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Topic
Planets

Key Question
How can we classify the eight planets?

Learning Goals
Students will:

- read tables and charts to learn about various aspects of the planets and their relationships with one another, and
- use Venn diagrams and graphs to organize information about the planets.

Guiding Documents
Project 2061 Benchmarks

- *The earth is one of several planets that orbit the sun, and the moon orbits around the earth.*
- *Like all planets and stars, the earth is approximately spherical in shape. The rotation of the earth on its axis every 24 hours produces the night-and-day cycle. To people on earth, this turning of the planet makes it seem as though the sun, moon, planets, and stars are orbiting the earth once a day.*
- *Tables and graphs can show how values of one quantity are related to values of another.*
- *Graphical display of numbers may make it possible to spot patterns that are not otherwise obvious, such as comparative size and trends.*
- *Use numerical data in describing and comparing objects and events.*

NRC Standards

- *Mathematics is important in all aspects of scientific inquiry.*
- *The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.*
- *Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.*

NCTM Standard 2000*

- *Represent data using tables and graphs such as line plots, bar graphs, and line graphs*

Math
Using Venn diagrams
Graphing
Equalities and inequalities
Whole number operations

Science
Earth science
astronomy
planets

Integrated Processes
Observing
Comparing and contrasting
Classifying
Recording data
Interpreting data
Drawing conclusions

Materials
Student pages
Crayons or colored pencils

Background Information
Much has been discovered about our planets as a result of information gathered by Voyagers 1 and 2. Students should be encouraged to look for articles that continue to report on new information about our solar system. An excellent web site for current information is <http://nineplanets.org>
All information included was correct at the time of printing. New discoveries about the planets are constantly being made, so you may want to check for updated information.

Management

1. Divide the class into pairs or learning groups for this activity. Alternate between small group activity and whole group discussions. The last part of the activity may be done in small groups with copies of the planets or as a whole class activity with one copy of the planets.
2. If desired, planet names can be attached to the Venn diagram with paste or tacky adhesive. The tacky adhesive is useful because the titles can be moved if inaccurately placed.



Procedure

1. Discuss with students what they already know about the planets. (total number [eight], appearance, distance from the Earth, etc.). Have them tell their sources of information whenever possible.
2. Discuss the *Key Question*: Using Venn diagrams, how can we classify the eight planets? [size, appearance, having moons, etc.]
3. Choose any two table headings for the circles of the Venn diagram. Fill in the appropriate planet names.
4. Use the information from *Planetary Facts*. Color in the proper spaces for the first three attributes. Guide the students to choose three more attributes with which to classify the planets. Have groups compare their results and discuss any differences.
5. Using the two-circle and three-circle Venn diagrams, write the names of the planets in the appropriate places. As a whole class, discuss similarities and differences of the planets from information recorded on the Venn diagrams.
6. With the whole class, make a list of what has been learned.

Connecting Learning

Using the Venn diagrams:

1. Which planets are larger than the Earth?
2. Which planets have moons?
3. Which planets have days longer than 24 hours?
4. Which planet fits all three categories?
5. Which planets have no moons?
6. Which planets are smaller than the Earth?
7. What fraction of the planets have moons?
8. What fraction of the planets are smaller than the Earth?
9. Which planets have both moons and rings?

Using the Planetary Facts chart:

1. Which planet has the most moons?
2. What is the total number of moons?
3. What is the average number of moons?
4. Which two planets are the closest in size?

Extensions

1. Enlarge the Venn diagrams so that they will accommodate the cutouts of the planets. Arrange the planets by a variety of attributes such as
 - smallest to largest
 - longest day to shortest day
 - no moons to most moonsBe sure students label each continuum clearly: which is smallest, etc.
2. Research information on newly-discovered planet-like objects such as Sedna and Quaoar.

Curriculum Correlation

Language Arts

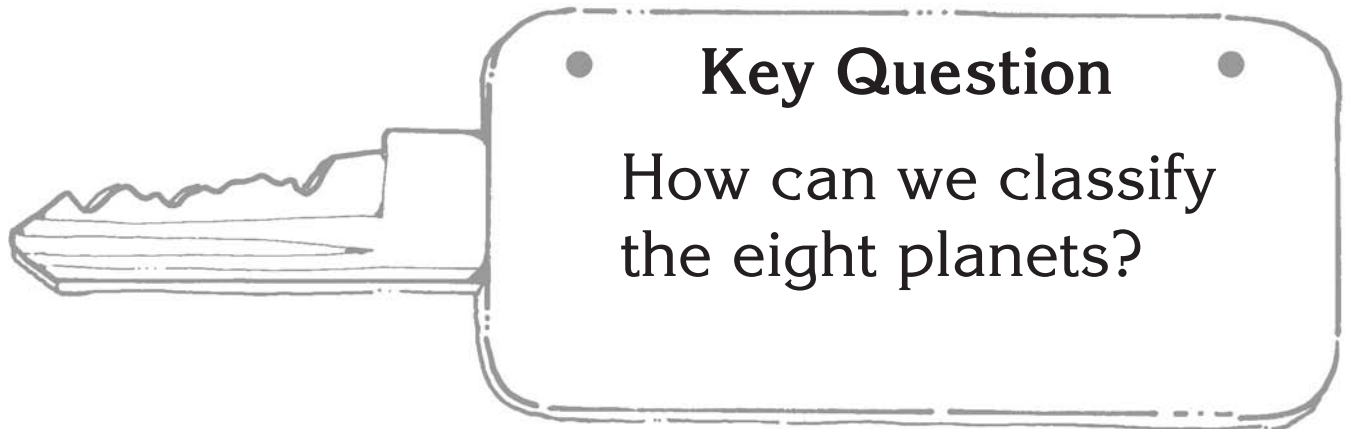
Have students do research reports on individual planets. The *National Geographic* is an excellent source.

Art

Let each group choose a planet to make in papier-mâché by covering a balloon. Have students research the visual characteristics of their planet to represent it as accurately as possible without regard to its size in relation to other planets. Challenge students to create unique ways to show features such as the rings!

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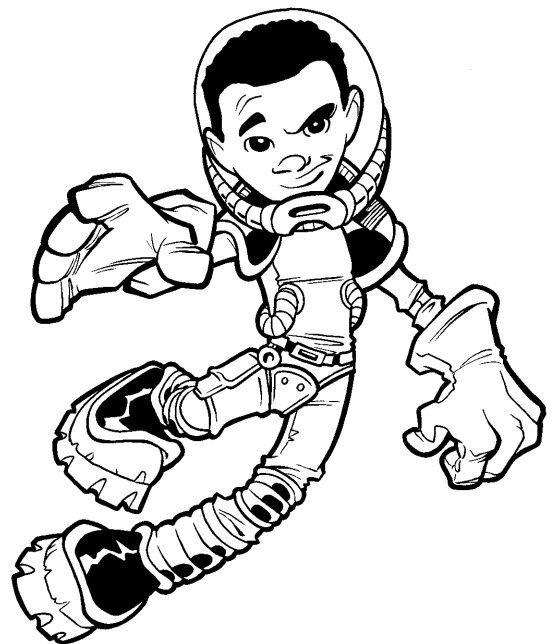




Learning Goals

Students will:

- read tables and charts to learn about various aspects of the planets and their relationships with one another, and
- use Venn diagrams and graphs to organize information about the planets.



PLANETARY FACTS

PLANET ▼	Approximate Diameter	Approximate Period of Rotation	Moons	Rings?
Mercury	4,900 km	59 days (176 days) *	0	No
Venus	12,100 km	243 days (117 days) *	0	No
Earth	12,800 km	23 hours, 56 minutes	1	No
Mars	6,800 km	24 hours, 37 minutes	2	No
Jupiter	143,000 km	9 hours, 55 minutes	63	Yes
Saturn	120,600 km	10 hours, 39 minutes	34	Yes
Uranus	51,100 km	17 hours, 14 minutes	27	Yes
Neptune	49,500 km	16 hours, 7 minutes	13	Yes

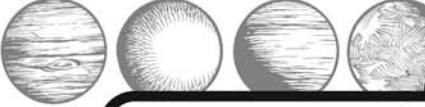
* length of day sunrise to sunrise



0001 OUT OF THIS WORLD
 001001010110100100101010
CAN YOU PLANET?
 0010010101101001001010 10-0820-02

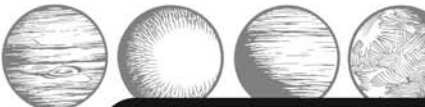
Sort out the planets. Next to each planet's name, color in those spaces that are true. Use this information to place the planets on the Venn Diagram.

PLANETARY FACTS HELPING TABLE



	Larger than Earth	Has Ring(s)	Has Moon(s)
Mercury			
Venus			
Earth			
Mars			
Jupiter			
Saturn			
Uranus			
Neptune			

MORE PLANETARY FACTS (Venn Again)



Mercury			
Venus			
Earth			
Mars			
Jupiter			
Saturn			
Uranus			
Neptune			

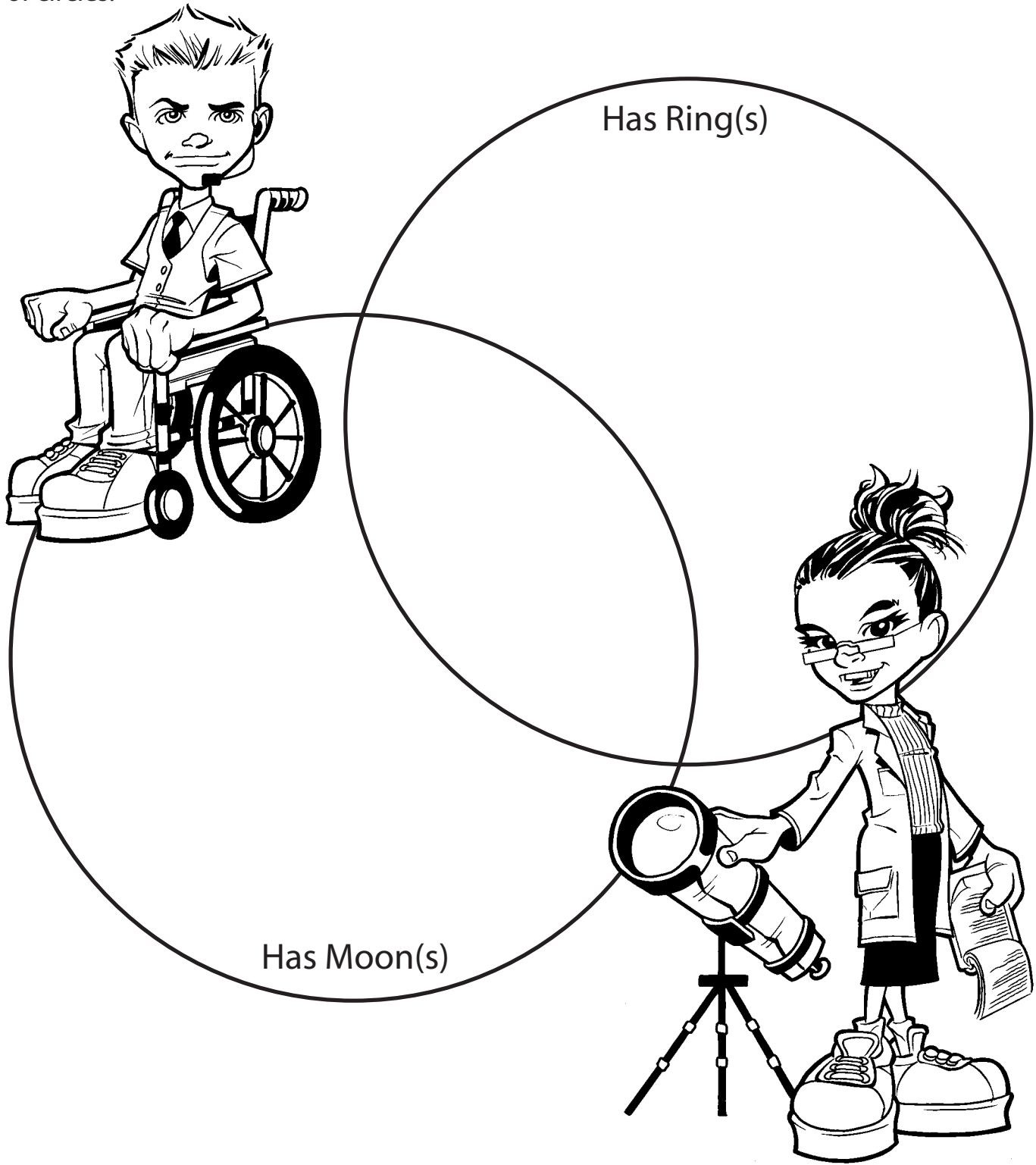
CAN YOU PLANET?



Cut out these symbols to use on the Venn Diagrams.

 Mercury	 Mercury	 Mercury	 Mercury	 Mercury	 Mercury	 Mercury
 Venus	 Venus	 Venus	 Venus	 Venus	 Venus	 Venus
 Earth	 Earth	 Earth	 Earth	 Earth	 Earth	 Earth
 Mars	 Mars	 Mars	 Mars	 Mars	 Mars	 Mars
 Jupiter	 Jupiter	 Jupiter	 Jupiter	 Jupiter	 Jupiter	 Jupiter
 Saturn	 Saturn	 Saturn	 Saturn	 Saturn	 Saturn	 Saturn
 Uranus	 Uranus	 Uranus	 Uranus	 Uranus	 Uranus	 Uranus
 Neptune	 Neptune	 Neptune	 Neptune	 Neptune	 Neptune	 Neptune

Use the information from the chart to place the planets in the correct circle or intersection of circles.





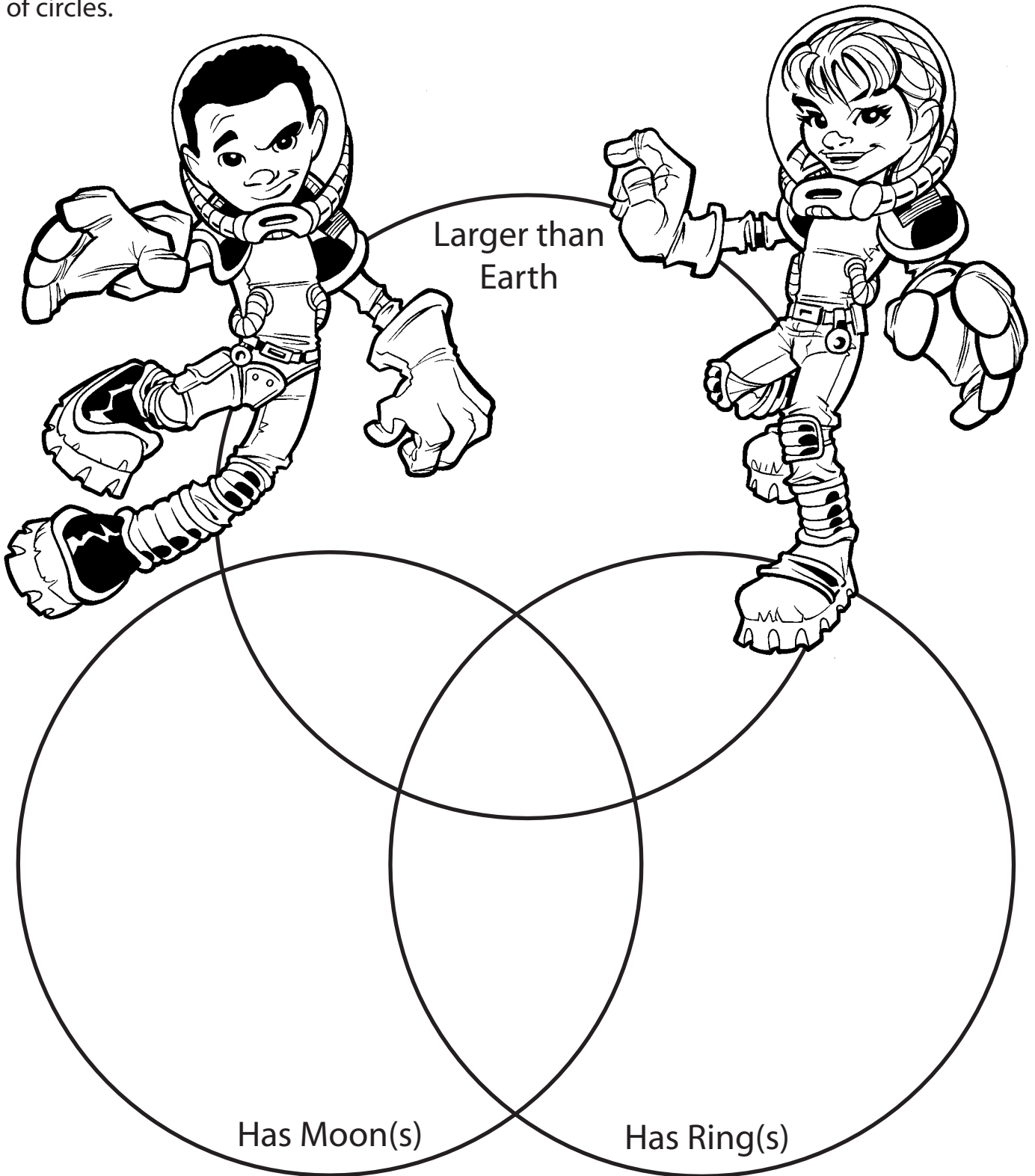
OUT OF THIS WORLD

001001010110100100101010

CAN YOU PLANET?

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Use the information from the chart to place the planets in the correct circle or intersection of circles.





Use the Venn Diagrams or charts to answer the following questions.

1. Which planets are larger than Earth?
2. Which two planets are closest in size?
3. What percent of the planets are smaller than Earth?
4. Which planets have moons?
5. Which planet has the most moons?
6. What is the total number of known moons in our solar system?
7. What is the average number of moons per planet?
8. Which planets fit into all three categories?
9. Which planets have days that are longer than 24 hours?

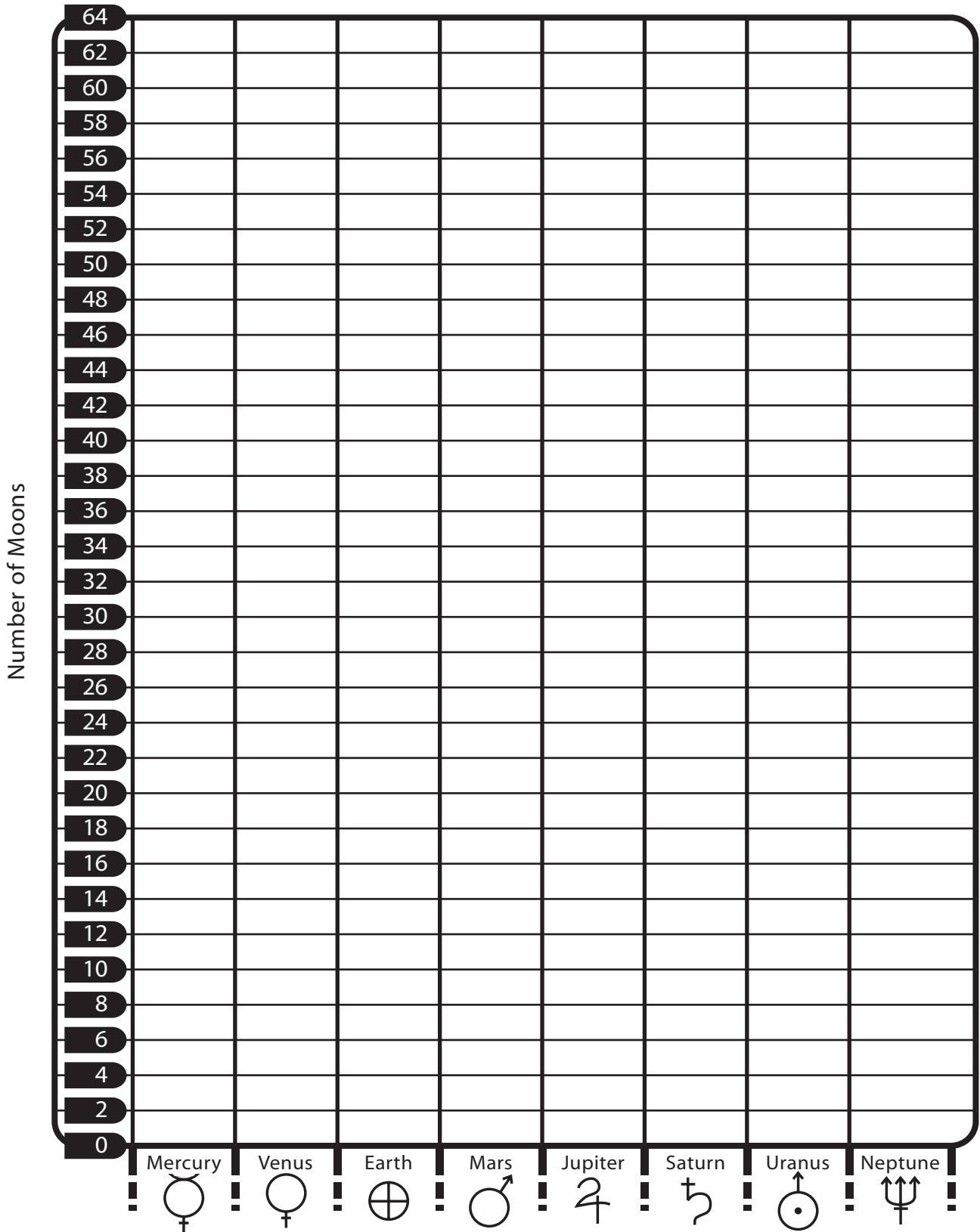


Think of two more questions you can ask your classmates. Write them below.



CAN YOU PLANET?

HOW MANY MOONS ? 0110100100101010



0001

001001010110100100101010

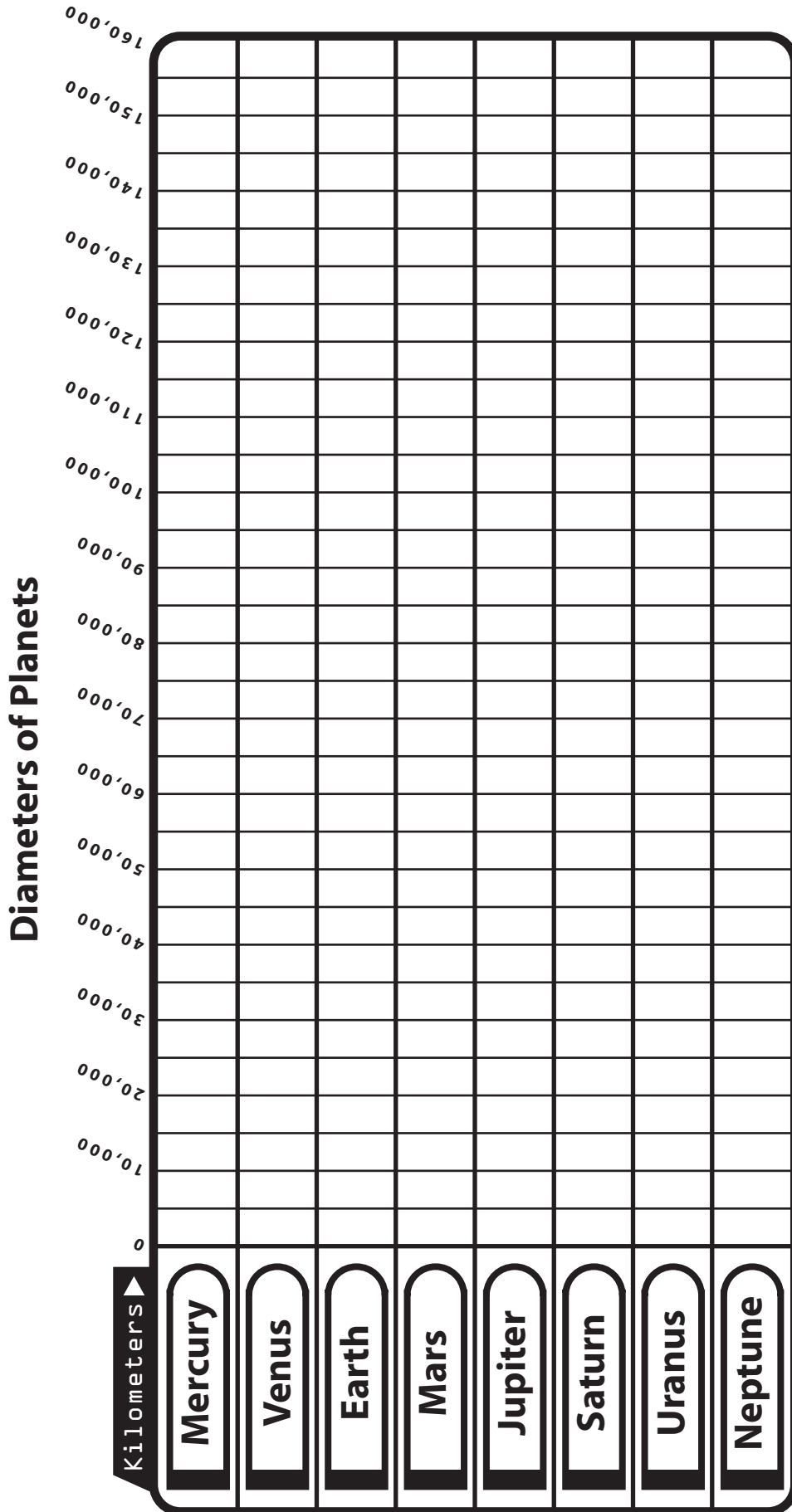
OUT OF THIS WORLD

CAN YOU PLANET?

WHAT'S MY SIZE? 011010010010101010-0&20-02



Graph the diameters of the planets.



THE SOLAR SYSTEM

MERCURY



VENUS



EARTH



MARS



JUPITER



SUN

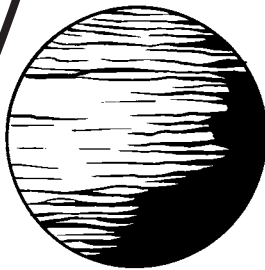
SATURN



URANUS

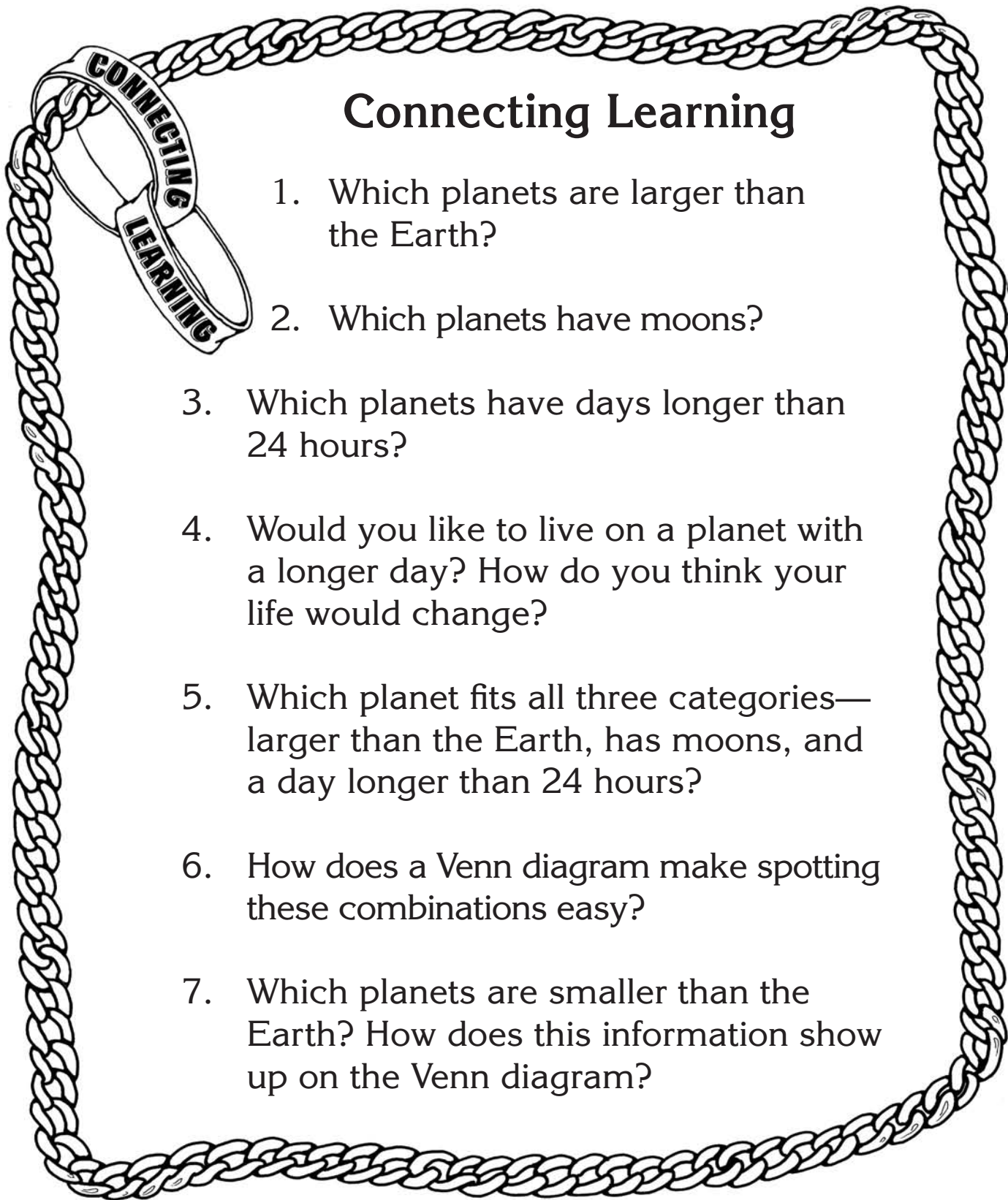


NEPTUNE





CAN YOU PLANET?

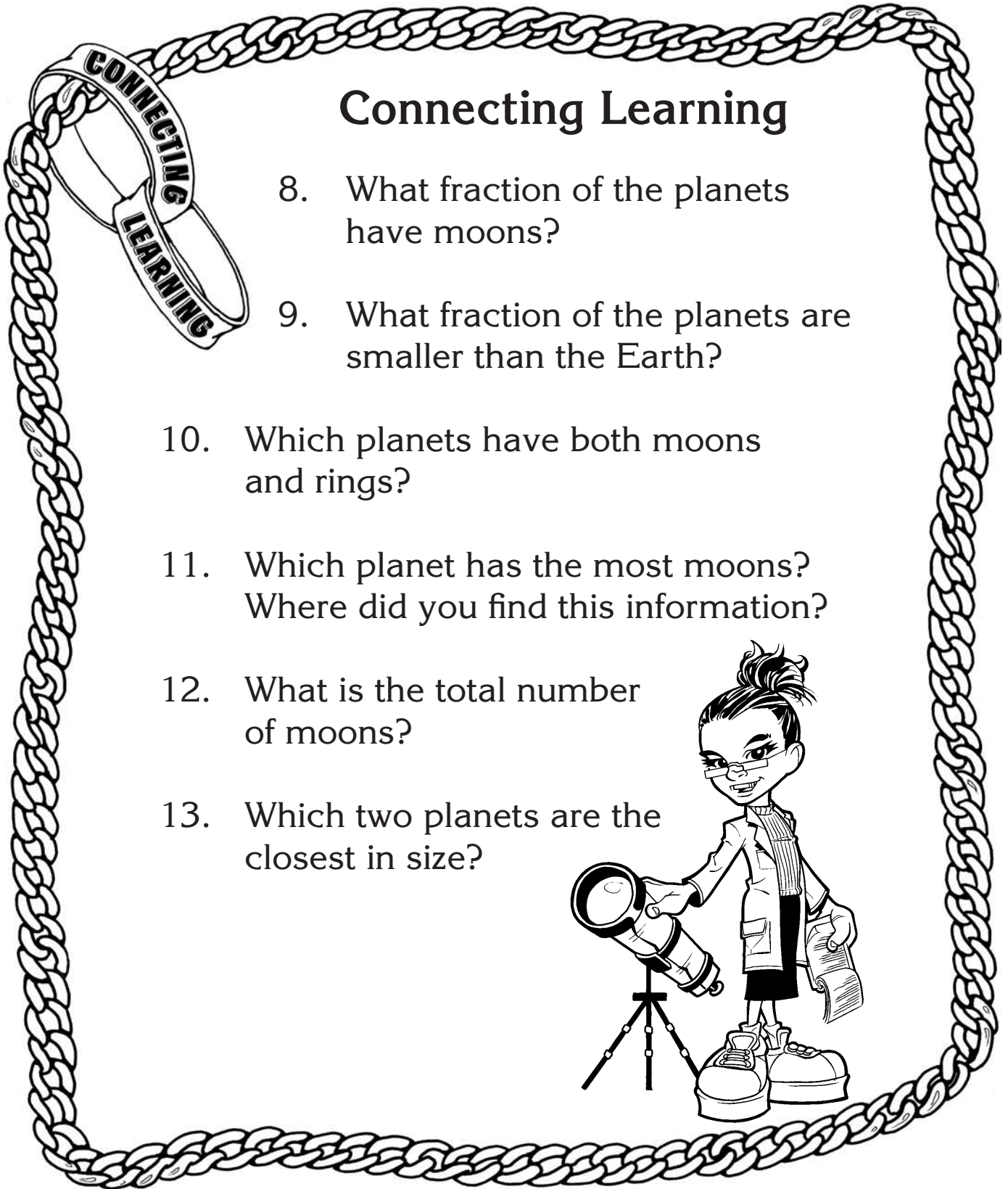


Connecting Learning

1. Which planets are larger than the Earth?
2. Which planets have moons?
3. Which planets have days longer than 24 hours?
4. Would you like to live on a planet with a longer day? How do you think your life would change?
5. Which planet fits all three categories—larger than the Earth, has moons, and a day longer than 24 hours?
6. How does a Venn diagram make spotting these combinations easy?
7. Which planets are smaller than the Earth? How does this information show up on the Venn diagram?



CAN YOU PLANET?



Connecting Learning

8. What fraction of the planets have moons?
9. What fraction of the planets are smaller than the Earth?
10. Which planets have both moons and rings?
11. Which planet has the most moons? Where did you find this information?
12. What is the total number of moons?
13. Which two planets are the closest in size?

