Units of cosmic measure

The **speed of light** in a vacuum is **186,282 miles per second** (299,792 kilometers per second), and in theory nothing can travel faster than light. In miles per hour, light speed is about **670,616,629 mph**. If you could travel at the speed of light, you could travel the circumference of the Earth 7.5 times in ONE second.

A light-year is how astronomers measure distance in space. It's defined by how far a beam of light travels in one earth year: six trillion miles.

The cosmic distance ladder (also known as the extragalactic distance scale) is the way astronomers measure the distance of objects in space. It is the larger distances which are the problem. Several methods rely on a standard candle, which is an astronomical object that has a known standard luminosity.

The parallax formula states that the distance to a star is equal to 1 divided by the parallax angle, p, where p is measured in arc-seconds, and d is parsecs.

Parsec: A way that astronomers describe distances in space. One parsec is the same as 30.86 trillion kilometers. Surface Brightness Fluctuations (SBF): ↑ How bumpy light appears in a picture of a galaxy from place to place. It is what we measure to help determine a galaxy's distance.

Age of the universe: **13.79 billion years. 8.8×10^{26} meters or 2.89×10^{27} feet, which equals 880 yottameters.**

"**Infinity**" means; beyond the observable universe, you won't just find more planets and stars and other forms of material…you will eventually find every possible thing.

To measure distances to other galaxies: we use the units of **kiloparsec (kpc)** and **Megaparsec (Mpc)**.

Closest star: Proxima Centauri is **4.22 light years away** (25.32 trillion miles)
The two main stars are Alpha Centauri A and Alpha Centauri B, which form a binary pair. They are an average of 4.3 light-years from Earth. The third star is Proxima Centauri. It is about 4.22 light-years from Earth and is the closest star.

The distance between Earth and the edge of the observable universe is 46 billion light-years (14 billion parsecs), making the diameter of the observable universe about 93 billion light-years (28 billion parsecs).

Planck Time, tP: Divide the minuscule Planck length by the speed of light and you get a really tiny unit of time: tP = (hG/2πc5)1/2 . The Planck time is **5.39 x 10^{-44}** seconds. It's the time it would take a photon travelling at the speed of light to across a distance equal to the Planck length. This is the 'quantum of time', the smallest measurement of time that has any meaning, and is equal to **10^{-43}** seconds.

Planck Limit: is equal to 1.616255(18)×10^{-35} m. It is a base unit in the system of Planck units, developed by physicist Max Planck. The Planck length can be defined from three fundamental physical constants: the speed of light in a vacuum, the Planck constant, and the **Gravitational Constant**: **G = 6.673(10) x 10^{-11} m^3 $kg^{-1}s^{-2}$**.

All that happened during the Planck Time Period:

1) http://hyperphysics.phy-astr.gsu.edu/hbase/Astro/planck.html#c3
2) http://hyperphysics.phy-astr.gsu.edu/hbase/Astro/unify.html#c1

Unit	Used to measure distances
Radar	within our solar system
Parallax	to nearby stars
Cepheids	in our Galaxy and to nearby galaxies
Supernovae	to other galaxies
Redshift	to objects extremely far away (Hubble's Law)

Cosmic distances - Distances of Planets from the Sun

Planet	Miles	AU	Light-Minutes	Light-Hours
Mercury	36 million	0.387	3.2	
Venus	67.2 million	0.723	6.0	
Earth	93 million	1.000	8.3	
Mars	141.6 million	1.523	12.6	
Jupiter	483.6 million	5.203	43.2	
Saturn	886.7 million	9.538	79.3	
Uranus	1.784 billion	19.819	159.6	
Neptune	2.794 billion	30.058		4.1
Pluto	3.674 billion	39.44		5.5

Travel Time:

Distance of the circumference of the Earth: **25,000** miles (24,900)

Speed	Seconds	Hours	Days
100 MPH	**1,384,200**	**384.5**	**16**

**** At the speed of light, 186,282 MPS, you could travel around the earth in .135 seconds or about 7.5 times in 1 second.**

From the **Sun to Earth**: **93 million** miles

At Speed of	Hours	Days	Mos	Years
100 MPH	**915,840**	**38,160**	**1272**	**106**

**** It takes 499 seconds (8.3** minutes**) for** light **to travel from the** Sun **to the Earth**

From the Sun **to Pluto**: **3.67 billion** miles (2.8 billion at closest point)

Speed	Hours	Days	Mos	Years
100 MPH	**36,141,211**	**1.505, 880**	**50,196**	**4,183 +/-**

The **Milky Way** galaxy is about **100,000 light years** across. Our Solar System is located about **25,000 light-years** from the galactic center and **25,000 light-years** away from the rim, **8 kpc** from the center on what is known as the Orion Arm of the Milky Way. Think of the Milky Way as a big record; we would be the spot that's roughly halfway between the center and the edge.

The Milky Way is in the Virgo Supercluster of galaxies and in a smaller group of galaxies called the Local Group. Earth is in the second largest galaxy of the Local Group.

Currently, the Andromeda Galaxy and the Milky Way are about **2.5 million light-years** apart, but four billion years from now, the Milky Way will collide with its large spiraled neighbor, Andromeda. The galaxies as we know them will not survive. In fact, our solar system is going to outlive our galaxy.

The M31 galaxy is considered relatively close and is about 13.89 trillion miles away or **2.3 million light years (725 kpc)**.

What is Beyond the Universe? | Futurism: https://futurism.com
https://imagine.gsfc.nasa.gov/features/cosmic/local_group_info.html

Big Bang Expansion and the Fundamental Forces

More of the creation process of our universe, and the most important transformations, took place in the FIRST second after the Big Bang than will continue to take place for the balance of its existence.

Modeling of the "Big Bang" expansion of the universe at earlier and earlier times has led to the use of the "Planck time" of 10^{-43} seconds as a proposed interval during which all the fundamental forces were unified into a single force.

Below is an attempt to illustrate the "spontaneous symmetry breaking" which is presumed to have separated the original force into the four forces which we see operating in the present, low temperature universe. Proposed energies and temperatures associated with each of the symmetry breaks are shown along with a modeling of the time elapsed in the big bang model.

Big Bang Time-Line