

Distances In Light Years - Educator's Guide (Ages 16-18)



At the end of these Night Sky activities students will understand:

- Astronomers use light-years as unit of distance measurement
- How this unit is defined
- The closest stars to our Solar System are just over four light-years away
- The parsec is an alternative unit of distance used in astronomy

Astronomy background information

Earth orbits 150 million km (93 million miles) from the Sun. This distance is used to define a unit of measurement called the astronomical unit (AU). Astronomers express distances across the Solar System in AU but it is a massive leap in distance to even the closest star to the Sun.

In 1838 Friedrich Bessel (1784-1846) measured the distance to the star 61 Cygni. Bessel used the principle of parallax to achieve this. It was the first time the distance to another star had been measured. Bessel was surprised to find that 61 Cygni was 660,000 AU away. He remarked that light would take ten years to cover this distance. Within a couple of decades German astronomers were quoting distances to stars in light-years. By the start of the 20th century the unit was in use in English-speaking nations.

Light is used to define this unit because it travels at the fastest speed possible (about 300,000 km/s) and this speed is constant in a vacuum. Multiplying the speed of light by the number of seconds in a year, shows that 1 light-year \approx 9.5 trillion km (5.9 trillion miles). Light-years are more convenient units to use than smaller units like km or even AU.

Professional astronomers prefer to use an alternative unit to measure the distance to astronomical bodies. This is the parsec (short for parallax second), 1 parsec \approx 3.26 light-years, derived from the same principle used by Bessel.

The brightest stars visible from Earth range in distance from 4.3 light-years (Alpha Centauri/Rigel Kentaurus) to 860 light-years (Rigel). This indicates that the luminosities (intrinsic brightnesses) of stars are very variable.

Accessible Learning:

- Text size can be increased in the Preferences section
- Star numbers can be reduced by sliding two fingers down the screen

App Essential Settings

No essential settings are required for this activity.