# Planet Line-Ups

**Strand** Scientific Investigation

**Topic** Investigating the Planets in the Solar System

**Primary SOL** ES.3 The student will investigate and understand the characteristics of Earth and the solar system. Key concepts include
c) characteristics of the sun, planets and their moons, comets, meteors, and asteroids.

**Related SOL** ES.1 The student will plan and conduct investigations in which
b) technologies including computers, probeware, and geospatial technologies are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions.

**Background Information**

The solar system consists of the Sun and the astronomical objects gravitationally bound in orbit around it, all of which formed from the collapse of a giant molecular cloud approximately 4.6 billion years ago. The vast majority of the system's mass is in the Sun. Of the many objects that orbit the Sun, most of the mass is contained within eight relatively solitary planets whose orbits are almost circular and lie within a nearly flat disc called the ecliptic plane. The four smaller inner planets, Mercury, Venus, Earth and Mars, also called the terrestrial planets, are primarily composed of rock and metal. The four outer planets, the gas giants, are substantially more massive than the terrestrials. The two largest, Jupiter and Saturn, are composed mainly of hydrogen and helium; the two outermost planets, Uranus and Neptune, are composed largely of ices, such as water, ammonia and methane, and are often referred to separately as ice giants.

Tables of data about the planets can be difficult for students to learn. In this activity, students will be able to create physical representations of these data. They will also work together as a team to demonstrate their understanding of the planets' characteristics.

**Materials**

- Planetary information (from printed or Internet sources)
- Poster board or tag board
- Markers
- Colored pencils
- Drafting compasses

**Vocabulary**

*orbital period, planet (inner, outer; terrestrial, gas giants), revolution, rotation, rotational period, satellite*

**Student/Teacher Actions (what students and teachers should be doing to facilitate learning)**

*Introduction*

1. Have the students look at an ordered list of the planets. In groups have them come up with a clever way to remember the correct order of the planets as you go from the sun to Pluto. Once the groups are finished, have the students share with the class.
2. In these same groups, have the students place questions about the planets on sticky notes. Before moving to the next portion of the activity, have a designated group member place the sticky notes in a designated area on the wall or chalk/white board as a parking lot. These questions can be addressed at the end of the class or choose a few each day to answer as you continue your instruction on the planets.

*Procedure*

1. Divide the class into two teams, with each team having at least nine members—one for each planet. The dwarf planet, Pluto, is included in the list to illustrate why it is no longer classified as a planet. Extra team members can be team leader or support staff.
2. Have each student on each team create a poster to represent his/her planet. Have students draw, color, and label the planets on the front of their posters, making sure that the writing is clear and large enough to see from across the classroom. On the back of the posters, have them list the following planetary data:
   - Diameter (km)
   - Distance from the sun (km)
   - Orbital period (period of revolution)
   - Rotational period
   - Number of satellites
   - Surface temperature (°C)

   Make sure students use the same units. Also, have students on opposite teams confer with each other to ensure they are using the same data for the same planets (e.g., make sure both Mercury posters use an orbital period of 88 days).
3. Once the planet posters are done, hold a planet line-up race. When the Start signal is given, team members, holding their posters, must find their appropriate places in line while a team captain and/or support staff check the order. The first team to form the correct line-up wins a point.
4. To emphasize the connection between a planet's distance from the sun and its orbital period, be sure to go over the correct order of the planets to better memorize the pattern. As students begin to demonstrate familiarity with this pattern, have them switch planets with someone else on their team. Be sure team captains and support staff have opportunities to represent planets and go over the specific information about each. This will ensure that all members of the team learn about all of the planets, not just the one that they were assigned.

**Assessment**

- **Questions**
  - What do the outer planets have in common? What do the gas giants have in common? *(rings, greater number of satellites, greater diameters, longer orbital periods)*

  - Does it make sense, then, that Pluto does not fit into the definition of a planet? Why, or why not?
  - What do the inner planets have in common? *(smaller diameters, faster orbital periods)*
  - What determines a planet's orbital period? *(distance from the sun)*
- **Journal/Writing Prompts**
  - You have the opportunity to visit another planet in our solar system. Select the one you would most like to visit, and explain the reasons for your choice.

**Extensions and Connections (for all students)**

- Have students investigate the satellites of the gas giant (Jovian) planets and prepare detailed analyses of their compositions, geologic histories, and significance to understanding Earth processes.

**Strategies for Differentiation**

- Looking at the solar system as a whole, have students write a short essay on their position on Pluto. As they report back to the class be sure to make a chart containing the numbers in support and in opposition and their main points. Analyze this as a class and compare this to the official reasons for declassifying this as a planet.