

# Your Birthday on Another Planet

## The Solar System Flip Book

### General Information

- ★ Level: Grades 2, 3 and 4.
- ★ Students per group: Individual activity or groups of four.
- ★ Duration: Two 60-minute periods.
- ★ Where: In class.
- ★ When: Before or after visiting the Planetarium.
- ★ Type of activity: Discovery led by the teacher.
- ★ Key words: Planetary movement — solar system — planets.
- ★ Skills developed: Asking questions, interpreting data, observing, identifying variables, using logic, deducing, predicting, developing motor skills.



### Starting Point

When would my next birthday be if I lived on another planet?

### Preconceptions

Students may believe that the planets all revolve around the Sun at the same speed or take the same amount of time to complete one orbit around the Sun. Some students might not know that all the planets revolve around the Sun in the same direction.

*Adapted from Your Birthday on Another Planet by Ed Rusczyk and Gary Sampson, copyright © 1994 by the President and Fellows of Harvard College.*

## Basic Concepts

All the planets in the solar system revolve around the Sun in the same direction. The closer a planet is to the Sun, the faster it travels in its orbit and the less time it takes to complete a full trip around the Sun.

On a given planet, the “year” is the period of time this planet takes to complete one orbit around the Sun. If we could live on another planet, our birthdays would occur more or less frequently depending on the planet’s revolution period (the time taken to complete one full trip around the Sun). On a few planets, we couldn’t even celebrate our first birthday because we wouldn’t live long enough to give these planets time to complete one full trip around the Sun!

## Goals

By assembling and using the solar system flip book, students realize that the four planets closest to the Sun (Mercury, Venus, Earth and Mars) revolve around the Sun in the same direction, albeit at different speeds. Students use this visual information, along with a table showing the orbital period of the planets in the solar system, to deduce that the length of a “year” isn’t the same from one planet to the next. They conclude that their birthdays wouldn’t be celebrated at the same frequency on these planets as on Earth.

## Steps in the Activity

### Preparation

Gather the supplies needed and copy out the quiz questions on the board.

Identify a source of information on planets that students can consult, whether it be the table in Appendix 2 or an astronomy book from your school’s library (preferably a recent publication).

### Supplies

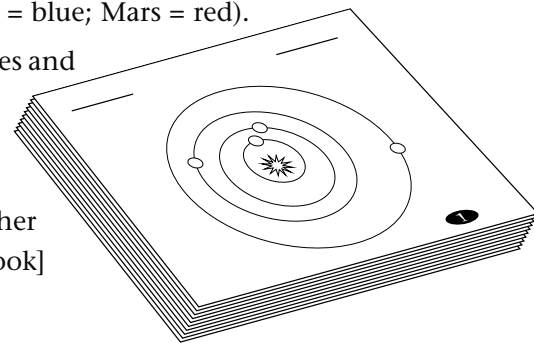
For each student (or each team):

- Thick paper (index cards or file folders).
- Photocopies of planetary orbit sheets numbered 1 to 24 (Appendix 1).
- Glue, scissors.
- Coloured pencils.
- Stapler or large clips for holding together a stack of 24 sheets of thick paper.
- Photocopies of the table of the planets’ revolution periods (Appendix 2).
- Photocopies of the student handout “Your Birthday on Another Planet.”

## Assignment

❶ In front of the class, explain the steps for assembling the solar system flip book:

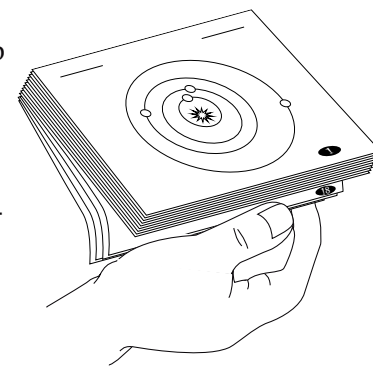
- Glue the photocopies of the planetary orbit sheets (Appendix 1) onto thick paper.
- On each of the illustrations numbered 1 to 24, colour the Sun and four planets (Sun = yellow; Mercury = green; Venus = brown; Earth = blue; Mars = red).
  - Carefully cut out the illustrations along the dotted lines and stack them in order (1 to 24) with No. 1 on top and No. 24 at the bottom of the pile. Make sure the images are placed in such a way that the numbers all appear in the same corner. Staple or pin the pile together in the spaces marked. [Illustration of assembled flip book]



❷ Explain to students that once they've finished, they can observe the orbital movement of the planets by holding the flip book in one hand and quickly flipping through the pages with the other. Their flip book will work all the better if they've assembled it carefully. The planets should revolve around the Sun counterclockwise. To produce this effect, flip the pages from top to bottom. [Illustration of the use of the flip book]

❸ Make sure that students each assemble their flip book and flip through its pages several times till they've properly observed planetary movement.

❹ Once they've mastered the previous step, pass around the student quiz "Your Birthday on Another Planet."

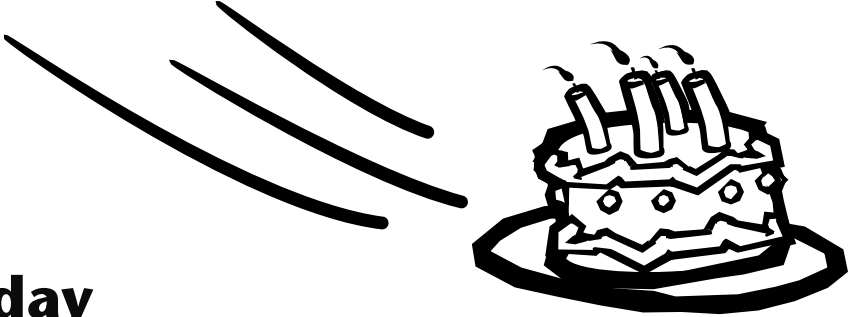


## Wrap-up

Correct the quiz with your class, asking volunteers to give and explain their answers. Help students reach general conclusions about planetary movement: all planets revolve around the Sun in the same direction (counterclockwise as seen from above the Earth's North Pole), and the farther away a planet is from the Sun, the longer it takes to complete one full trip around our star. If time permits, discuss the different features of the planets in the solar system.

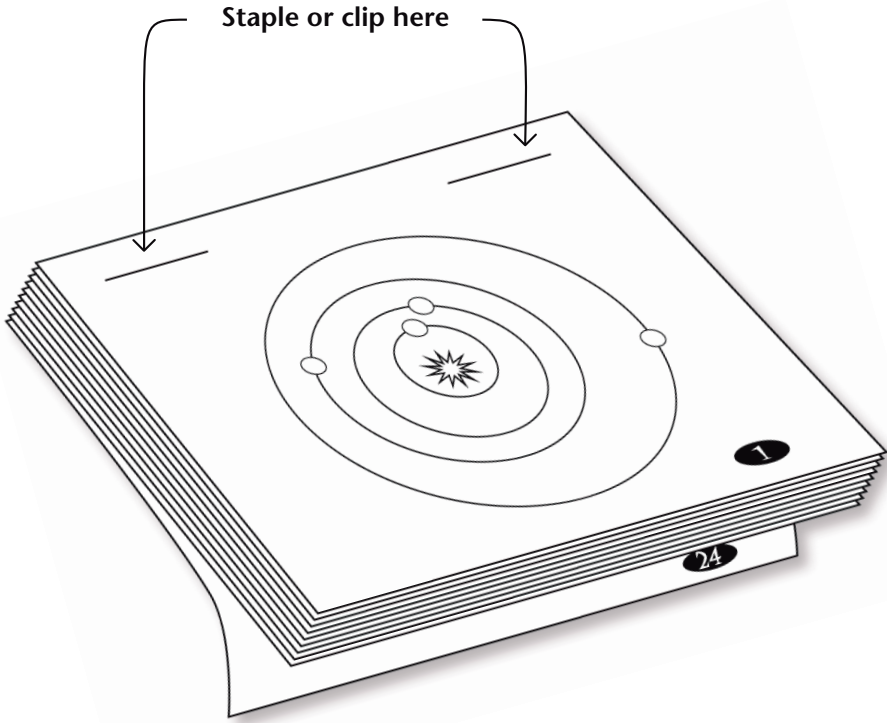
## Table of the Planets' Period of Revolution

Planet	Distance from Sun (millions of km)	Orbital Velocity (km per second)	Period of Revolution
Mercury	58	48	88 days
Venus	108	35	225 days
Earth	150	30	1 year
Mars	228	24	2 years
Jupiter	778	13	12 years
Saturn	1 429	10	29 years
Uranus	2 875	7	84 years
Neptune	4 504	6	165 years
Pluto	5 916	5	248 years

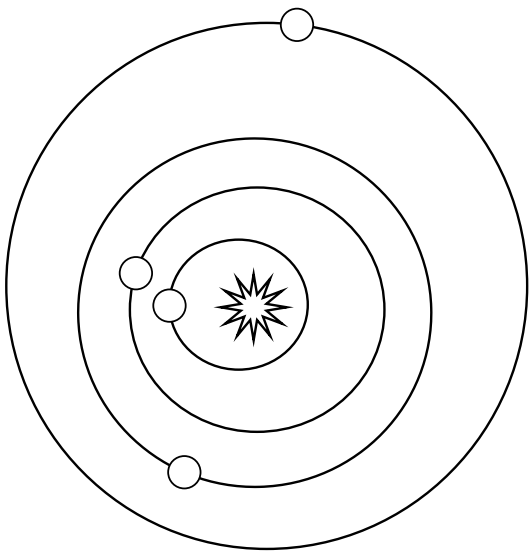


# Your Birthday on Another Planet

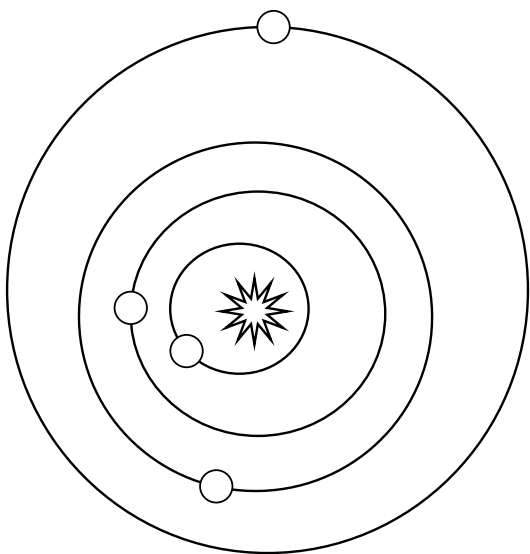
Planet Orbit Sheets to Photocopy



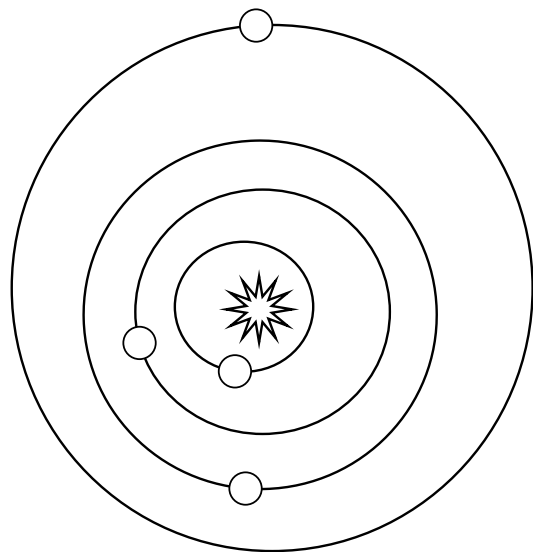
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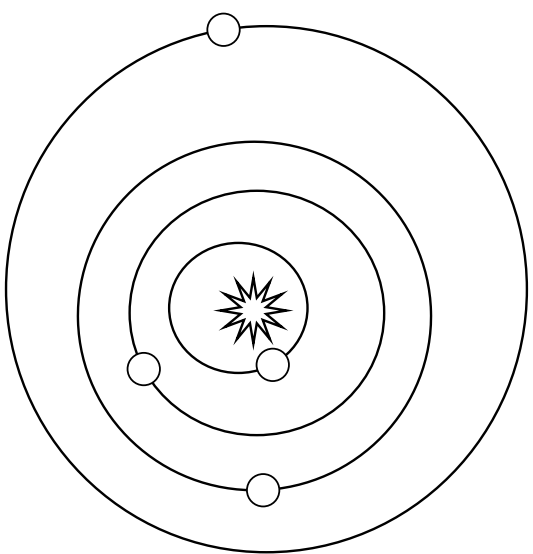
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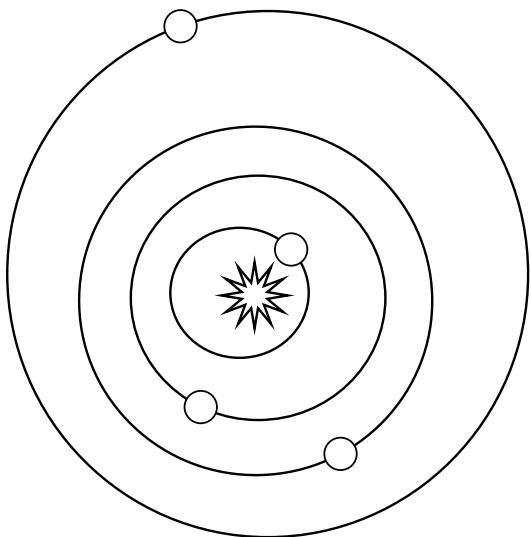


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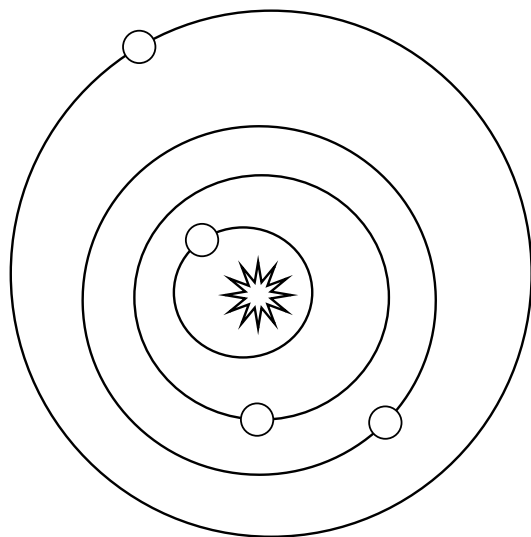


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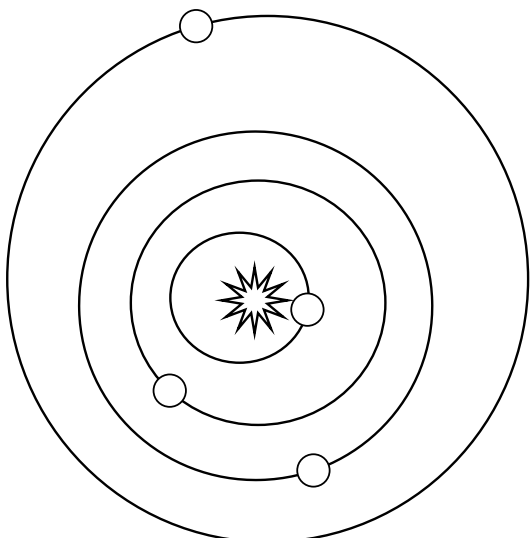
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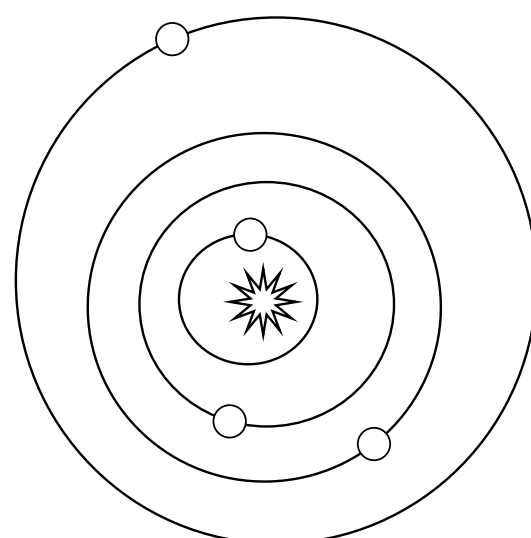
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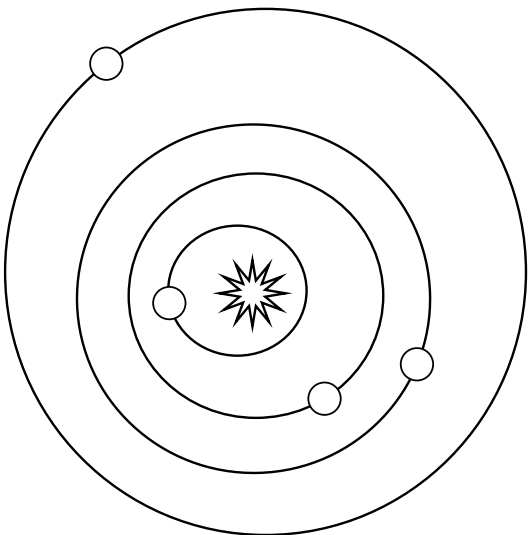
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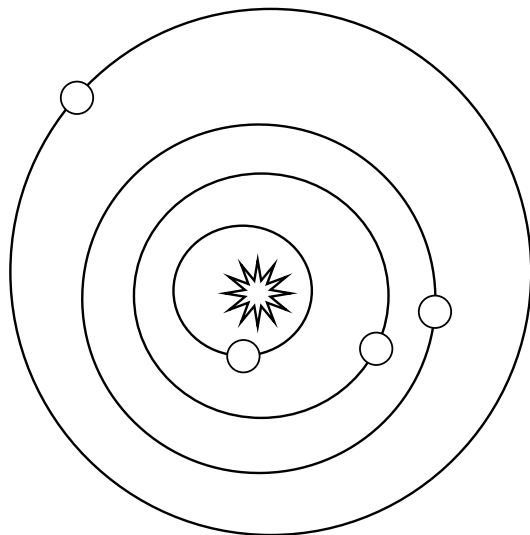
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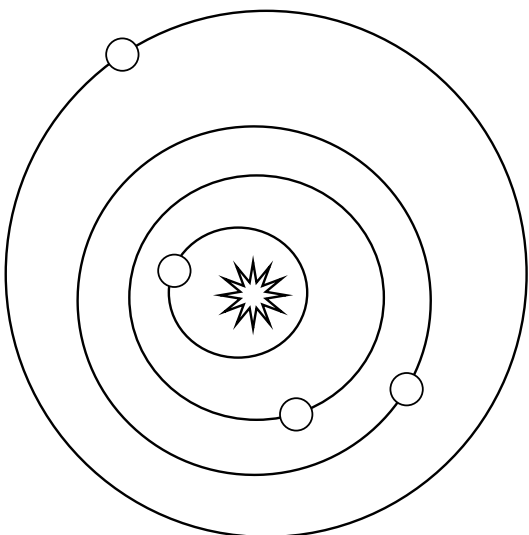
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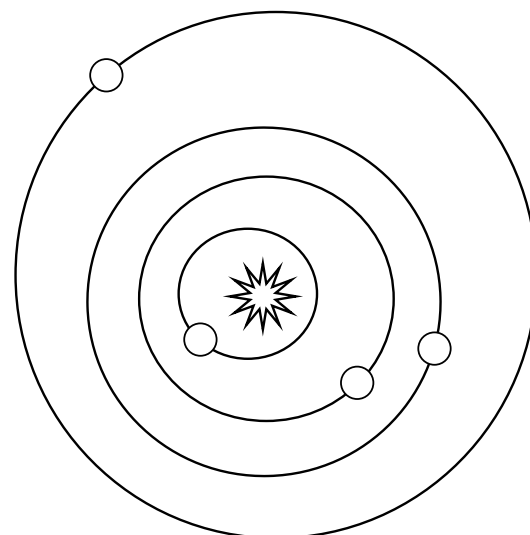
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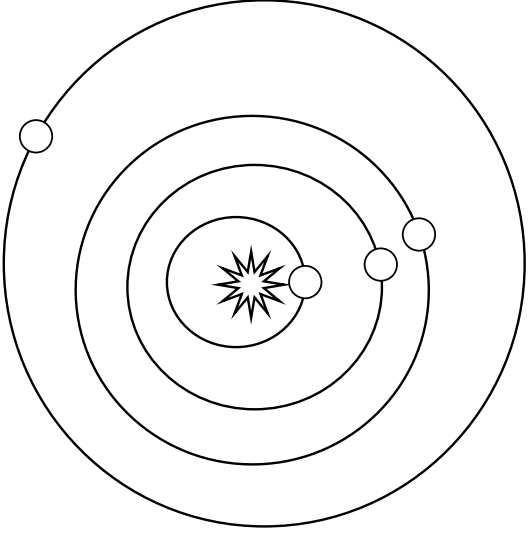


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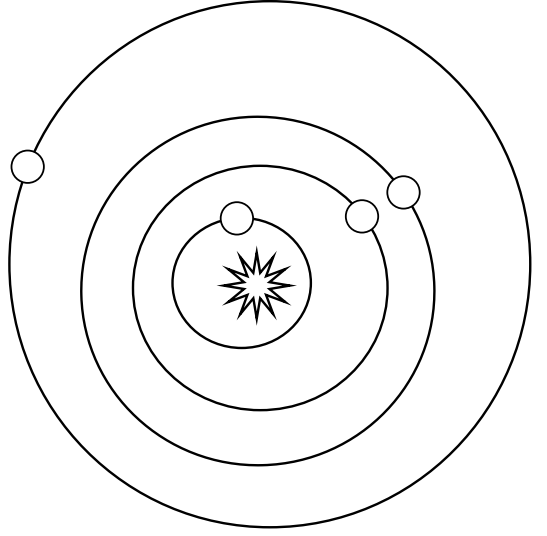




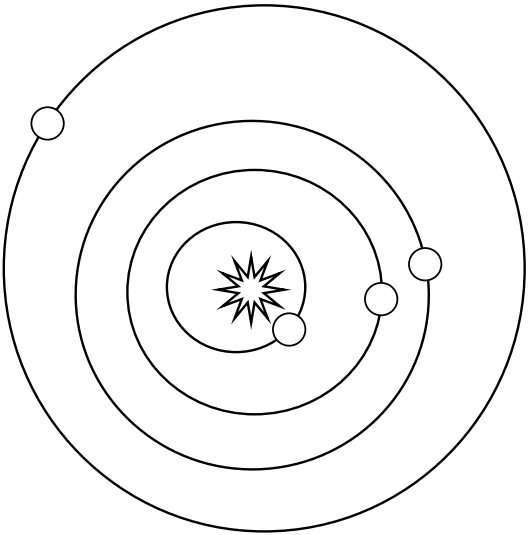
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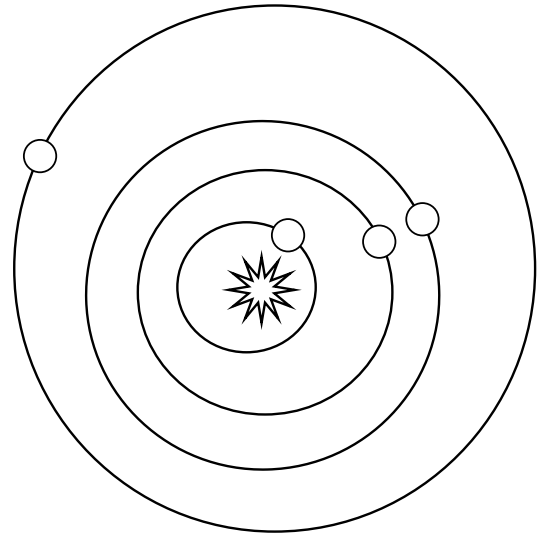
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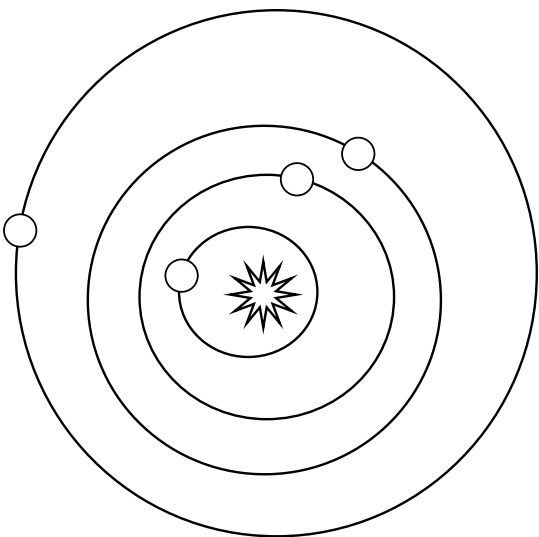
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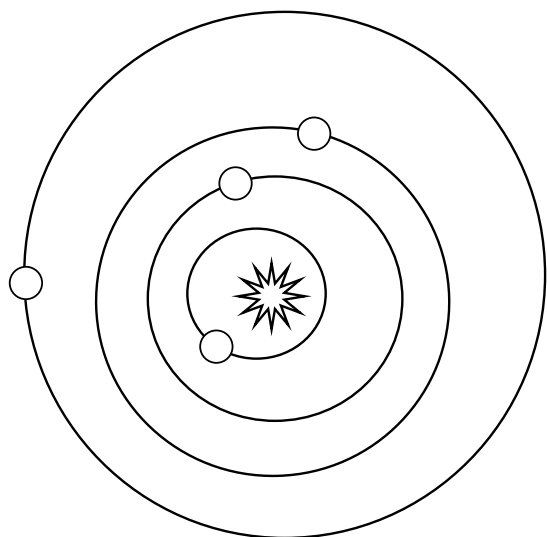
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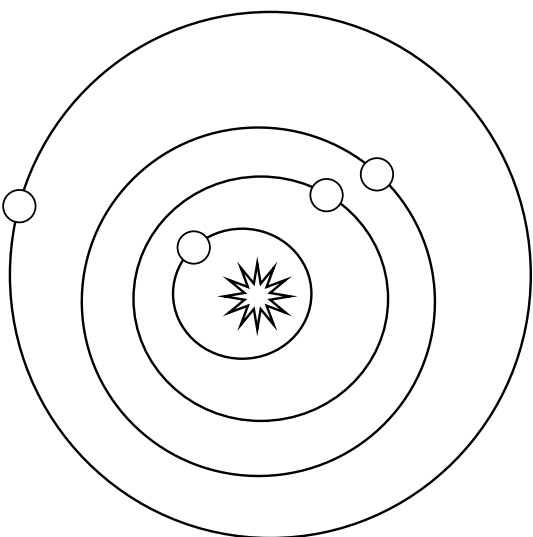
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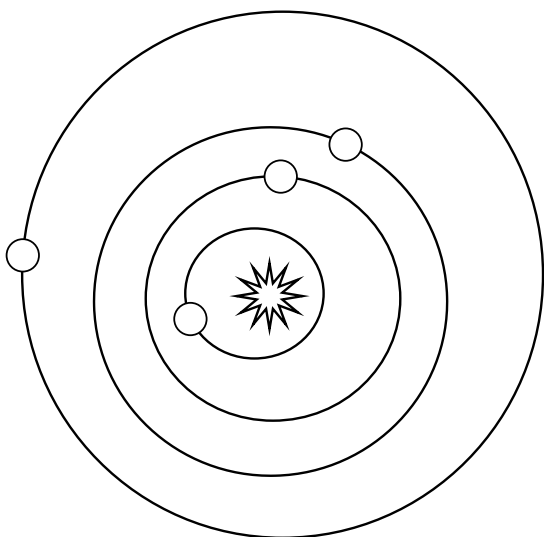
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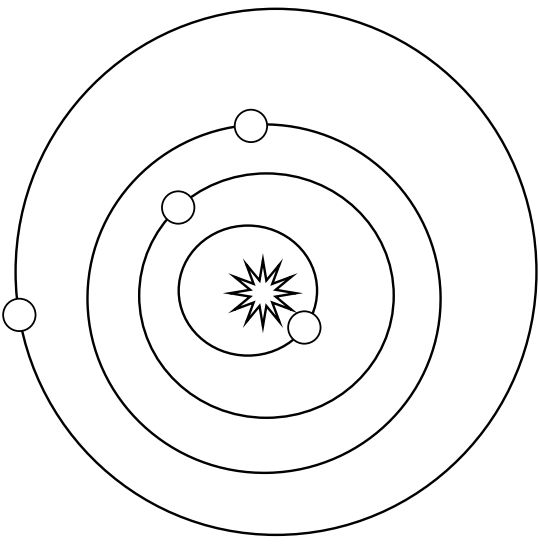
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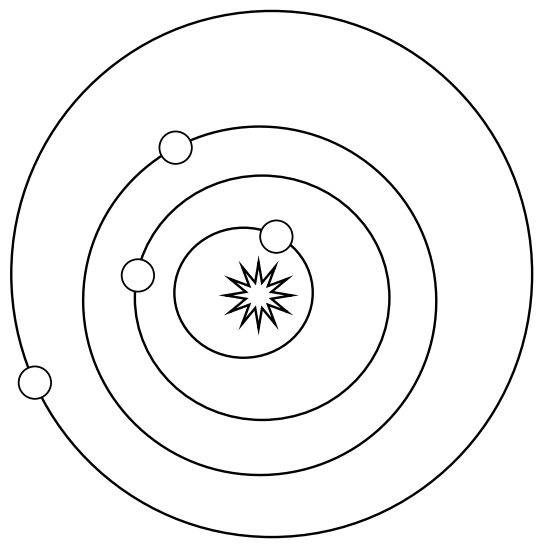
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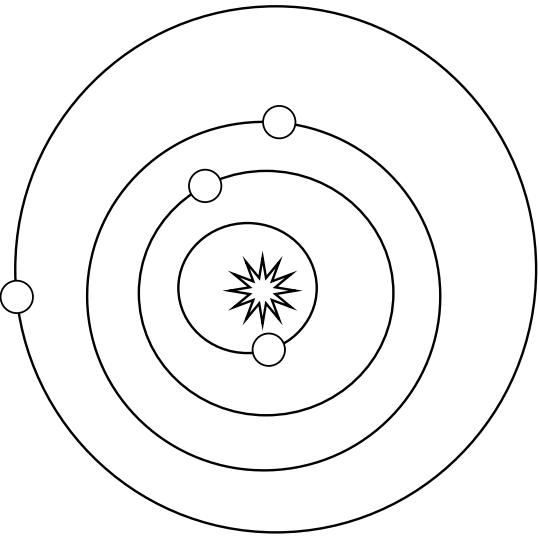
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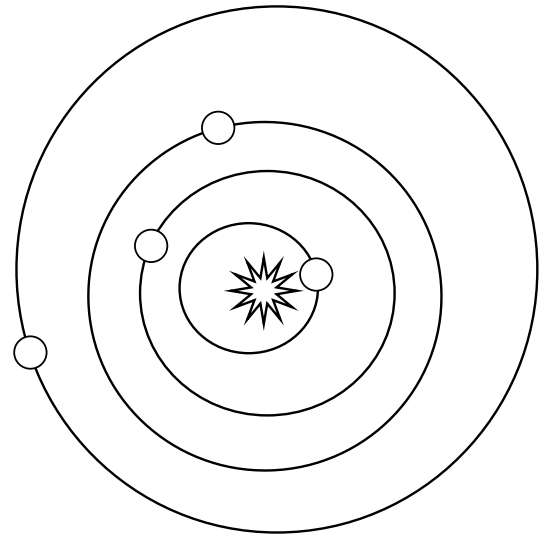
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# Your Birthday on Another Planet

Name: \_\_\_\_\_

Class: \_\_\_\_\_ Date: \_\_\_\_\_

1. In what direction do the planets move around the Sun?  
 Answer by comparing this movement with the movement of the hands of a clock.

Counterclockwise (as seen from above the Earth's North Pole.)

2. Which of the four planets travels fastest in its orbit around the Sun?

Mercury, the planet closest to the Sun.

3. Which of the four planets travels most slowly in its orbit around the Sun?

Mars, the planet farthest from the Sun.

4. You celebrate your birthday once every Earth year.  
 How do we determine the length of a year?

It's the amount of time the Earth takes to complete one orbit around the Sun.

5. Does a "year" last the same amount of time on all the planets?

No.

6. If you lived on Mercury, would your birthday occur more or less often than on Earth?

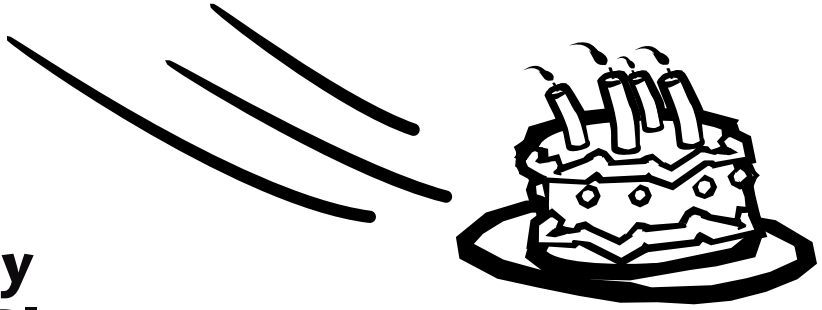
More often. (Slightly more than four birthdays on Mercury for one birthday on Earth.)

7. What would your age be in Martian years in you lived on Mars?

Slightly more than half your age on Earth. For example, eight Earth years equal about four Martian years. For this question, students should consult the table of the period of revolution and compare the periods for the Earth and Mars.

8. At what age in Earth years could you celebrate your first birthday on Uranus? On Pluto?

At about age 84 on Uranus and 248 on Pluto. For this question, students should consult the table of the revolution periods and compare the periods for the Earth, Uranus and Pluto.



# Your Birthday on Another Planet

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Class: \_\_\_\_\_ Date: \_\_\_\_\_

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Answer by comparing this movement with the movement of the hands of a clock.

\_\_\_\_\_

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\_\_\_\_\_

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\_\_\_\_\_

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\_\_\_\_\_

7. What would your age be in Martian years if you lived on Mars?

\_\_\_\_\_

\_\_\_\_\_

8. At what age in Earth years could you celebrate your first birthday on Uranus? On Pluto?

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