

Across the Dark

Use light travel and spacecraft speed to make sense of space distances.

SC.8.E.5.1 "Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each statement that explains how light lets you see the past. Circle each measurement that shows why travel through space takes a long time.

A Long Look Outward

- ① Space looks crowded in a night-sky picture, but objects are separated by vast empty distances. Astronomers use the speed of light to describe these distances. Light moves about 300,000 kilometers each second. A light-year is the distance light travels in one year, about 9.46 trillion kilometers. It is a distance, not a time. When light from a star reaches Earth, it carries information that began its trip before the moment we see it on Earth.
- ② The Sun is about 150 million kilometers away. Its light needs about eight minutes to reach Earth, so we see the Sun as it was eight minutes ago. Proxima Centauri, the nearest star beyond the Sun, is about 4.24 light-years away. Its light takes 4.24 years to arrive. Looking at Proxima Centauri means looking into its past, not seeing the star exactly as it is at that instant. The distance makes the delay unavoidable for us.
- ③ Human spacecraft travel far more slowly than light. Voyager 1, one of the fastest spacecraft leaving the solar system, travels roughly 17 kilometers per second. At that speed, a trip to Proxima Centauri would take tens of thousands of years, not 4.24 years. Engineers can send robotic probes across the solar system, but reaching another star is a much harder challenge. Light signals also need years to cross interstellar space, so messages cannot arrive instantly for people on Earth.

2 ANSWER WITH EVIDENCE Use the passage

1 What does a light-year measure, and why is it not a unit of time?

2 How far into the past do you see the Sun and Proxima Centauri when their light reaches Earth?

3 A light signal leaves Proxima Centauri today. About when will it reach Earth? Use evidence from the passage.

4 Compare the time light and Voyager 1 would need to travel from Proxima Centauri to Earth.

3 YOUR TURN Your own words

Write exactly two sentences for a mission briefing about a star 12 light-years away. In one sentence, explain what a telescope sees. In the other sentence, compare light's travel time with a spacecraft traveling about 17 kilometers per second.

PART 1 • READ AND MARK

Underline each statement that explains how light lets you see the past. Circle each measurement that shows why travel through space takes a long time. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What does a light-year measure, and why is it not a unit of time?	A light-year measures the distance light travels in one year. It is a distance, not a measure of time.
2	How far into the past do you see the Sun and Proxima Centauri when their light reaches Earth?	The Sun is seen as it was about eight minutes ago. Proxima Centauri is seen as it was 4.24 years ago.
3	A light signal leaves Proxima Centauri today. About when will it reach Earth? Use evidence from the passage.	It will reach Earth about 4.24 years from now because Proxima Centauri is about 4.24 light-years away.
4	Compare the time light and Voyager 1 would need to travel from Proxima Centauri to Earth.	Light would take 4.24 years. Voyager 1 would take tens of thousands of years because it travels much more slowly than light.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A telescope receiving light from a star 12 light-years away shows the star as it was 12 years ago. Light needs 12 years to cross that distance, but a spacecraft traveling about 17 kilometers per second would need more than 200,000 years.

Accept equivalent descriptions that identify a light-year as distance and connect longer distance with older arriving light. For the mission briefing, accept a spacecraft estimate of about 210,000 years or a supported statement such as more than 200,000 years.