WHAT'S ALL THE BUZZ ABOUT LIGHT YEARS?

INSTRUCTIONS

Overview:

Vast distances in outer space are a difficult concept to grasp. Scientists use light years to calculate these vast distances. Making comparisons to familiar terms helps students grasp the concept of a light year.

Objectives:

The student will design a poster that advertises a method of transportation that travels at the speed of light. The poster must define "light year.

Targeted Alaska Grade Level Expectations:

Science

[6] SD4.2 The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by defining a light year.

Vocabulary:

light – a form of electromagnetic energy that can be perceived by the human eye; made up of electromagnetic waves that travel at a speed of about 186,282 miles per second

light year – the distance that light travels in a vacuum in one year, equal to about 5.88 trillion miles or 9.48 trillion kilometers

moon – the natural satellite of Earth, visible by reflection of sunlight; travels around Earth in a slightly elliptical orbit at an average distance of about 238,857 miles

Proxima Centauri – one star in the three-star-constellation Alpha Centauri; it is the star nearest Earth and the third brightest star in the night sky

Saturn – the sixth planet from the sun and the second largest; encircled by a large, flat system of rings that are made up mostly of tiny particles of ice

Sirius – the brightest star seen in the night sky; it is in the constellation Canis Major

sun – the star that is orbited by all of the planets and other bodies in our solar system; supplies the heat and light that sustains life on Earth

vacuum – a condition in which there is no matter or very little matter

Whole Picture:

Light travels almost 6 trillion miles in a year. This can be calculated based on the following: Scientists have calculated that light travels 186,000 miles per second. We know there are 60 seconds in a minute, 60 minutes in an hour, 24 hours in a day, and 365 days in a year. Multiply and you'll find there are 31,500,000 seconds in a year. Multiply that times 186,000 miles per second and you get 5,850,000,000,000 miles—5.88 trillion miles.

Materials:

- Colored pencils (one box per student)
- Blank white copy paper or construction paper (one sheet per student)
- STUDENT INFORMATION SHEET: "How Far?"
- STUDENT WORKSHEET: "The Speed of Light"

Activity Preparation:

1. Locate and bookmark websites that show pictures of the Moon, the Sun, Saturn, Proxima Centauri and Sirius. Show these to students for inspiration as they create posters in Activity Procedure 5.
2. Locate and bookmark the website Science on the Brain at http://www.marshallbrain.com/science/ home of the video titled, "How far is a light year?" (http://marshallbrain.com/science/lightyear.htm)

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Activity Procedure:

1. Explain the lesson will compare distances. Ask students how they measure the distance across a small space, such as their notebook (inches, centimeters). Ask how they measure the distance across a room (feet, meters). How do they measure the distance around town (miles/ kilometers, fractions of miles/kilometers)? How about to a different city (miles/kilometers)? How about a different state? How about around the entire Earth? Would it make sense to measure the distance from Alaska to New York in inches or centimeters? Why?

   NOTE: The circumference of Earth is 25,000 miles. If one were to travel non-stop at 60-miles-per hour it would take about 417 hours to go the entire way. That is about 17 and one half days.

2. Explain scientists who study space are studying things that are so far away they have devised a measurement much easier to use than inches, miles or kilometers. It's called a light year. Ask students if they can explain what the term light year means. Discuss. (See Whole Picture.)
3. If possible, show students a five-minute video titled, "How far is a light year?" found on the website Science on the Brain at http://www.marshallbrain.com/science/.
4. Hand out STUDENT INFORMATION SHEET: "How Far?" Explain it's easier to grasp the concept of a light year when distances are compared to more familiar things. Review the information sheet.
5. Hand out STUDENT WORKSHEET: "The Speed of Light." Review and discuss the questions with students. Allow time to answer questions 1- 5.
6. Hand out blank white copy paper or construction paper as well as colored pencils. Ask students to complete a poster.

Extension Idea:

Visit NASA.gov and explore the resources available to teach about light speed. For example, the PlanetQuest Interstellar Trip Planner allows students to choose a destination and a vehicle to learn how long it would take to reach the destination.

Answers:

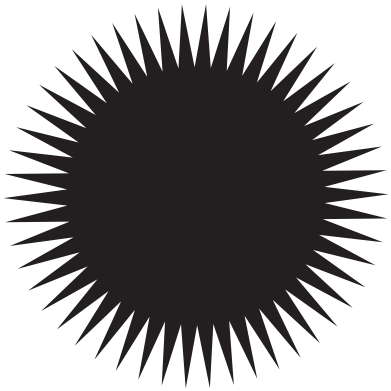
STUDENT WORKSHEET: "The Speed of Light"
Answers will vary.
Question 4 should reflect definition of a light year: the distance that light travels in a vacuum in one year.

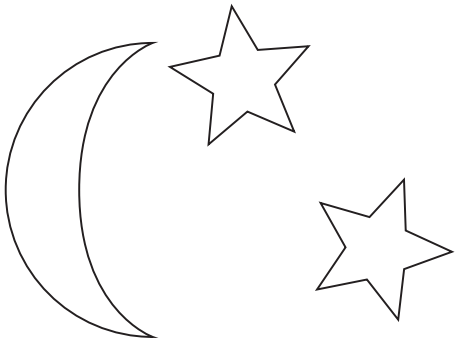
Sun

The Sun is the star that is orbited by all of the planets in our solar system. It supplies the heat and light that makes life on Earth possible.

Earth to the Sun – Using light speed it would take 8 minutes to get from Earth to the Sun.

- The average distance from Earth to the sun is about 92,935,700 miles.
- If you were to drive a car to the Sun at 60 mph, it would take 180 years.





Moon

The Moon is the natural satellite of Earth. We can see it as reflects light from the Sun.

Earth to the Moon – Using light speed it would take 1.3 seconds to get from Earth to the Moon.

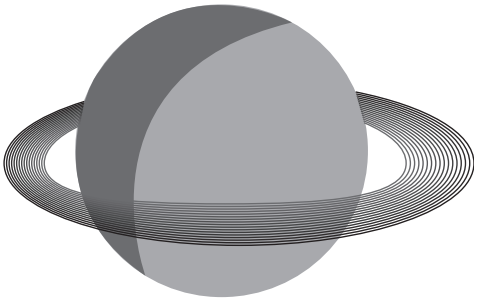
- The average distance from Earth to the moon is about 238,857 miles.
- If you were to drive a car to the Moon at 60 mph, it would take 166 days.

Saturn

Saturn is the sixth planet from the sun and the second largest in our solar system. It is surrounded by a large, flat system of rings that is made up mostly of tiny particles of ice.

Earth to Saturn – Using light speed it would take 80 minutes to get from Earth to Saturn.

- The average distance from Earth to Saturn is about 762,422,453 miles.
- If you were to drive a car to Saturn at 60 mph, it would take 1.451 years.



Sirius

Sirius is the brightest star seen in the night sky.

Earth to Sirius – Using light speed it would take 8.6 years to get from Earth to Sirius.

- The approximate distance from Earth to Sirius is 5×10^{13}. Multiply that out and you'll a lot of zeros!!

Proxima Centauri

Proxima Centauri is the closest star to Earth and the third brightest star in the night sky.

Earth to Proxima Centauri– Using light speed it would take 4.2 years to get from Earth to Centauri.

- The approximate distance from Earth to Proxima Centauri is 25,000,000,000,000 miles.
- The space shuttle, traveling at 18,000 miles per hour, would take 38 years to get there.

NAME: _____ STUDENT WORKSHEET

THE SPEED OF LIGHT

Directions: Design a poster advertising your new invention -- a new method of transportation that travels at the speed of light. You are now offering trips to outer space! Use the STUDENT INFORMATION SHEET: "How Far?" to help with fact. Fill in the information below before starting on your poster.

1. Choose a destination. Pick one of the following: the Moon, the Sun, Saturn, Proxima Centauri or Sirius.

   I pick the following destination: _____

2. Review all the facts on the information sheet. Why do you think people would want to visit this place? Write down three reasons:

   _____

   _____

   _____

Conclusion:

3. Write down two reasons people should pick your company and invention to visit your far-away destination.

   _____

   _____

light year – the distance that light travels in a vacuum in one year, equal to about 5.88 trillion miles or 9.48 trillion kilometers!

4. Explain what the term light year means, and why it will get you to your destination faster than regular travel.

   _____

   _____

   _____

5. What is the name of your method of space travel? _____ .

Now you are ready to begin! Using the information in questions 1 – 5, create a poster that advertises trips to your chosen destination. Be sure to:

• draw a picture of your invention along with a picture of the place you will be visiting; and

• explain the meaning of light year.