



## TEACHER GUIDE

• Assessment Rubric .....	4
• How Is Our Resource Organized? .....	5
• Bloom's Taxonomy for Reading Comprehension .....	6
• Vocabulary .....	6



## STUDENT HANDOUTS

- Reading Comprehension

1. *An Introduction to the Universe* .....

2. *Measuring Distance in the Universe* ..... 7

3. *Nebulae* .....

4. *Galaxies* .....

5. *Gravity* .....

6. *Black Holes* .....

7. *Quasars* .....

• Hands-on Activities ..... 11

• Crossword ..... 15

• Word Search ..... 16

• Comprehension Quiz ..... 17



**EASY-MARKING™ ANSWER KEY** ..... 19

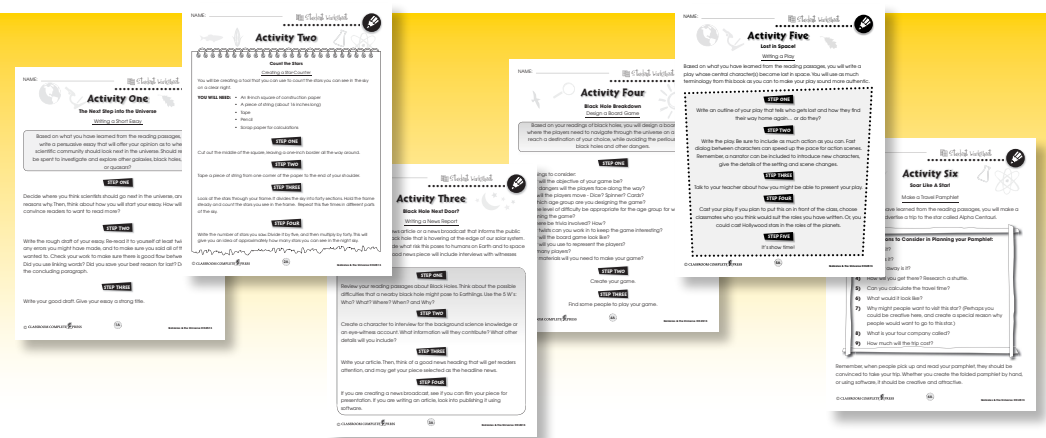
**MINI POSTERS** ..... 21

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- Go to our website:  
[www.classroomcompletepress.com/bonus](http://www.classroomcompletepress.com/bonus)
- Click on item CC4513 – Galaxies & the Universe
- Enter pass code CC4513D





## Measuring Distance in the Universe

- Think about all of the units of measurement you use in a day. Make a list of five of them. Why doesn't the same unit of measurement work for every thing that you need to measure?
- For each of the following situations, give the appropriate unit of measurement from the list below.

minute    month    kilometers/mile    second    yard/meter    year

- Sarah was the first one to cross the finish line in the 100-\_\_\_\_\_ dash.
- Juan took the bus to school every morning. He waited for it on the corner outside of his house. He thought it should arrive any \_\_\_\_\_.
- As Sofia blew out the candles on her birthday cake, she thought to herself that this was sure to be her best \_\_\_\_\_ yet!
- Meri and Franka were having a contest to see who could hold their breath the longest. Franka won with a time of forty-nine \_\_\_\_\_.
- Kumiko walked along the sidewalk to her friend's house and thought about how cool the weather was getting. Summer was just about over. It is amazing how the weather can change from one \_\_\_\_\_ to the next.
- Sam always hated long car rides. The ride to his grandmother's house seemed to take forever and it was only eighteen \_\_\_\_\_ away.

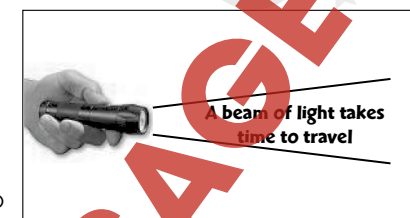
- Fill in the blanks on the chart with equivalent (equal) measurements.

A	One hour	_____ minutes
B	Twenty-four hours	_____ day
C	One centimeter	_____ millimeters
D	Twelve months	_____ year
E	One kilometer	_____ meters



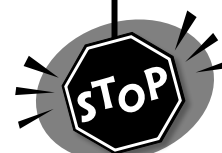
## Measuring Distance in the Universe

**W**hen you switch on a light in your room, it lights up instantly. That is because the light source is right in the spot that you wish to light up. Imagine you and a friend are standing at opposite ends of a field. You flick on a flashlight and shine it toward your friend. The light would actually take time to reach the other side of the field. There would be a slight delay from the moment you turned on the flashlight to when your friend saw the beam of light. This is because light travels, and travel takes time.



This is how scientists measure distance in space. They measure how long it would take light to travel places. The unit of measurement used to describe distances in space is light years. A **light year** is the distance light will travel in one year. Do you know how far light travels in one year? 5.88 million million miles! That's far, and that's just one light year.

**Make an inference:** Using what you know about space and light years, explain why scientists would not just use standard units of measurement, like miles or kilometers, to measure distance in the universe?



Now that you have an idea about how big one light year is, it is time to think about how big the universe is. Let's start with our solar system. The Sun is the nearest star to the Earth. It is only about 94 million miles (150 million kilometers) away. A ray of light would take just eight minutes to get to the Sun. The Sun is a lot less than one light year away. The next closest star to the Earth is called **Proxima Centauri**. It is about  $4\frac{1}{4}$  light years away - that's 25 million million miles (40 million million kilometers). It's no wonder the other stars look so small!

Galaxies are so big that it takes a ray of light thousands of years to travel across one. The Milky Way galaxy is the closest galaxy to Earth. It is about 100,000 light years across. The distance between galaxies is even bigger than the distance across them. That's why the universe is too big to even imagine!



## Measuring Distance in the Universe

- Put a check mark (✓) next to the answer that is most correct.
  - Which of the following units would be used to measure the distance around the Earth?
    - A light years
    - B minutes
    - C miles/kilometers
    - D yards/meters
  - Which of the following objects is biggest?
    - A The Sun
    - B The Milky Way galaxy
    - C The distance between the Sun and the Earth
    - D The distance around the Earth
  - Which of the following is equal to one light year?
    - A 5.88 million million miles
    - B The distance from the Earth to the Sun
    - C  $4\frac{1}{4}$  million miles
    - D The distance to Proxima Centauri
  - Why are the stars in the sky so much smaller than the Sun?
    - A The Sun is the largest star in the Universe.
    - B The Sun is the hottest star in the Universe and burns the brightest.
    - C The Sun isn't really a star.
    - D The Sun is much closer to Earth than the other stars.
  - Which of the following is NOT true of a light year?
    - A A light year is the distance light travels in one year.
    - B The Earth is approximately three light years from the Sun.
    - C Light travels millions and millions of miles in one year.
    - D Light years are used by scientists to measure distances in the Universe.



## Measuring Distance in the Universe

- Answer each question with a complete sentence.
  - Why is it possible to use light as a measurement of distance?
 

\_\_\_\_\_

\_\_\_\_\_
  - How do you know that the solar system is just a small part of the Universe?
 

\_\_\_\_\_

\_\_\_\_\_
  - How fast is "faster than the speed of light"?
 

\_\_\_\_\_

\_\_\_\_\_

### Research & Extension

This table shows the time it takes light to travel from the Earth to the following places:

Destination	Time for Light to Get There from Earth	Distance From Earth
Mars	4.3 minutes	4.3 light minutes
Sun	8.3 minutes	8.3 light minutes
Pluto	5.4 hours	5.4 light hours
Proxima Centauri	4.3 years	4.3 light years
Vega	25 years	25 light years
Betelgeuse	430 years	430 light years
Antares	600 years	600 light years
Orion Nebula	1,600 years	1,600 light years
Crab Nebula	63,000 years	63,000 light years
Andromeda Galaxy	2,500,000 years	2.5 million light years

The farther things are away from Earth, the older they are. Think back to what you know about how the Universe was formed. Things exploded outward from the Big Bang - the farther they went, the newer they are. If you are looking at Mars, you are looking at things that happened about four minutes ago. The farther the object is that you are looking at, the farther back in time it is. Therefore, when you look out into the universe, you are looking back in time.

Conduct research to create a timeline of some of the main features of the universe. At one end will be the beginning of time (The Big Bang), and the other end will be the present era (Earth). Plot the items from the chart, and more that you find in your research, onto your timeline. You may wish to refer to the timeline you created on page 7.



# Build It!

## PINHOLE GALAXIES

You will use what you know to create a presentation on the different types of galaxies: barred, elliptical, spiral and irregular.

### You will need:

- black construction paper
- a set of compasses with a sharp point
- a flashlight (an overhead projector may be used instead)
- dark projection area

### Steps

- STEP ONE:** Review what you learned about galaxies. Sketch the four different shapes that galaxies can form.
- STEP TWO:** Use a pencil to lightly outline one of the shapes on a piece of black construction paper.
- STEP THREE:** Use the sharp point of a compass to poke holes all over the sketch that you made.
- STEP FOUR:** Test the size of the holes with the flashlight and make any adjustments needed.
- STEP FIVE:** Repeat steps 1-4 for all four galaxies shapes.
- STEP SIX:** Write a brief description of what a galaxy is to present to your class with your pinhole galaxy slides.



# Word Search

Find all of the words in the Word Search. Words are written horizontally, vertically, diagonally, and some are even written backwards.

- |                    |                     |           |            |
|--------------------|---------------------|-----------|------------|
| universe           | nebula              | quasar    | light year |
| interstellar space | gravitational force | Milky Way | atoms      |
| Big Bang           | astronomer          | hydrogen  | collide    |
| galaxy             | black hole          | gravity   |            |
| mass               | satellite           | matter    |            |
| explosion          | theory              | compress  |            |



# Comprehension Quiz

## Part C

Answer the questions in complete sentences.

- Outline the most commonly-accepted theory of how the universe began. 4
- Give two roles that gravity plays in the universe. 2
- What is the difference between *rotate* and *orbit*? Give an example of an object that does each to show your understanding. 4
- Why can't we see black holes? 3
- Why is it important to study *quasars*? 3

SUBTOTAL: /16

# The Rosette Nebula



NAME: \_\_\_\_\_

After You Read 



# Measuring Distance in the Universe

2. Answer each question with a complete sentence.

a) Why is it possible to use light as a measurement of distance?

\_\_\_\_\_

\_\_\_\_\_

b) How do you know that the solar system is just a small part of the Universe?

\_\_\_\_\_

\_\_\_\_\_

c) How fast is "faster than the speed of light" ?

\_\_\_\_\_

\_\_\_\_\_

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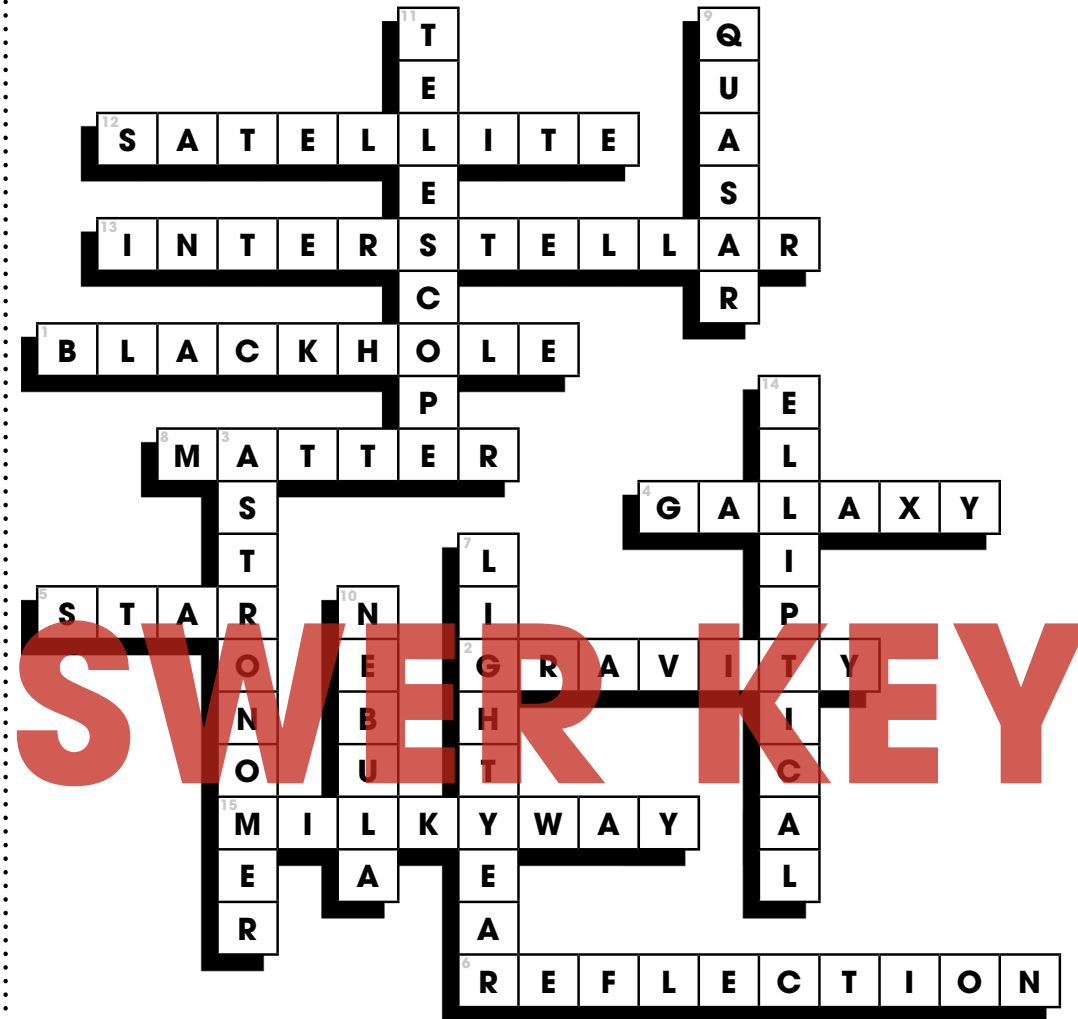
2.

a) it takes time to travel

b) should give a related measurement to tell

c) faster than 5.88 million million miles/year

## Crossword Puzzle!



EASY MARKING ANSWER KEY