CLASSROOM ACTIVITY

Your Birthday on Another Planet

The Solar System Flip Book

General Information

- ★ Level: Elementary-cycle two
- ★ Students per group: Individual activity or groups of two
- ★ When: After the Planetarium visits your school
- ★ Duration: One or two 50-minute periods
- ★ Where: In class.
- ★ Type of activity: Discovery led by the teacher
- ★ Subjects covered: Science and technology — Mathematics — Visual Arts
- ★ Essential knowledges: **Science and technology**: solar system; terminology related to an understanding of the material world, of living things, of the Earth and the universe; conventions and types of representations specific to the concepts studied (symbols, tables, norms and standardization) — **Mathematics**: arithmetics: meaning of operations involving numbers (natural numbers and integers); geometry: geometric figures and spatial sense (space); measurement (time: estimating and measuring); probability (doing simulations with or without a computer); cultural references; symbols; vocabulary — **Visual Arts**: transforming gestures and their extension; the tools; language of visual arts; visual arts production
- ★ Subject-specific competencies: **Science and technology**: To explore the world of science and technology; to propose explanations for or solutions to scientific or technological problems; to make the most of scientific and technological tools, objects and procedures; to communicate in the languages used in science and technology — **Mathematics**: To solve a situational problem related to mathematics; to reason using mathematical concepts and processes; to communicate by using mathematical language — **Visual Arts**: To produce individual works in the visual arts
- ★ Cross-curricular competencies: to cooperate with others; to use information; to exercise critical judgement; to use creativity; to solve problems; to communicate appropriately; to adopt effective work methods

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.

Basic Concepts

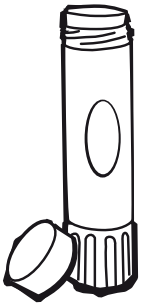
All the planets in the solar system revolve around the Sun in the same direction. The closer a planet is to the Sun, the faster it travels in its orbit and the less time it takes to complete a full trip around the Sun. On a given planet, the "year" is the period of time this planet takes to complete 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 orbital period (the time taken to complete one full trip around the Sun). On one planets, we couldn't even celebrate our first birthday because we wouldn't live long enough to give it 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

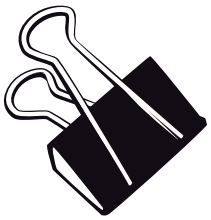


Gather the supplies needed and copy out the quiz questions on the board. Identify a source of information on planets that students can consult, whether it be the table in Appendix 1 or an astronomy book from your school's library (preferably a recent publication).

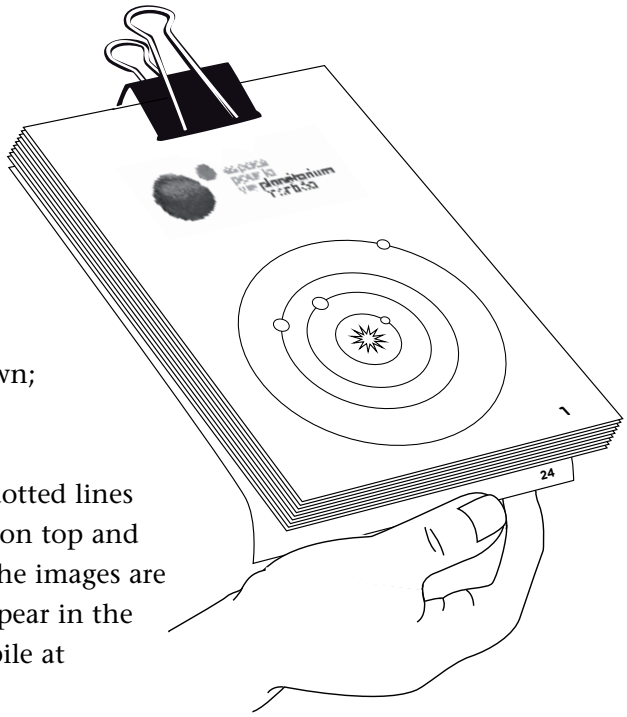
Supplies

For each student (or each team):

- Photocopies of planetary orbit sheets numbered 1 to 24 (Appendix 1)
- Glue stick
- Scissors
- Coloured pencils
- Large clips for holding together a stack of 24 sheets of paper
- Photocopies of the table of the planets' revolution periods (Appendix 2)
- Photocopies of the student handout "Your Birthday on Another Planet"



Assignment



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

   - 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. Place the clip at the top of the pile at the mark.

2. 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.

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

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

Wrap-up

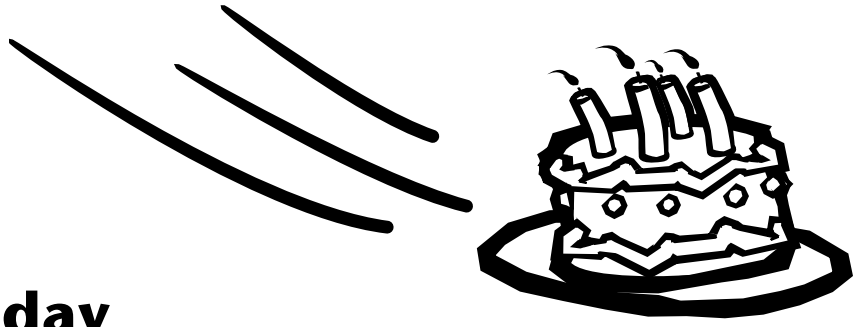
Correct the quiz with your class, asking volunteers to give and explain their answers. Help students reach general conclusions about planetary movement: all planets revolve around the Sun in the same direction (counterclockwise as seen from above the Earth's North Pole), and the farther away a planet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

APPENDIX 1

Table of the Planets' Orbital Periods

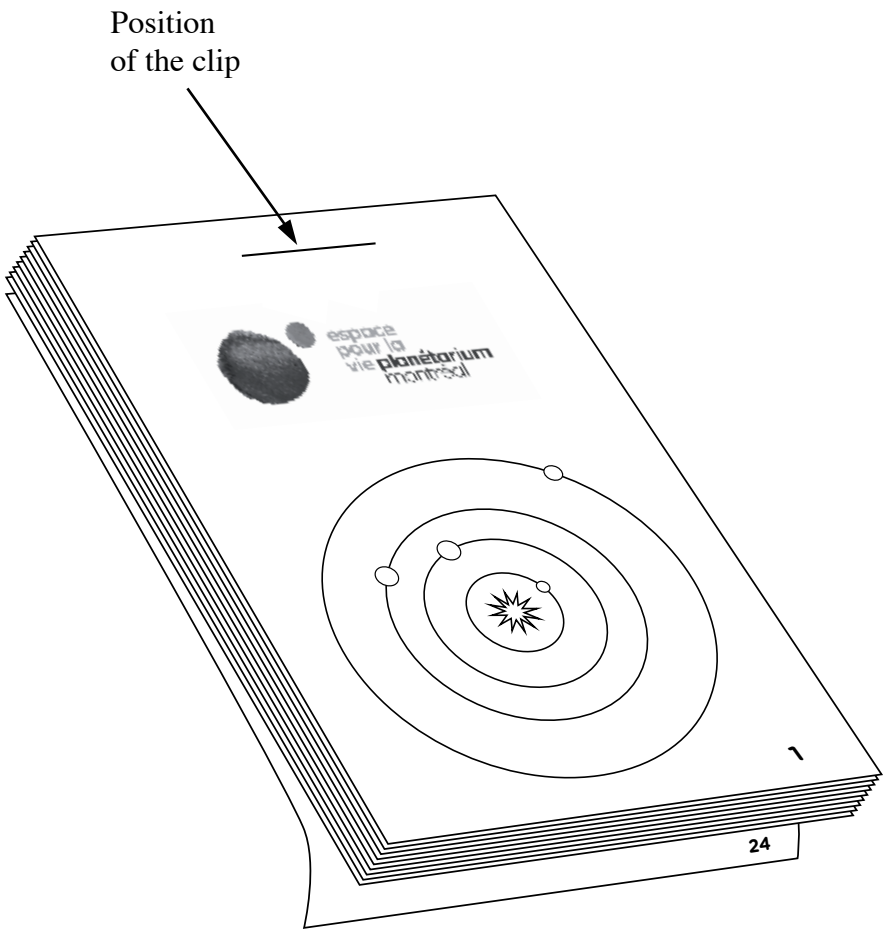
Planet	**Distance from Sun** (millions of km)	**Orbital Velocity** (km per second)	**Period of Revolution**
Mercury	58	48	88 days
Venus	108	35	225 days
Earth	150	30	1 year
Mars	228	24	2 years
Jupiter	778	13	12 years
Saturn	1 429	10	29 years
Uranus	2 875	7	84 years
Neptune	4 504	6	165 years

APPENDIX 2



Your Birthday on Another Planet

Planet Orbit Sheets to Photocopy



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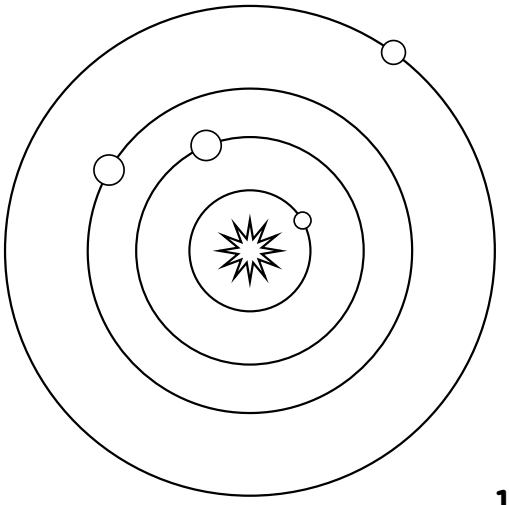

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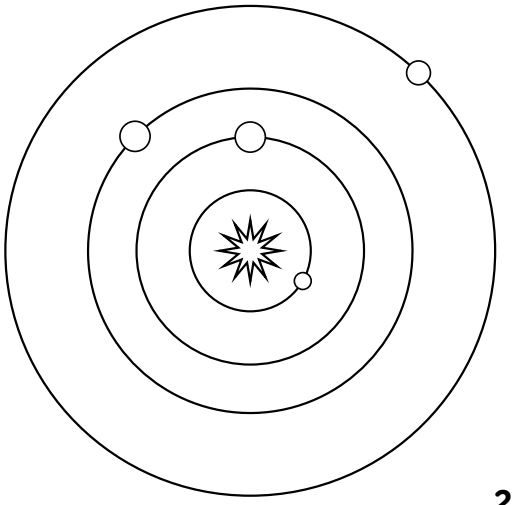

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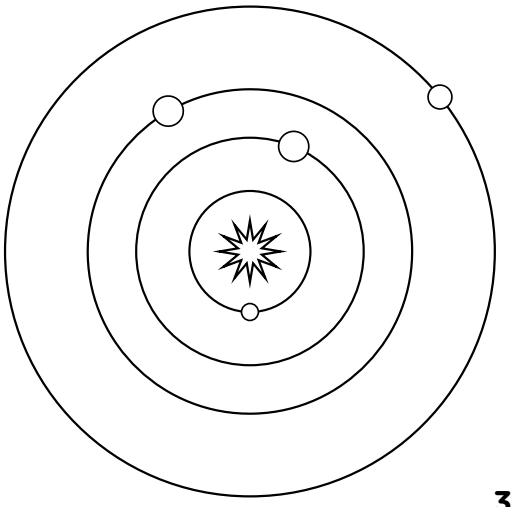

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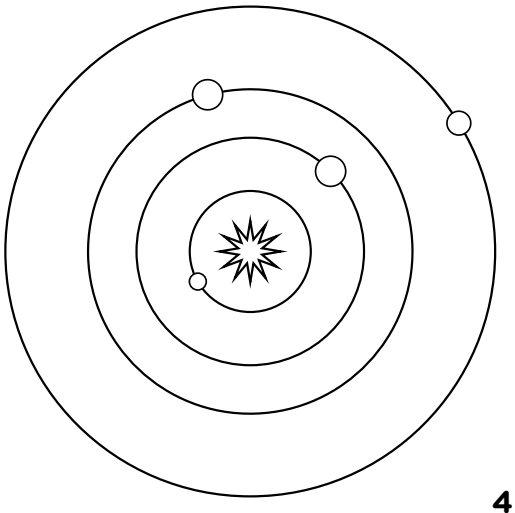

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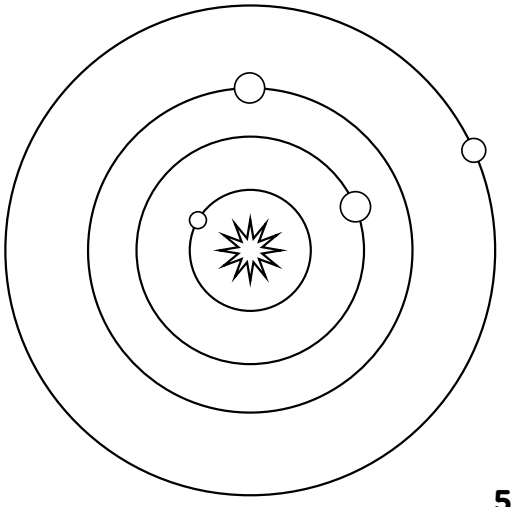

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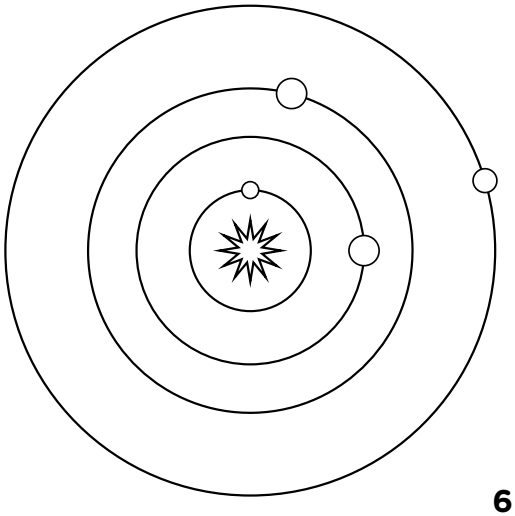

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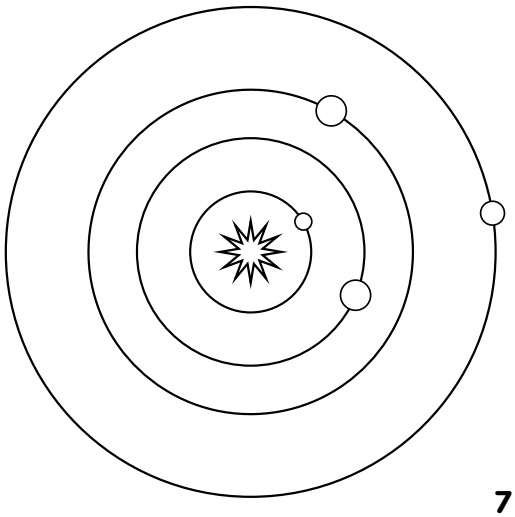

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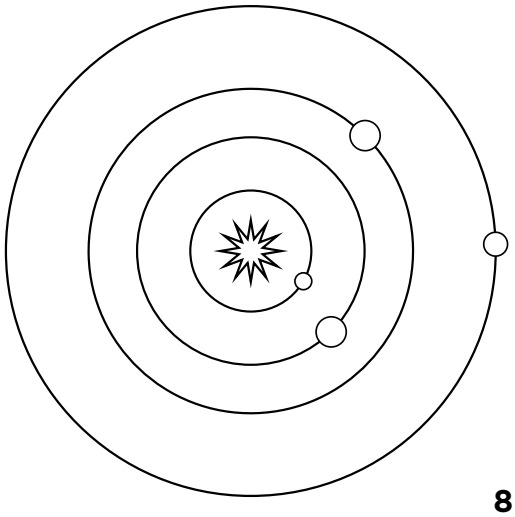

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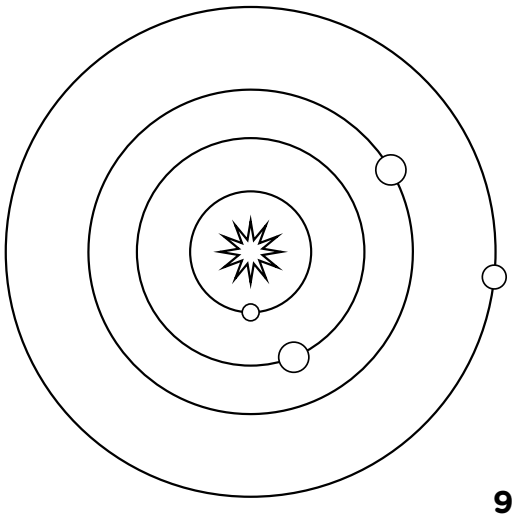

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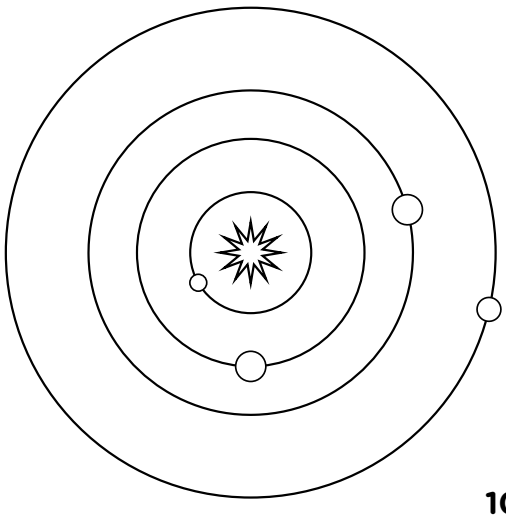

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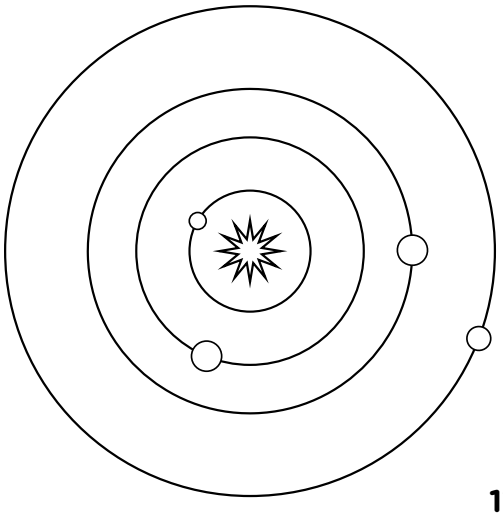

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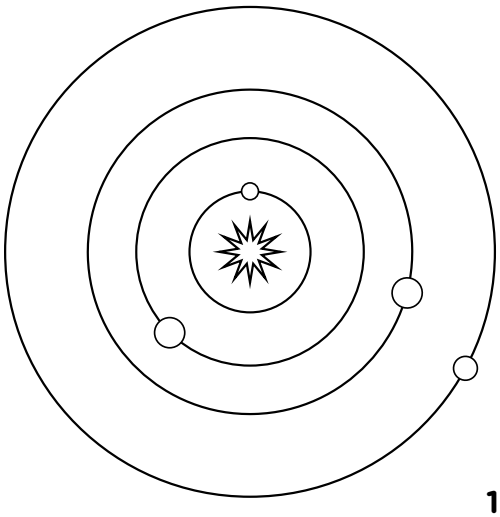

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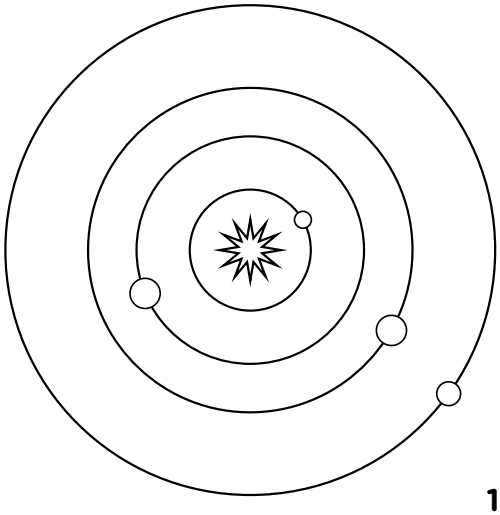

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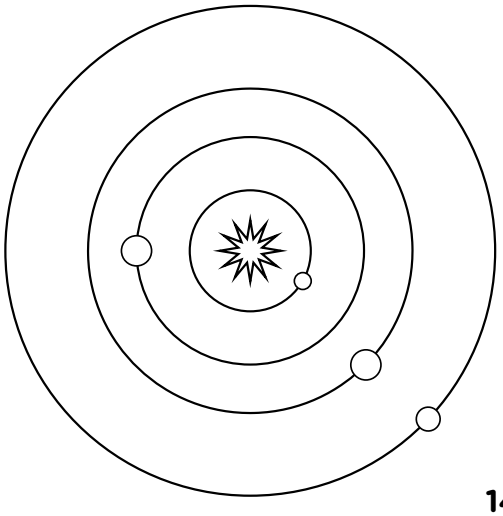

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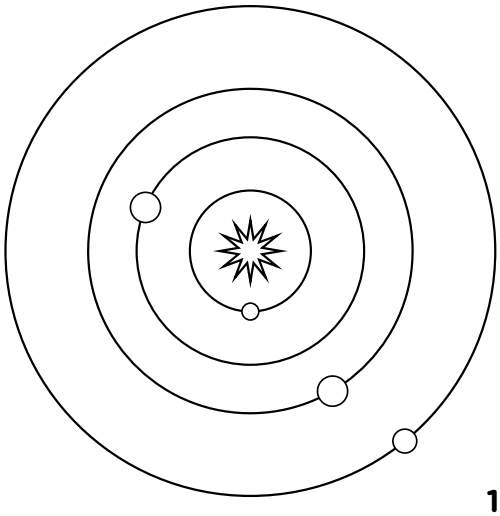

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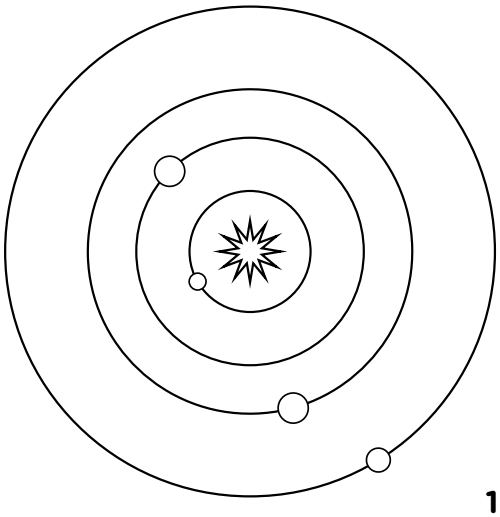

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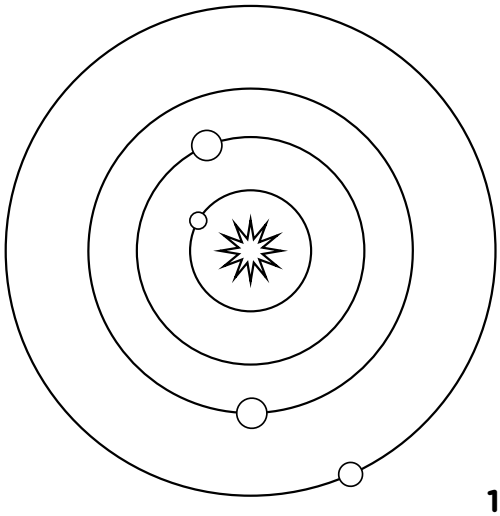

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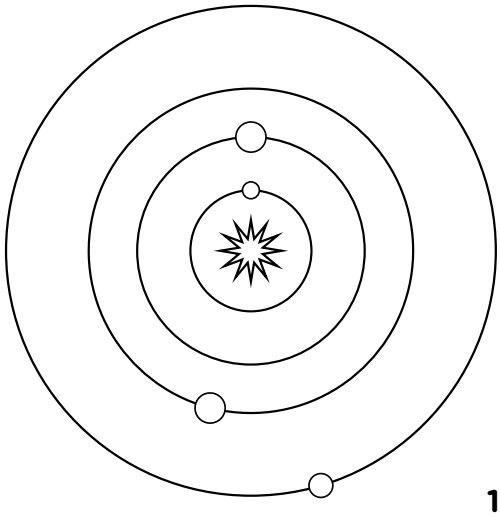

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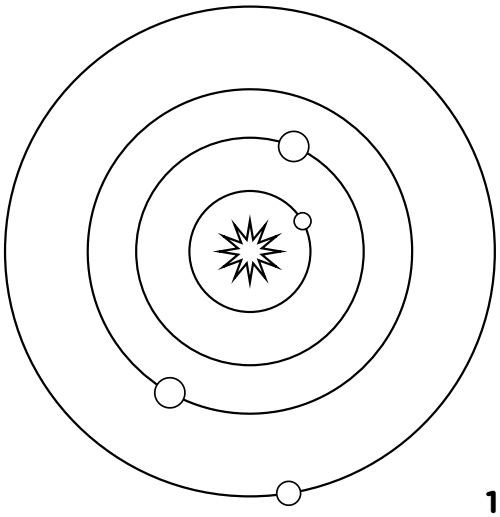

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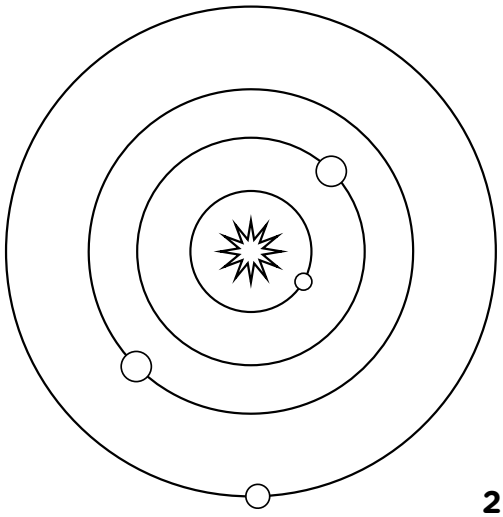

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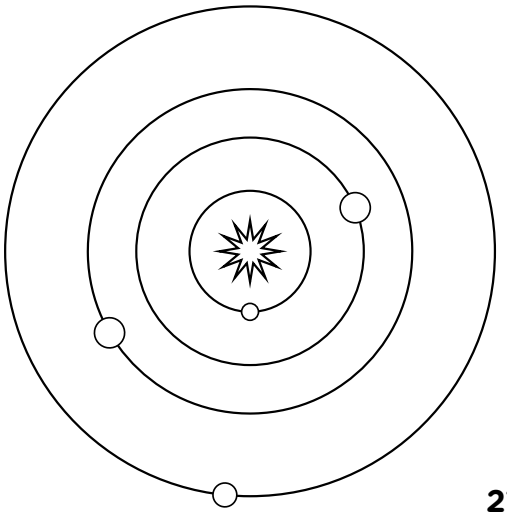

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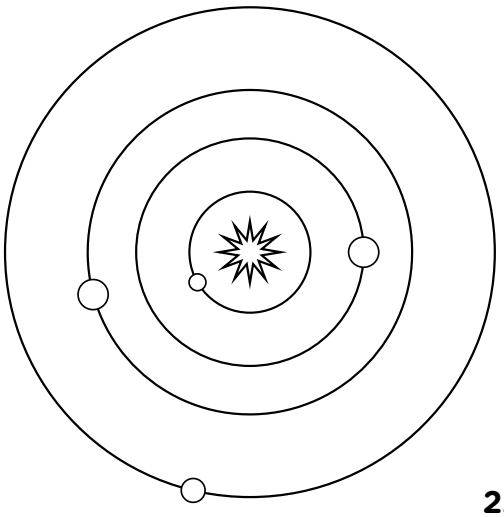

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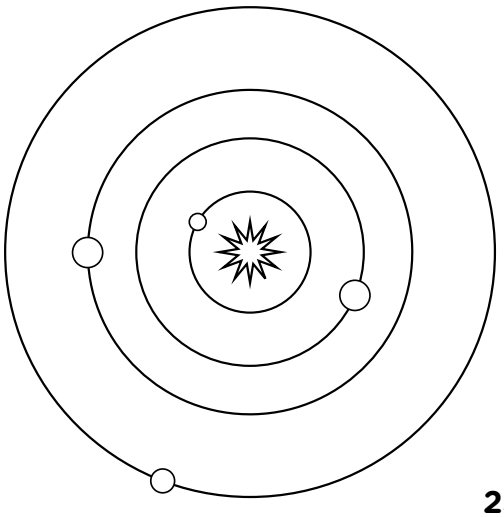

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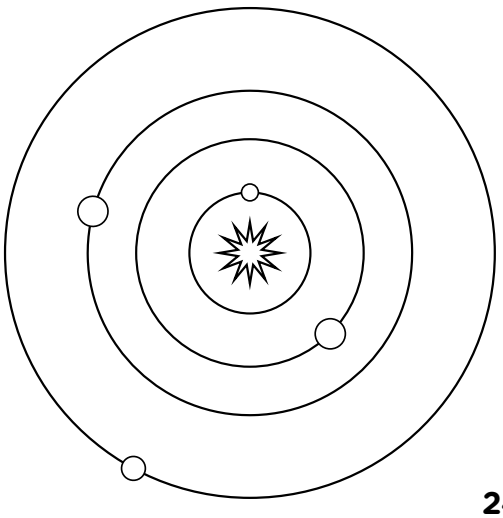

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TEACHER'S COPY

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 orbital periods and compare the periods for the Earth and Mars.

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

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

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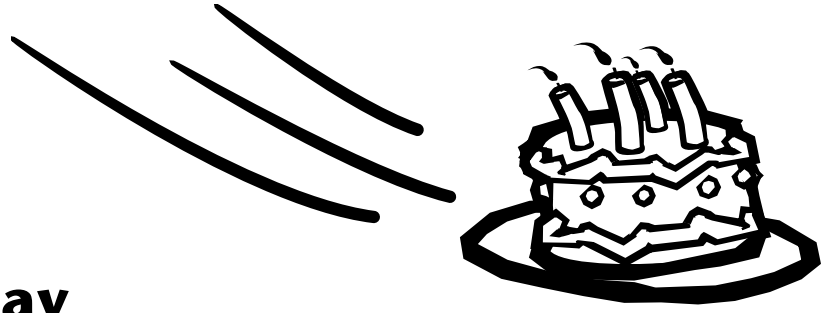
STUDENT'S COPY



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