

August 29, 2020

A Weird Solar System Cousin Makes Its Photographic Debut

Student Discussion Worksheet

Directions: After you have read the online *Science News* article "[This is the first picture of a sunlike star with multiple exoplanets](#)," answer the questions below. You will need a ruler, pencil, paper and calculator to answer the last question. Then partner with a classmate to discuss the final two prompts.

A unit's purpose

1. What is a quantitative observation? Give two examples of a quantitative observation from the article.
2. In your examples, what type of quantity has been measured? How do you know this?
3. What is a unit of measurement?
4. List all the types of measurements you can think of. What unit of measurement is commonly associated with each of them (think about both the English and metric, or SI, systems)?
5. Give an example of a unit that is defined by a number alone (hint: think eggs). How many of an item does each unit include? (If you've taken a chemistry class, don't forget about the unit of measurement that defines a number of atoms, molecules, etc.!)

Units are all relative

6. Give an example of prefixes that are used with base units in the metric system.
7. Using the prefixes kilo and milli, and the base unit meter, explain how each prefixed unit relates to the

base unit. Give an example of something you would measure in millimeters and something you would measure in kilometers. Why are prefixed units helpful?

8. According to the article, star TYC 8998-760-1 is 300 light-years away from our sun. Given that light travels at 3.0×10^8 meters per second, calculate the distance in kilometers. Check out the short NASA video “Our Milky Way Galaxy: How Big Is Space?” on [this page](#) to see how many kilometers are in one light-year.

9. Why is the unit light-year used to measure some of the distances in the article? Why isn't meter or kilometer used?

10. The article gives some measurements in terms of relative values. Give at least two examples of these relative values. Why do you think the author chose to use relative values instead of other defined units? Do you think the primary research paper reported the data in the same way? Why or why not?

11. An astronomical unit is an example of a relative value often used in outer space measurements. What type of quantity does an astronomical unit measure? What relative value is an astronomical unit equal to? Give an example of a measurement that is commonly expressed in AUs.

Create a scaled drawing

Use a ruler to create a scaled drawing of the distance each exoplanet is from the star TYC 8998-760-1. You'll first need to determine an appropriate scale to represent 1 AU, which is equal to about 150 million kilometers. You should include this scale in your drawing. After your drawing is complete, determine an answer for the following question.

12. State your scaled length for 1 AU. Use your scaled length, the given distance of 1 AU and your answer to question No. 8 to find the scaled length for the distance between TYC 8998-760-1 and our sun. Can you represent the distance on your drawing?

Final prompts

13. When is it important to standardize units used in science? When is it appropriate to give measurements as relative values? Explain.

14. Give an example of a relative value that has become a standard unit in science. Why do you think this happened?