

11.13: Light-Years

Yet trillions of miles to the nearest star beyond the Sun is not a measurement or system that is user-friendly. So astronomers use light-years instead. A **light-year (ly)** is a unit of length or distance; the distance light travels in one year. It is also written as light year or lightyear. So how does light travel in one year, or what is the length of a light-year? This sounds like a time calculation, and is often misused as such in movies, television shows, and books. The light-year is a distance measurement, and is calculated by knowing the speed of light.

Using light-years instead of miles, meters, or kilometers provides one a friendly number. For example, instead of stating the Sun is 93,000,000 miles away, one can note it is 8.33 light minutes distance. What of Proxima Centauri, 25,219,301,250,000 miles or 40,586,533,727,000 kilometers away? Using light-years, Proxima Centauri is 4.29 ly in distance.

To give you a sense of the size of our galaxy and even the Universe, there are about 30 stars, which lie within 16.5 ly of Earth. Only 30 stars out of the billions of stars in just our own Milky Way galaxy.

Light Years: Calculations

Light-Years calculated in miles — the English System: $186,000 \text{ miles/second} \times 365.25 \text{ days/year} \times 24 \text{ hours/day} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/minute} = 5,869,713,600,000 \text{ miles}$ or $5.8697136 \times 10^{12} \text{ miles}$

Light-Years calculated in meters and kilometers — the Metric System: $299,792,458 \text{ meters/second} \times 365.25 \text{ days/year} \times 24 \text{ hours/day} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/minute} = 9,460,730,472,580,800 \text{ meters}$ or $9.4607304725808 \times 10^{15} \text{ meters} = 9,460,730,472,580.8 \text{ kilometers}$ $9.4607304725808 \times 10^{12} \text{ kilometers}$

Astronomical Units in 1 ly; distance from the Sun to Earth (93,000,000 miles = 1 AU): $1 \text{ ly} = 63,241.077 \text{ AU}$ or $63241077 \times 10^4 \text{ AU}$ *The distance light travels in one year is 63,241.077 times the distance from Earth to Sun.

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