



## Get the Data

Visit EOSS <http://1.usa.gov/MsnJCa> to recreate the scene shown above.  
 Recommended operating system: MS Vista or later; Browser: MS Internet Explorer 8 or later.

**Step 1** – Click on the ‘Visual Controls’ tab and make sure that the following items are selected with a ‘white spot’: spacecraft, planets, labels, orbit lines, trails and metric.

**Step 2** - Activate the Distance Measuring tool and measure the distance between the Juno spacecraft and Jupiter.

## Answering Questions

On August 5, 2011 NASA’s Juno spacecraft was launched on a 5-year journey to Jupiter. The image above from *Eyes on the Solar System* shows the orbit of Juno on November 21, 2016 at 16:00 Universal Time (UT) along with one of the moons of Jupiter called Thebe. The Juno mission will come to an end after 33 orbits when the spacecraft will be directed to burn up in the Jovian atmosphere.

**Problem 1** – Follow the spacecraft for one full orbit and note the time. About how many hours does one orbit take? Express your answer as a mixed fraction

**Problem 2** – The closest distance to Jupiter that Juno gets during its orbit, a point called the periJove, is about 4,289 km above Jupiter’s cloud tops. If the radius of Jupiter is 71,492 km, what is the distance between Juno and the center of Jupiter? Express your answer as a mixed fraction

## Math Challenge

**The JunoCam is designed to photograph the cloud tops of Jupiter in the North and South Polar Regions. If Juno completes 33 orbits, and the polar regions are visible for 2 hours every orbit, how many total days of polar viewing will Juno complete if the spacecraft takes 11 hours to complete one orbit?**

## Answer Key

# 4

**Problem 1** – Follow the spacecraft for one full orbit and note the time. Expressed as a mixed fraction, about how many days does one orbit take?

**Answer:** The first orbit starts at November 21, 2016 at 16:00 Universal Time (UT). The second orbit starts at December 2, 2016 at 15:00 UT. November has 30 days, so from November 21 to December 2, 11 days elapse, but since the time is from 16:00 to 15:00, the actual elapsed time is 10 days and 23 hours. The mixed fraction is then **10 and 23/24 days**.

**Problem 2** – The closest distance to Jupiter that Juno gets during its orbit, a point called the periJove, is about 4,289 km above Jupiter’s cloud-tops. If the radius of Jupiter is 71,492 km, what is the distance between Juno and the center of Jupiter expressed as a mixed number?

**Answer:** Juno’s distance to the center is  $4289 + 71492 = 75,781$  km. Expressed as a fraction of Jupiter’s radius this is just  $75,781/71492 = 1 + 4289/71492$  or  $1 + 0.06$  which is  $1 + 6/100$  or

**1 and 3/50ths of Jupiter’s radius.**

**Math Challenge:** The JunoCam is designed to photograph the cloud tops of Jupiter in the North and South Polar Regions. If Juno completes 33 orbits, and the polar regions are visible for 2 hours every orbit, how many total days of polar viewing will Juno complete if the spacecraft takes 11 hours to complete one orbit?

**Answer:**  $2 \text{ hours} \times 33 \text{ orbits} = 66 \text{ hours}$ . There are 24 hours in one day, so the total observing time is  $66/24 = 2 \text{ and } 18/24$  or **2 ¾ days**.