Jet Propulsion Laboratory
California Institute of Technology

Education

π IN THE SKY 5

Can you determine what – or rather where – is shaking on Mars?
A slice of pi will help you reveal this mystery like a NASA space explorer.

Explore the full NASA Pi Day Challenge at:
jpl.nasa.gov/edu/nasapidaychallenge

QUAKE QUANDARY

During a seismic event on Mars, or a "marsquake," a type of seismic wave called surface waves travel outward from the epicenter, across the planet in all directions. Scientists expect these surface waves to arrive at NASA's InSight lander, designed to study the quakes, at three different times: R_1, when the first wave arrives, having traveled the shortest distance from the epicenter to the lander; R_2, when the second wave arrives, having traveled the other way around Mars; and R_3, when the first wave again impacts the lander, having traveled all the way around Mars.

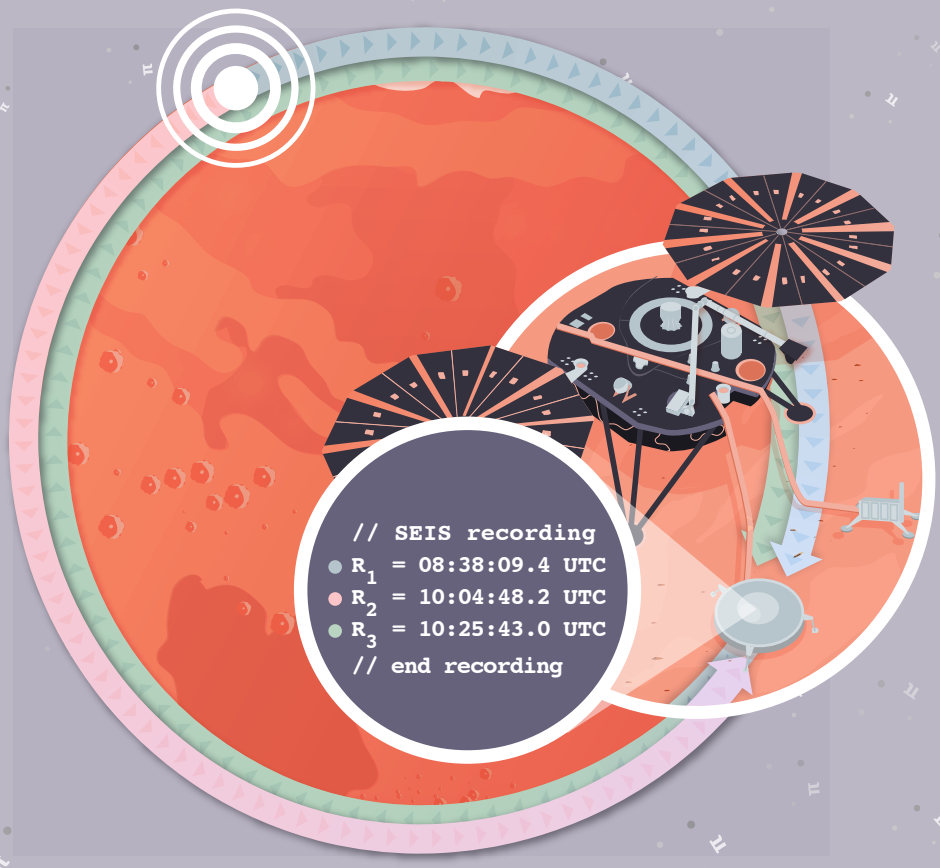
Let's imagine InSight records marsquake waves at the Earth times shown on the graphic. **What is the velocity (U) in rad/s of the surface wave, the distance in radians on the sphere from InSight to the epicenter (Δ), and the time the marsquake occurred (t_0)?**

$$U = \frac{2\pi}{(R_3 - R_1)}$$

$$\Delta = \pi - \frac{U(R_2 - R_1)}{2}$$

$$t_0 = R_1 - \frac{\Delta}{U}$$

LEARN MORE
mars.nasa.gov/insight



*** Marsquake wave times are in UTC, which is written in hh:mm:ss format.**