



The Solar System Mat Guide to Presentation

The Solar System Mat

(suitable for children 6 - 12 years of age)

The Solar System Mat includes:

- Guide to Presentation
- 48” round vinyl Solar System Mat
- 20 wood Solar System pieces (pogs) with control chart for matching
- 66 Solar System Mat Fact File Cards with wood storage box
- 76 command cards on three levels (20 Level One, 28 Level Two, 28 Level Three) with wood storage box
- 4 charts (Planet Facts chart, Sun Facts chart, Distance from the Sun chart, Relative Size of Planets chart) with wood tray for storage
- Lidded wood box

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About The Solar System Mat

We are very excited to introduce The Solar System Mat to our line of classroom materials for Biomes and Cosmic Curriculum! This mat and all of its associated cards and parts offers an engaging and interactive educational experience for learning about the Solar System.

We believe the Solar System Mat not only provides a comprehensive overview of all of the parts of our Solar System and how they formed and interact, but also fosters a Systems Thinking approach of scientific and creative inquiry for learning about our place in the Universe.

There are 66 Fact File Cards that come with the Solar System Mat. The first two serve as an introduction to the Solar System's location in the Universe ("The Universe" and "The Milky Way"). The 64 that follow are organized into 3 groups:

- Parts of a Planetary System (14 cards)
- The Solar System (44 cards)
- Exploring the Solar System (6 cards)

These Fact File Cards serve as introductions to both objects in the Solar System and concepts, like orbits, that govern their movements and behavior. These Fact File Cards are highly adaptive and the lessons that follow outline options for presentation. Please note that these presentations are suggestions and may be adapted to focus on particular parts for extended research or further lessons. They may be broken up into multiple sections for group and individual work as you see fit.

Please note that astronomy is a diverse and dynamic field. The information provided in these materials is the most current information available as of March 2019. New discoveries are constantly being made and new theories are constantly being proposed and investigated. The rapidly expanding research and knowledge base surrounding the Universe and all of its structures and objects is inspirational and shows the power of inquiry and observational science. We will do our best to update these materials in the future if there are large shifts in thinking or impactful discoveries.

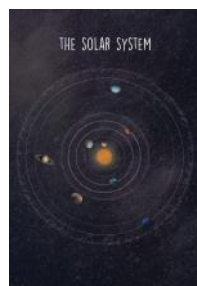
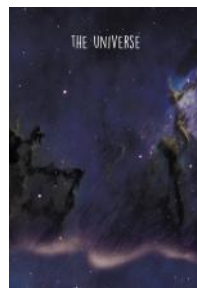
First Presentation: Our Place in the Universe

You will need: The Universe, The Milky Way, and The Solar System Fact File Cards; the Solar System Mat, the Sun and 8 planet wooden pieces for the Solar System Mat sorted in the order they orbit the Sun (optional: Cosmic Nesting Boxes)

Purpose: To introduce the Solar System Mat materials and establish an understanding of our place in the Universe.

1. Read the Universe card aloud and lay it out above the mat.
2. Read the Milky Way card aloud and lay it below the Universe card.
3. Read the Solar System card aloud and lay it below the Milky Way card at the edge of the mat.
4. Place the Sun, our star, at the center of the mat. Then, place each planet on its orbital path as you name it highlighting that we live on Earth.

You can feel free to continue onto the Second Presentation at this point or place these cards on the shelf. If you have our Cosmic Nesting Boxes, you can have the children work independently with the Nesting Boxes and the Solar System cards to reinforce their place in the Universe and how our Solar System formed within the Milky Way Galaxy in the Universe.

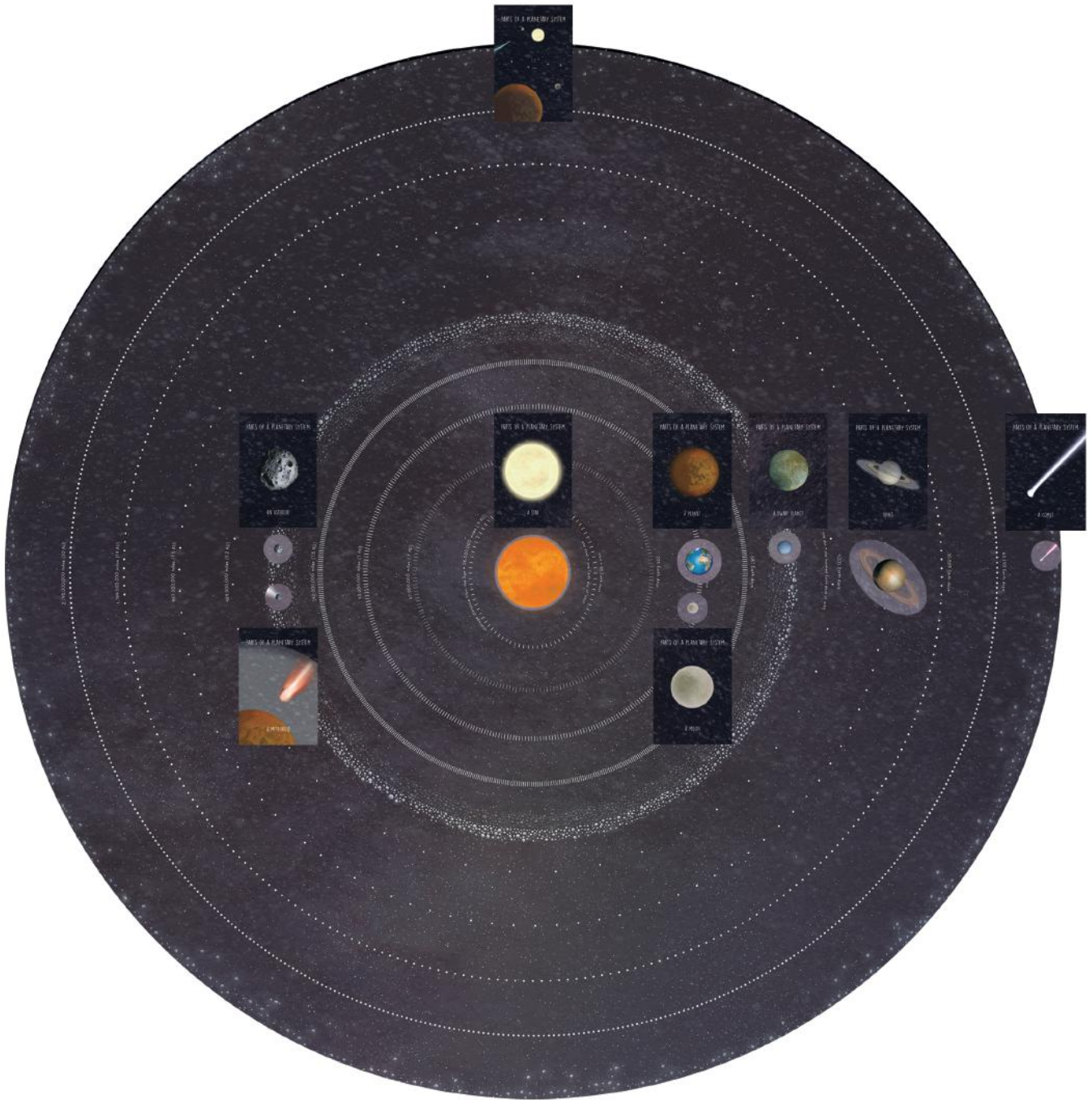


Second Presentation: What is a Planetary System?

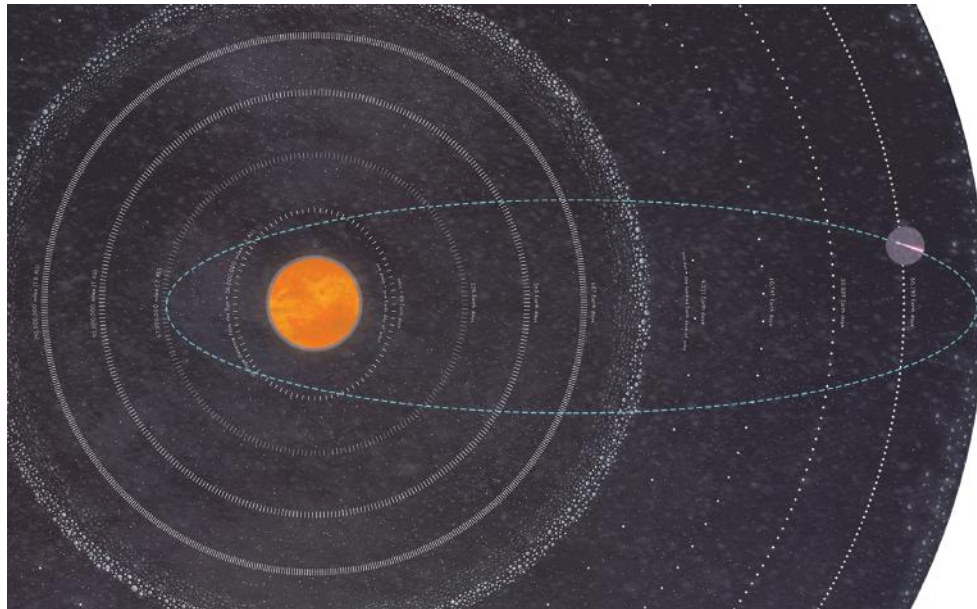
You will need: The Solar System Mat, Parts of Planetary System Fact File Cards: Parts of a Planetary System, A Star, A Planet, A Dwarf Planet, An Asteroid, A Meteoroid, A Comet, A Moon, Rings, What is an Orbit?, Why Does a Planet Orbit a Star? How Do Moons Get Their Orbits?; wooden Solar System Mat pieces (pogs): The Sun, Earth, Ceres, An Asteroid, A Meteoroid, Halley's Comet, A Moon, Saturn

Purpose: To introduce the Parts of a Planetary System and how they move in relation to their star before introducing detailed information regarding our planetary system, the Solar System.

1. Ask the child, or children, which galaxy we live in. Do they remember the name of the arm of the galaxy where our star, the Sun is? Where do we live in relation to the Sun? The Solar System!
2. Introduce the Parts of the Planetary System cards by explaining that scientists have discovered there are other planets orbiting other stars. Our Solar System is not the only planetary system in our galaxy! Read the Parts of a Planetary System card and place it at the top of the mat.
3. Read the A Star card aloud. Place it on the mat above the position for our Sun. Ask the child, or children, what is the star in our Solar System? Place the Sun wooden piece in its position at the center of the mat below the A Star card.
4. Read the A Planet card aloud. Place it on the mat on Earth's orbital path. Ask the child, or children, what our home planet in the Solar System is. Place the wooden piece for Earth on the mat on its orbital path below the A Planet card.
5. Read the A Dwarf Planet card aloud. Place it on the mat on the Asteroid Belt. Take out the wooden piece for Ceres. Tell the child, or children, Ceres is a dwarf planet in the Asteroid Belt. Place the wooden piece on the Asteroid Belt below the A Dwarf Planet card.
6. Read the An Asteroid card aloud. Place it on the mat on the other side of the Asteroid Belt. Place the wooden asteroid piece on the Asteroid Belt below the An Asteroid card.
7. Read the A Meteoroid card aloud. Place it on the mat below the wooden asteroid with enough room for the meteoroid wooden piece to go above it. Place the meteoroid wooden piece below the Asteroid on the Asteroid Belt.
8. Read the A Comet card aloud. Place it on the mat's outermost edge. Explain that comets like Halley's Comet circle the Sun. They come from the far reaches of the Solar System. Place the wooden Halley's Comet piece below the card at the mat's edge.
9. Read the A Moon card aloud. Place the card below the wooden Earth piece with enough room from the moon wooden piece to go above it next to Earth.
10. Read the Rings card aloud. Place it above Saturn's orbit on the mat. Place the wooden Saturn on its orbital path below the Rings card as you explain that Saturn has the brightest rings of any planet in our Solar System.



11. Remove all of the cards from the mat and the moon wooden piece leaving all of the other wooden pieces on the mat. Read the What is an orbit? card aloud. Place it at the top of the mat. Move Earth around its orbital path to complete one revolution going counterclockwise.
12. Read the Why Does a Planet Orbit a Star? card aloud. Place it at the top of the mat.
13. Move, or ask the child or children to move, Saturn around the Sun all the way through its orbit around the Sun counterclockwise. Reiterate that this path is Saturn's orbit and that the amount of time it takes Saturn to come back to the point it started from is one year on that planet.
14. Ask the child, or children, to move the dwarf planet Ceres, the asteroid, and the meteoroid around their orbital paths (the Asteroid Belt for the latter two). Discuss how these objects are much smaller than planets, but they revolve around the star just like planets.
15. Remove all of the wooden pieces from the mat except for Halley's Comet and the Sun. Trace Earth's orbital path with your finger pointing out that its elliptical path is close to a circle. Ask the child, or children, if a comet's path is circular or if it has a different shape. Move the comet around the Sun in a tight ellipse to demonstrate how comets travel. They orbit the Sun like planets too, but their orbit is a tighter ellipse!



16. Remove Halley's Comet from the mat and place Earth and the moon on Earth's orbital path. Move the moon around Earth a few times. Why would a moon orbit a planet and not the star? Read the How Do Moons Get Their Orbits? card aloud and place it at the top of the mat. Have the child move the moon around Earth.

Place these cards and wooden pieces on the shelf for independent work.

Third Presentation: Revolution and Rotation

You will need: The Solar System Mat, Parts of a Planetary System Fact File Cards: What Makes a Day?, What Makes a Season?; wooden Solar System mat pieces (pogs): The Sun, Earth; a globe, a lamp

Purpose: To reinforce the idea that a complete revolution on a planet's orbital path, its orbital period, is a year. To introduce the idea that planets rotate as they revolve and that this rotation creates days and seasons (if the planet has a tilt).

1. Place the Sun wooden piece in its position at the center of the mat. Place Earth on its orbital path. Ask the child, or children, to move Earth through a complete orbit on the mat. How long does that take?
2. Does Earth move in any other way while it is orbiting the Sun? Yes! It spins, or rotates, as it revolves. Read the What Makes a Day? card aloud and place it at the top of the mat.
3. Remove the wooden pieces from the mat. Place the lamp at the center and explain that it will represent a star like the Sun. Take out the globe and place it on the mat in the lamp's light. Ask the child, or children, to spin the globe. What happens? Do all sides get light at once? Spin the globe slowly to show how one part of the globe is in light while another is in darkness. It is day where the Sun's light is shining. It is night where the Sun's light cannot reach.
4. Point out that the globe is at a tilt because Earth tilts on its axis. Read the What Makes a Season? card aloud. Place it at the top of the mat next to the What Makes a Day? card.
5. Move the globe around the lamp in a revolution keeping the tilt the same all the way around. Highlight how the tilt of the planet affects the distance light has to travel to reach the poles as the planet orbits. This tipping toward and away from the Sun creates seasons!

Place the globe and these cards with the others you have worked through so far on the shelf for independent work.

Extensions:

- "The Globe as a Model of the Earth" lesson from the Waseca Biomes Curriculum
- "The Reason for the Seasons" lesson from the Waseca Biomes Curriculum

Fourth Presentation: The Solar System - Planets and Other Structures

You will need: The Solar System Mat, The Universe Fact File Card, The Milky Way Fact File Card; The Solar System Fact File Cards: The Solar System, Formation of the Solar System, An Astronomical Unit, The Sun, Mercury, Venus, Earth, Mars, The Asteroid Belt, Jupiter, Saturn, Uranus, Neptune, The Kuiper Belt, The Oort Cloud; Planet Facts chart, Sun Facts chart, Distance from the Sun chart, Relative Size of Planets chart; wooden solar system pieces (pogs): The Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune; another large mat or work surface to lay out the cards next to the Solar System Mat.

Purpose: To introduce how our Solar System formed and the large bodies and structures in it. To introduce the immense scale of our Solar System.

1. Walk through our place in the Universe by reviewing the Universe, Milky Way, and The Solar System cards. Place the Universe card at top of large mat or work surface near the mat. Place the Milky Way card below it and The Solar System card below that as you review each.
2. How did our Solar System come to be? Read the Formation of the Solar System card and place it to the right of The Solar System card. (See the following page for a diagram of the card layout.)
3. Introduce the large objects and structures in the Solar System by telling the child, or children, that the Sun has objects large and small orbiting it in the Solar System. It is time to learn about the large objects.
4. Place the card for the Sun at the left hand side of the large mat or work space below the row with The Solar System and the Formation of the Solar System cards. Name it as you place it. This is our star!
5. Place the cards for Mercury, Venus, Earth, and Mars in a row extending to the right from The Sun card. Name each planet as you place the card. These are the inner planets. They are rocky planets.
6. Place the card for the Asteroid Belt next to Mars as you name it. The Asteroid Belt is a huge stretch of space with millions of asteroids that orbit the Sun. It separates the rocky, inner planets from the rest of the planets in our Solar System. There is a even a dwarf planet orbiting here!
7. Place the cards for Jupiter and Saturn in order next to the Asteroid Belt card. Name each card as you place it. These are the two largest planets in our Solar System. They are gas giants!
8. Place the cards for Uranus and Neptune in order next to the card for Saturn. Name each card as you place it. These are also large planets in our Solar System. They are not as big as the gas giants and they are much colder. They are ice giants!

9. Place the card for the Kuiper Belt beyond Neptune and name it as you place it. Beyond Neptune is a vast expanse of space filled with cold, icy objects. Many comets come from this region. There are several dwarf planets that orbit far, far from the Sun here in the Kuiper Belt.
10. Place the card for the Oort Cloud next to the Kuiper Belt and name it as you place it. Far beyond the Kuiper Belt, even more dark, icy objects orbit the Sun. Its furthest reaches are the edge of the Solar System, billions of miles away from the Sun. These farthest objects do not orbit on a plane like most of the other things that orbit the Sun. They create a cloud that encloses the whole Solar System.
11. Move attention back to the mat and the wooden pieces for the Solar System. Ask the child, or children, to place the Sun and each of the planets on its orbital path working outward in order. Have the child, or children, name the Asteroid Belt between Mars and Jupiter. Point out that the edge of the mat is the beginning of the Kuiper Belt. It starts beyond Neptune.
12. Tell the child, or children, that the Oort Cloud would be a much larger ring that extends into a cloud. It starts far beyond the edge of the mat. In fact, the Solar System is so huge that a scaled mat would not fit in the classroom.
13. Have the child, or children, move the planets around the mat in a counterclockwise direction to move through their orbits.
14. Introduce the An Astronomical Unit card and read it aloud. Place the card next to the Formation of the Solar System card on the work space. Highlight the distances marked on the mat for each planet. One set of these show how far the planet is from the Sun in both miles and AU. Which one is easier to read? The number of miles or the number of AU?
15. Introduce the Distance from the Sun chart. The distances between the planets are huge! There are no planet illustrations on it because the distances at this scale would make the Sun smaller than a grain of sand!
16. Introduce the Relative Size of Planets chart. Reiterate that the distances in our Solar System are bigger than we can imagine. The objects in the Solar System like planets are really big too! Earth is very, very big. Jupiter is huge! The Sun is enormous!

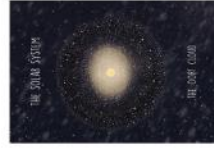
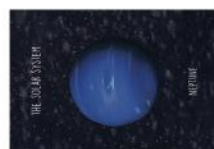
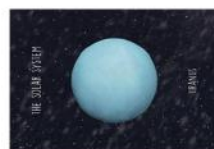
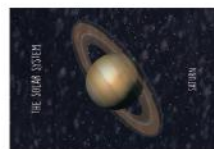
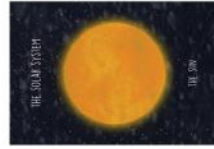
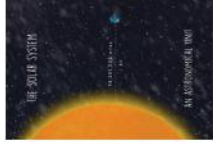
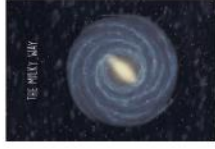
At this point, you can place all of these cards, charts, and pogs on the shelf for independent work. The masters for coloring and labeling the planets and the masters for Fact File Cards can also be put out with the Solar System Mat materials for children to illustrate and write about their research. Some of the Command Cards on three levels can be introduced at this point. (A list of Command Cards by level relevant to the materials thus far is included after the diagram for the card configuration of this presentation.)

Please note: For younger children, you may want to revisit this lesson in separate sessions to read the Fact File Cards to them to engage them with facts about the planet and what it is like there. Proficient readers can read the cards on their own and refer to the Planet Facts chart

and Sun Facts chart to work with the command cards. In either instance, if you have units of study that are devoted to each planet, you may want to introduce the ancillary cards for each planet and the other objects in the Solar System found in the Asteroid Belt, Kuiper Belt, and Oort Cloud that are presented in Presentation Five as you work through your unit for each planet.

Extensions:

- “Model of the Solar System” lesson from the Waseca Biomes Curriculum
- “Dance of the Planets” lesson from the Waseca Biomes Curriculum



Fourth Presentation: The Solar System - Planets and Other Structures

These Solar System Mat Command Cards on three levels can be introduced after the **Fourth Presentation: The Solar System - Planets and Other Structures.**

LEVEL ONE

- Sort all of the pogs to match the control chart.
- Place our star, the Sun, in its spot on the mat.
- Place Mercury on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Venus on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Earth on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Mars on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Jupiter on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Saturn on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Uranus on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Place Neptune on its orbit on the mat. Move it around the Sun on its path to complete an orbit.
- Find the 4 rocky planets. Place them on the mat. Move each around the Sun on its path to complete an orbit.
- Find the 2 gas giant planets. Place them on the mat. Move each around the Sun on its path to complete an orbit.
- Find the 2 ice giant planets. Place them on the mat. Move each around the Sun on its path to complete an orbit.

LEVEL TWO

- Mercury completes about 4 orbits for every 1 orbit Earth completes. With a partner, place Mercury and Earth on their orbits. Move the planets so that Mercury completes 4 orbits each time Earth completes an orbit.
- Mercury completes about 2.5 orbits for every 1 orbit that Venus completes. With a partner, place Mercury and Venus on their orbits. Move the planets so that Mercury completes 2.5 orbits each time Venus completes an orbit.
- Earth completes nearly 2 orbits for every 1 orbit that Mars completes. With a partner, place Earth and Mars on their orbits. Move the planets so that Earth completes 2 orbits each time Mars completes an orbit.
- Earth completes nearly 12 orbits for every 1 orbit that Jupiter completes. With a partner, place Earth and Jupiter on their orbits. Move the planets so that Earth completes 12 orbits each time Jupiter completes an orbit.
- Jupiter completes about 7 orbits for every 1 orbit that Uranus completes. With a partner, place Jupiter and Uranus on their orbits. Move the planets so that Jupiter completes 7 orbits each time Uranus completes an orbit.
- Earth completes nearly 30 orbits for every 1 orbit that Saturn completes. With a partner, place Earth and Saturn on their orbits. Move the planets so that Earth completes 30 orbits each time Saturn completes an orbit.
- How many AUs is Earth from the Sun?
- How many AUs is Mars from the Sun?
- How many AUs is Saturn from Earth?
- How many AUs is Uranus from Mars?
- How many Earth days does it take Mercury to complete an orbit?
- How many Earth days does it take Earth to complete an orbit?
- How many Earth days does it take Saturn to complete an orbit?
- How many Earth days does it take Neptune to complete an orbit?
- Design your own planetary system with all of the parts of a planetary system like a star, planets, moons, and comets.
- Pick a planet to live on in the planetary system you designed. Write about what a day is like on your planet. Is it hot or cold? Is it a long day or a short day?
- Draw a picture and write about what a night sky looks like from your home planet in the planetary system that you designed. Can you see other planets? Can you see comets? Are there lots of moons?

- Draw a picture of your home planet in the planetary system you designed. Where do you live on the planet? Draw the house or space base you live in.
- Does your home planet in the planetary system you designed tilt? Does it have seasons? What are winter and summer like there?
- Place the asteroid and the meteoroid together on the Asteroid Belt. Move them around the Sun to complete an orbit. What happens if the meteoroid gets knocked out of orbit?

LEVEL THREE

- How much longer does it take sunlight to reach Earth than Mercury?
- How much longer does it take sunlight to reach Saturn than Earth?
- In AUs, how many times farther is Neptune from the Sun than Earth is from the Sun?
- In AUs, how many times farther is Neptune from the Sun than Mars is from the Sun?
- If one Earth year is 365 days, how many Earth years does it take Uranus to complete an orbit?
- How many times bigger is Jupiter's diameter than Earth's diameter?
- How many times bigger is Jupiter's diameter than Mercury's diameter?
- How many times bigger is the Sun's diameter than Earth's diameter?
- How many miles per hour faster does Earth rotate than Mars?
- How many times faster does Earth rotate than Mars?
- How many miles per hour faster does Mercury orbit than Earth?
- How many times faster does Mercury move in miles per hour to complete its orbit than Jupiter?
- Do all planets in our Solar System have an atmosphere? Do some research to learn why a planet might not have an atmosphere.
- Which planets have nitrogen in their atmospheres? What other things do these planets have in common?
- Which planets have hydrogen in their atmospheres? What other things do these planets have in common?
- How much colder can Mercury's surface be than Earth's lowest surface temperature?
- How much colder is Neptune's "surface temperature" than Earth's lowest surface temperature?
- How many years old are you? Multiply that number by 365 to get an estimate of how many days old you are. Divide that answer by 88 to find out how many years old you would be if you had lived our whole life on Mercury.
- How many years old are you? Multiply that number by 365 to estimate how many days old you are. Divide that answer by 4,331 to find out how many years old you would be if you had lived your whole life on Jupiter. Would you be 1 yet?
- Divide Saturn's orbital period by 365 to find out how many Earth years its orbit takes.
- Divide Mars' orbital period by 365 to find out how many Earth years its orbit takes.
- How tall is Mars' biggest volcano, Olympus Mons? Do some research to find some of the tallest mountains on Earth. How do they compare?
- Here on Earth, there are craters from impacts with asteroids and meteoroids. Do some research about where some of the largest of these are. Pick one to draw and write about.

Fifth Presentation: What Else is in Our Solar System?

You will need: The Solar System Fact File Cards: The Solar System, The Sun, Mercury, Venus, Earth, The Moon, Mars, Phobos, Deimos, The Asteroid Belt, Vesta, Ceres, Jupiter, Rings of Jupiter, Moons of Jupiter, Io, Europa, Ganymede, Callisto, Trojan Asteroids, Centaurs, Saturn, Rings of Saturn, Moons of Saturn, Titan, Enceladus, Uranus, Rings of Uranus, Moons of Uranus, Miranda, Neptune, Rings of Neptune, Moons of Neptune, Triton, The Kuiper Belt, Pluto, Haumea, Makemake, Eris, Halley's Comet, The Oort Cloud, Comet Hale-Bopp; wooden solar system pieces (pogs): The Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Ceres, Halley's Comet, An Asteroid, Trojan Asteroids (two of them), A Meteoroid; another large mat or work surface to lay out the cards next to the Solar System Mat.

Purpose: To introduce the other objects that orbit the Sun in our Solar System. To introduce the natural satellites (moons and rings) that orbit large objects like planets in our Solar System. To highlight the diversity, complexity, and abundance of objects in our Solar System.

Please note: There are many objects in our Solar System beyond the 8 planets and 3 structures outlined thus far in the presentations. This presentation may be split into many sessions, briefly revisiting the cards you have covered so far to rebuild the the card hierarchy and review the names of the bodies associated with each planet or structure. The cards covered can be put on the shelf for independent work in between each session. Use the pogs to demonstrate each planet's or object's orbit that you have discussed and place them on the shelf as well.

1. Place the Solar System Mat card at the top of the large work surface. Tell them that you are going to discuss some of the trillions of other objects that are in our Solar System.
2. Introduce the Sun card and read it aloud before placing it.
3. Ask the child, or children, "What is the planet that orbits closest to the Sun?" Read the Mercury card aloud and place it to the right of the Sun card. Ask if it has any moons or rings.
4. Ask the child, or children, "What is the next planet from the Sun after Mercury?" Read the Venus card aloud and place it to the right of the Mercury card. Ask if it has any moons or rings.
5. Ask the child, or children, "What is the next planet from the Sun after Venus?" Read the Earth card aloud and place it to the right of the Venus card. Ask if Earth has any moons or rings. It does! The Moon is Earth's moon. Read The Moon card aloud and place it below Earth.
6. Ask the child, or children, "What is the next planet from the Sun after Earth?" Read the Mars card aloud and place it next to Earth. Does Mars have any moons or rings? Read the Phobos and Deimos cards aloud and place them below Mars.
7. Ask the child, or children, "What separates the inner planets from the outer planets? What comes between Mars and Jupiter?" Read The Asteroid Belt card aloud and place it next to Mars. There are millions of objects in the Asteroid Belt! The two largest are Vesta, an asteroid,

and Ceres, a dwarf planet. Read each of their cards aloud and place them below The Asteroid Belt card.

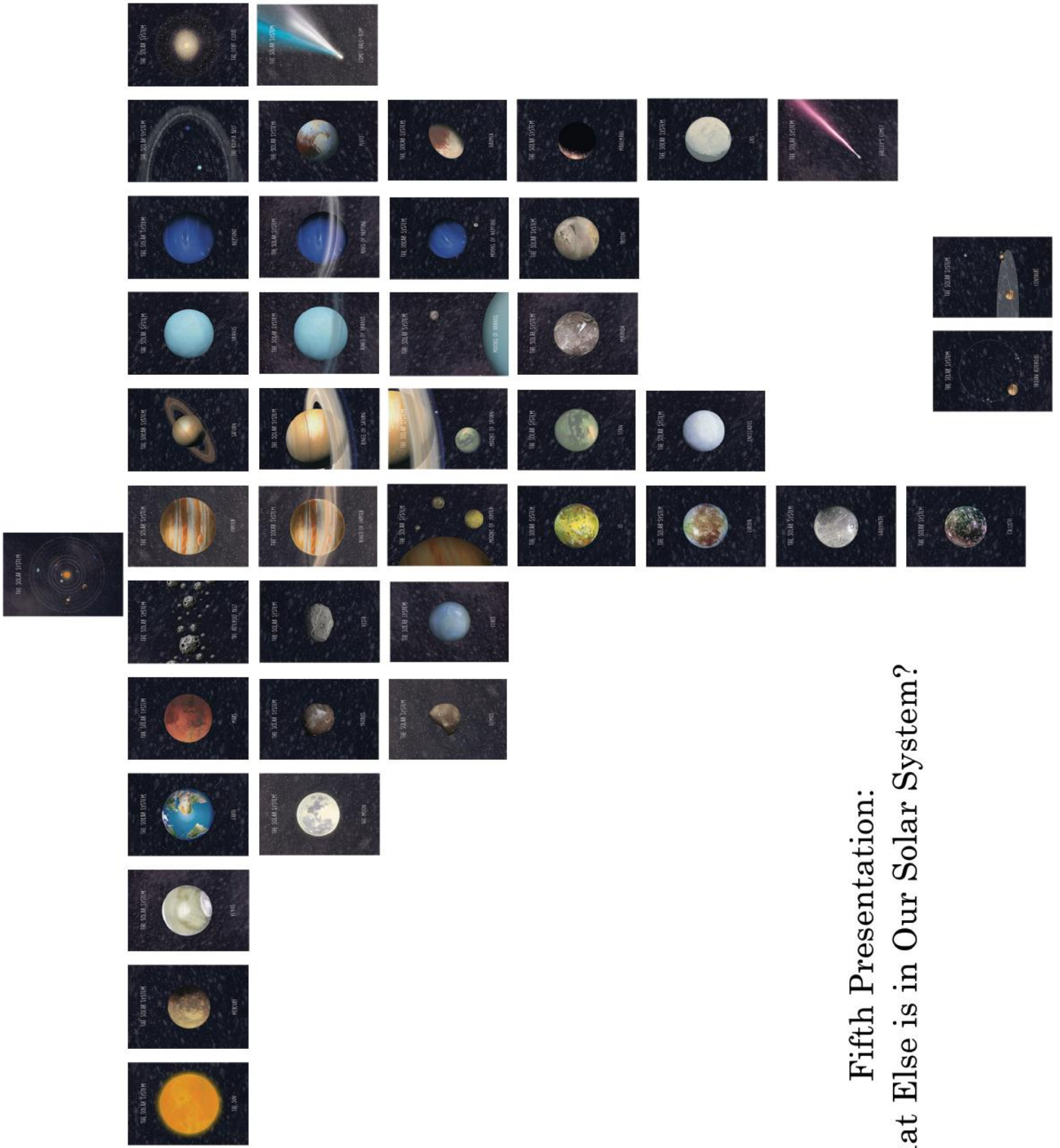
8. Ask the child, or children, "What planet orbits closest to the Sun beyond the Asteroid Belt?" Read the Jupiter card aloud and place it next to the Asteroid Belt card. Does Jupiter have any rings or moons? It sure does. A LOT of them. Read The Rings of Jupiter card aloud and place it below the Jupiter card. Read the Moons of Jupiter card aloud and place it below the Rings of Jupiter card. Jupiter has many, many moons. Lay the Io, Europa, Ganymede, and Callisto cards below the Moons of Jupiter card. (If time allows, read each aloud before you lay it down or place them with the cards on the shelf at the end of the session so the child, or children, can read about those moons independently.)
9. Ask the child, or children, "What is the next planet from the Sun after Jupiter?" Read the Saturn card aloud and place it next to Jupiter. Does Saturn have any rings or moons? Read the Rings of Saturn card aloud and place it below the Saturn card. Read the Moons of Saturn card aloud and place it below the Rings of Saturn card. Read the Titan card aloud and place it below the Moons of Jupiter card. Read the Enceladus card aloud and place it below the Titan card.
10. Ask the child, or children, "What is the next planet from the Sun after Saturn?" Read the Uranus card aloud and place it next to Saturn. Does Uranus have any rings or moons? Read the Rings of Uranus card aloud and place it below the Uranus card. Read the Moons of Uranus card aloud and place it below the Rings of Uranus card. Read the Miranda card aloud and place it below the Moons of Uranus card.
11. Ask the child, or children, "What is the next planet from the Sun after Uranus?" Read the Neptune card aloud and place it next to Uranus. Does Neptune have any rings or moons? Read the Rings of Neptune card aloud and place it below Neptune. Read the Moons of Neptune card aloud and place it below the Rings of Neptune card. Read the Triton card aloud and place it below the Moons of Neptune card.
12. Ask the child, or children, "What comes after Neptune in the Solar System?" Read the Kuiper Belt card aloud and place it next to Neptune. Scientists are just starting to investigate the Kuiper Belt and have found many objects there! There are 4 confirmed dwarf planets and millions of comets. Lay each of the dwarf planet cards below the Kuiper Belt card. Lay the Halley's Comet card below the dwarf planet cards. (If time allows, read each aloud before you lay it down or place them with the cards on the shelf at the end of the session so the child, or children, can read about these objects independently.)
13. Ask the child, or children, "What comes after Kuiper Belt? What cloud encircles our Solar System?" Read the card for the Oort Cloud aloud and place it next to the Kuiper Belt card. The Kuiper Belt is a mystery to scientists. It is too far for us to detect objects there. But we do see comets from there. Read the Comet Hale-Bopp card aloud and place it below the Oort Cloud card.

14. Ask the child or children if they know of any other objects in the Solar System that orbit the Sun. What happens to asteroids or comets if they get captured by another object's gravity or if they get knocked out of orbit? Three things can happen:

1. They can be sent rocketing out of the Solar System.
2. They can crash into the Sun!
3. They can gain a new orbit as a moon or in a new location still orbiting the Sun.

Read the Centaurs card aloud and place it below the outer planets card.

15. There are millions of asteroids in the Solar System! Not all of them orbit in the Asteroid Belt. Read the Trojan Asteroids card aloud and place it next to the Centaurs card below the outer planets. Place the Jupiter pog on its orbital path on the mat. Place the Trojan Asteroids pogs about 60° ahead of and behind Jupiter on the orbital path. Have the child, or children, help you move Jupiter through its orbit with the Trojan Asteroids moving at the same time and maintaining the same distance from the planet.



Fifth Presentation: What Else is in Our Solar System?

Sixth Presentation: Exploring the Solar System

You will need: The Exploring the Solar System Fact File Cards

Purpose: To discuss how we know what we do about the Solar System. To become familiar with the technology that has helped us learn about the Solar System and what technologies we plan to use to explore the Solar System further.

1. Read the Exploring the Solar System card aloud and place it at the top of a workspace.
2. Read the Telescopes card aloud and place it below and to the left of the Exploring the Solar System card.
3. Read the Scientific Satellites card aloud and place it next to the Telescopes card.
4. Read the Humans in Space card aloud and place it next to the Scientific Satellites card.
5. Read the Robotic Exploration card aloud and place it next to the Humans in Space card.
6. Read The Future of Space Exploration card aloud and place it next to the Robotic Exploration card.

These cards can be added to the shelf for independent work and the wooden pieces that feature an astronaut, the International Space Station, and the future spaceship can also be added to the wooden pieces already out for independent work. The remaining Command Cards on the levels you feel appropriate for your students can also be placed on the shelf at this time.

