What is a Light Year?

A **light-year is a measure of distance,** not time.

Because space is so vast and the distances between stars and galaxies is enormous, the science of astronomy needs a large unit of measurement. The kilometre is too small a unit of measurement. The distances reported in astronomy become too big to comprehend if measured in kilometres. A light year is a very large distance, but also not very easy to comprehend. However, light years is what astronomers use to measure distances.

Here is a step-by-step way to calculate the distance of one light year

Step 1: Write down the speed of light

- Light travels in the vacuum of space at a speed of **299,792.458 km/s**. Light can travel from Earth to the Moon (about 380,000km) in about 1.26 seconds.
  This is the **speed** you will use in the formula: Distance = speed × time.

Step 2: Work out how many seconds are in one year

- Use the number of seconds in a Julian year (used by astronomers): 1 Julian year = 365.25 days.
- Now convert that to seconds in a day:
  - Seconds in one day = seconds in 1 minute x minutes in 1 hour x hours in one day
  - Seconds in one day = 60 x 60 x 24 = 86,000 seconds per day
- Now calculate number of seconds in a Julian year:
  - Seconds in one Julian year = seconds in 1 day x number of days in 1 year.
  - Seconds in one Julian year = 86,000 x 356.25 = 31,557,600 seconds in a Julian year.

Step 3: Work out how many kilometres light can travel in 1 year

- The distance of 1 light year = seconds in 1 year x the distance light can travel in 1 second.
- The distance of 1 light year = 31,557,600 seconds × 299,792.458 km/s = **9,460,730,497,826.88 km,** or about 9.46 trillion kilometres.

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Why the light year is a good unit of astronomical distance

- If an astronomer wanted to tell you about the Small Magellanic Cloud galaxy, which is actually reasonably close to our Milky Way Galaxy, he or she would tell you the Small Magellanic Cloud is **a distance of 210,000 light years away from our Earth**.
- If that distance is reported in kilometres, the distance would be **1,986,753,404,543,644,800 km.** Which is just too big a number to try and comprehend.

A fun fact

The spacecraft Voyager I was launched on August 20th, 1977. Its is now the most distance man-made object from Earth. As of August 2026, it is about 25.6 billion kilometres away, or one light-day from Earth. It takes one whole day for a radio message sent from Earth to reach the craft, and another day for a reply from the craft to travel back to Earth. This would make for a very long and boring phone call. Space is big. Very, very, very, big!

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