Voyager 1 and *2* are the only human made objects that have crossed the boundary of the heliosphere. Today, it is still functioning and transmitting data from interstellar space.

In mid-November 2026, the spacecraft will pass beyond one light-day away. That means radio signals traveling at light speed take about 24 hours to reach it, so any command sent from Earth takes a full day to arrive, and any response takes another day to get back.

So how far is Voyager 1 from Earth?

<u>Math Problem Steps</u>:

1. Look up the speed of light in kilometers per second.

   (Answer: 300,000 km/second)

2. How many seconds are there in 1 hour? Hint: 1 hr = 60 min; 1 min = 60 s

   (Answer: 3,600 seconds)

3. In one light hour, what is the distance between Voyager 1 and Earth?

   (Answer: 300,000 km/s × 3,600 seconds = ~1.08 billion km)

4. In 24 light hours, what is the distance between Voyager 1 and Earth?

   (Answer: 1.08 billion km × 24 = ~26 billion km)

Extensions:

Since the distance from Earth to the Sun is 1 Astronomical Unit, or 1 AU, at how many AUs is Voyager 1? And at how many light years is the spacecraft?

Steps:

1. Look up the distance from Earth to the Sun in kilometers

   (Answer: 1 AU ≈ 150 million km)

2. What is the distance of Voyager from Earth in AUs? Hints: Divide the current distance of Voyager 1 (25.6 billion kilometers) by the distance from Earth to the Sun (150 million km). Remember 1 AU ≈ 150 million km.

   (Answer: ~173 AU)

3. How many hours are there in a year? Hints: 1 year = 365 days; 1 day = 24 hours

   (Answer: 24 x 365.25 = 8766; leap years occur approximately every 4 years)

4. In a light year, what is the distance of Voyager from Earth?

   (Answer: ~ 0.0027 light years; 24 light hours ÷ 8,766 hours in a year)

Launched in 1977, Voyagers 1 and 2 have taken a grand tour of our solar system, passing by all the planets. The fact that Voyager 1 is still transmitting data from interstellar space is truly an incredible achievement of engineering and space exploration.

What would you like to know more about Voyagers?

Glossary

Astronomical unit: A unit of length approximating the average distance from Earth to the Sun and formally defined as 149,597,870.7 km (92,955,807.3 miles). It is commonly used to describe distances within our own and other planetary systems.

Heliosphere: A giant bubble around the solar system formed by particles the Sun emits as part of the solar wind.

Interstellar space: Also known as interstellar medium, it is the matter and radiation that exists in the space between stars. This includes gas in different forms, as well as dust, and cosmic rays.

Light-year: The distance that light travels in one year at about 300,000 km per second, i.e. 9.5 x 10^12 km. It is equal to about 63,000 astronomical units.

Radio signals: Light with the lowest frequencies and longest wavelengths, produced by charged particles moving back and forth. Radio wavelengths range from 11.8 inches (30 centimeters) to larger than Earth.