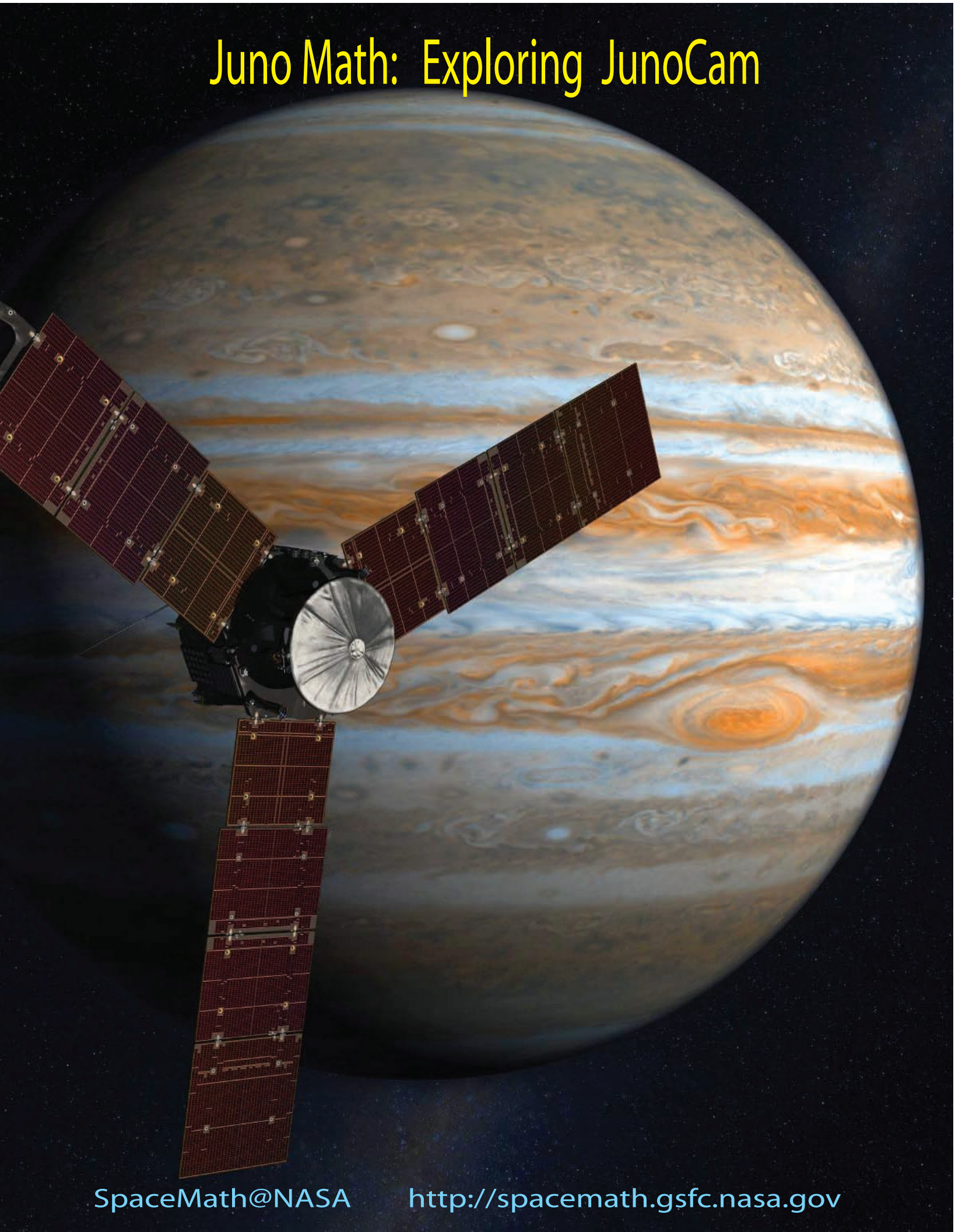
# Juno Math: Exploring JunoCam



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# Juno Math : Exploring JunoCam

Juno's color, visible-light camera, called JunoCam, is designed to capture remarkable pictures of Jupiter's cloud tops. As Juno's eyes, it will provide a wide view, helping to provide context for the spacecraft's other instruments.

JunoCam was included on the spacecraft specifically for purposes of public engagement; although its images will be helpful to the science team, it is not considered one of the mission's science instruments.

JunoCam takes images mainly within a few hours of closest approach – about 3,100 miles (5,000 kilometers) above the polar cloud tops – when it has the best-possible vantage point. Taking pictures with a resolution of up to 25 kilometers (16 miles) per pixel, the wide-angle camera will provide high-quality views of Jupiter's atmosphere. These images will be made available on the Juno mission website for members of the public to process into color views. The public will also help choose targets for JunoCam to image, and members of the amateur astronomy community will provide maps to help in image planning.

The $1.1 billion spacecraft has a total mass of over 1,600 kilograms, with 2000 kg of propellant at the time of launch. The 19-cm tall JunoCam itself has a mass of only about 4 kilograms, and consumes a maximum of 6 watts of electrical power. The CCD imager is an array of 1600 x 1200 pixels. The camera sees an area of the sky about 58 degrees wide as it sweeps across the cloud tops of Jupiter as the spacecraft rotates at 2 RPM.

The ability of the camera to resolve small details depends on its observing wavelength and the diameter of its camera lens. The resolution is usually described in terms of angular arcseconds, and can be calculated from the formula:

R = 206265 x Wavelength / Diameter

**Problem 1** – If the full width of the camera field is 58 degrees and is covered by 1600 pixels, what is the angular resolution, R, of each pixel in terms of arcseconds per pixel?

**Problem 2** - If the observing wavelength of JunoCam is about 600 nanometers, and each pixel can resolve an angle of R arcseconds, what is the diameter, in millimeters, of the camera lens in JunoCam?

# Answer Key

***Problem 1*** *– If the full width of the camera field is 58 degrees and is covered by 1600 pixels, what is the angular resolution, R, of each pixel in terms of arcseconds per pixel?*

Answer: R = 58 degrees x 3600 arcseconds/degree / 1600 pixels = 130 arcseconds/pixel.

***Problem 2*** *- If the observing wavelength of JunoCam is about 600 nanometers, and each pixel can resolve an angle of R arcseconds, what is the diameter, in millimeters, of the camera lens in JunoCam?*

Answer:

130 arcseconds = 206265 x (600 x $10^{-9}$ meters) / D(meters)

So D(meters) = 206265 x 6x$10^{-7}$/130 = 0.001 meters or 1 millimeter!