

## Universe—Lesson One

### Getting to know Light Years

**Standard IV: Students will understand the scale size, distance between objects, movements, and apparent motion (due to Earth's rotation) of objects in the universe and how cultures have understood, related to and used these objects in the night sky.**

**Objective 1: Compare size and distance of objects within the systems in the universe.**

**Indicator a: Use the speed of light as a measuring standard to describe the relative distances to objects in the universe.**

**Indicator b: Compare the distances between objects in the solar system. (See lessons one, two, three and four in the Solar System Lesson Plans.)**

Materials:

1. "Calculating a Light Year" Sheet
2. "Light Distances of Planets" Sheet
3. "Distances of the Stars in Orion in Light Years" worksheet
4. The Graphic of the Star Distances of Orion from Earth
5. Calculator for each student or a calculator for the teacher to use on the document camera.

Directions for calculating a light year:

1. Review what was learned about scale with learning about the sizes of the planets in the Solar System Lesson Plans.
2. Tell the students that scientists like to know what the distances between objects are in space. However, they are so big in miles that we have to reduce the scale down to another system that the numbers are smaller and easier to understand but at the same time can give us a pretty accurate distance.
3. Tell the students that we use light-years to measure distance. That sounds like a complicated measurement, but it is really easy to understand. So let's do the calculations on learning what a light-year is.
4. Have them look at the "Calculating a Light Year" Sheet.
5. First we need to find out how far light travels in one year.

6. Do the calculations to find how far light travels in one year by looking at the sheet in miles or kilometers or both. This is important because we need this number to find out what a light year is.
7. By multiplying how many seconds are in a year by how fast light travels in one second gives us how far light travels in one year. **This is one light year—the distance light travels in one year. This is the term scientists like to use when measuring distances in space.**
8. One light year is very far away.
9. Our planets are not even a light year away from the sun.
10. Have them look at the distances of planets below on the “Light Distances of the Planets” sheet. Notice that the distances are in “light-minutes” because it doesn’t take very long for light to get to the planets. This way it is much easier to understand distances of the planets.

Scientists use light years to measure star distances.

1. Tell the students that scientists mostly use light years to measure distance of stars.
2. Explain that the stars we see are not the same distance away from each other. Some are closer and some are farther away.
3. Give them the “Distances of the Stars in Orion in Light Years” worksheet. There are eight stars that make up Orion. Notice how the stars are not the same distance according to the chart.
4. Have the students estimate how far each star is away from Earth in light-years and write it on the “Distances of the Stars in Orion” sheet. You may want to do one planet with them to get them started.
5. Use the table to have them write their answers as to how far the stars are away from each other.
6. Have a discussion of why we have light-years and not actual miles.

