juno (after Jupiter's wife in Roman mythology) is scheduled to lift off Friday morning from the Cape Canaveral Air Force Station in Florida, embarking on a five-year trip. On July 4, 2016, as determined by planetary mechanics, not American patriotism, Juno will pull into orbit around Jupiter and ***spend a year there,*** making scientific observations of gravity, magnetic fields and the wetness of the Jovian atmosphere.

And then scientists may learn more of the secrets of Jupiter, **which has twice as much mass as the rest of the planets in the solar system combined.**

"Jupiter holds the history of the solar system," said Scott Bolton, director of the space science department at the Southwest Research Institute in San Antonio, and the principal investigator for the Juno mission. "If you want to understand that first step of how you went from forming a sun to forming the planets, you have to understand what went into Jupiter and how it was made."

Although the wait will be long, scientists are excited enough about what they learned from Galileo — which was sent into Jupiter's atmosphere in 2003, lest it crash into one of the moons and contaminate the environment with bacteria from Earth — that they have great expectations for Juno**. The trip is costing $1.1 billion.**

To make the measurements, Juno will travel along a squashed elliptical orbit (perigee 39 Jupiter radius, apogee 1.06 Jupiter radius) , swooping to within 3,100 miles of the cloud tops. Over the course **of 33 orbits during the mission**, Juno will get a global view of the interior. Unlike Galileo's orbit, Juno's will pass over Jupiter's north and south poles, allowing the first close-up looks at the bright auroras there.