



Activity 1: Student Worksheet

How Long Is A Light Year?

While the sun is often referred to as the most important star within our solar system, it is certainly not the only one. There are too many stars for us to even begin to count. See how many you can count while gazing up at the sky on a clear night. Not only are there too many stars to count but, the stars are beyond our imagination as to how far away they are. They are so far away that standard units of measurement like miles and kilometers are awkward to measure these distances, therefore a unit known as the *light year* is used.

A light year is defined as the distance that light travels in one Earth year. Light moves extremely fast, 300,000 km/s or 180,000 miles/second. In one second light can travel around Earth almost four times. Nothing travels faster, establishing light as the ultimate speed limit. In 31,536,000 seconds--or one year--light will travel a distance of 9.46 trillion kilometers or 5.86 trillion miles, or 240 million times around Earth. This distance equals one light year.

Because light travels so very fast, everything appears to happen instantly in our everyday experience. If we are watching the Baltimore Ravens kick a field goal, we assume that the ball was kicked right at the moment that we saw it. In actuality we must see the light that is being reflected from the ball, and it does take time for the light to travel from the ball to our eyes. If the distance from the ball to our eyes were 10 m, the light reflecting off the ball would take only 300 millionths (.000003) of a second to reach our eyes, thus making it seem instantaneous.

Stars are millions and millions of kilometers away. To see a star, that star's light must travel across space to our eyes. If the star is 5 light years away, then the light we are seeing from that star took five years to travel to our eyes. It also means that what we see happening at that star is actually what happened five years ago, not what is happening in the star's present.

- 1.) Imagine that there is a planet with intelligent beings on it that's 20 light years away from Earth. These beings have an extremely powerful telescope and can actually make out details of what is happening on Earth. If they aim their telescope at the White House in Washington, DC, who would they find living there as the president and first lady?
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- 2.) Suppose that a child is born on Earth in the year 2000. You are on an imaginary planet that is 94.6 trillion kilometers away from Earth and looking through a very high powered telescope and you witness this child's third birthday party. How old is that child on Earth at the time you are watching the child's third birthday party? (Hint: Calculate the number of light years this planet is from Earth.)
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- 3.) On another imaginary planet in the year 2000, someone is looking through a high powered telescope aimed at Earth, and is observing America's Bicentennial celebration in Boston, Massachusetts. How many light-years away is the planet from Earth? How far away is this planet (in kilometers)?
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- 4.) Are any of the 9 planets within our solar system a light year or more from Earth? Support your response by giving the distances between the planets.
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Activity 1: Answers

How Long Is A Light Year?

Based upon the information provided in the reading *How long is a Light Year* and in the information box below, respond to the following questions.

- 1 light year is the distance that light travels in one Earth year.
- In 1 light year light will travel a distance of 9.46 trillion kilometers.

- 1.) Imagine that there is a planet with intelligent beings on it that's 20 light years away from Earth. These beings have an extremely powerful telescope and can actually make out details of what is happening on Earth. If they aim their telescope at the White House in Washington, DC, whom would they find living there as the president and first lady?

President Jimmy Carter and First Lady Rosalyn Carter

- 2.) Suppose that a child is born on Earth in the year 2000. You are on an imaginary planet that is 94.6 trillion kilometers away from Earth and looking through a very high powered telescope and you witness this child's third birthday party. How old is that child on Earth at the time you are watching the child's third birthday party? (Hint: Calculate the number of light years this planet is from Earth.)

13 years old

- 3.) On another imaginary planet in the year 2000, someone is looking through a high powered telescope aimed at Earth, and is observing America's Bicentennial celebration in Boston, Massachusetts. How many light-years away is the planet from Earth?

24 light-years away

- 4.) Are any of the 9 planets within our solar system a light year or more from Earth? Support your response by giving the distances between the planets.

No