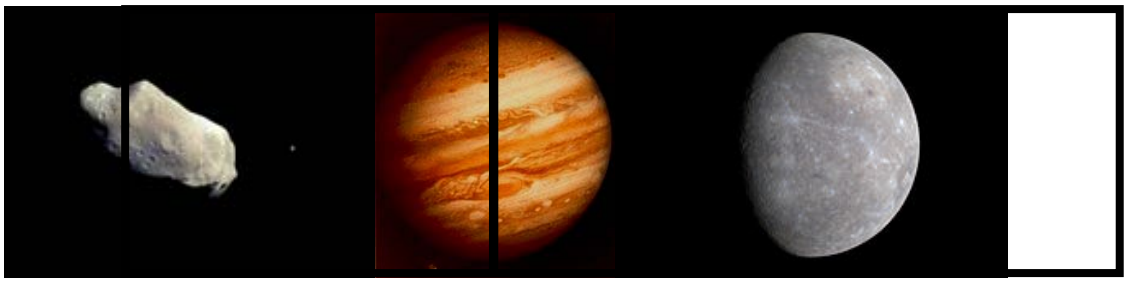
The Planets in the Solar System

There are billions of objects in our solar system. These objects range in size from a huge star to tiny particles of dust. Somewhere between the two extremes are planets. Take Ida, Jupiter, and Mercury as an example:



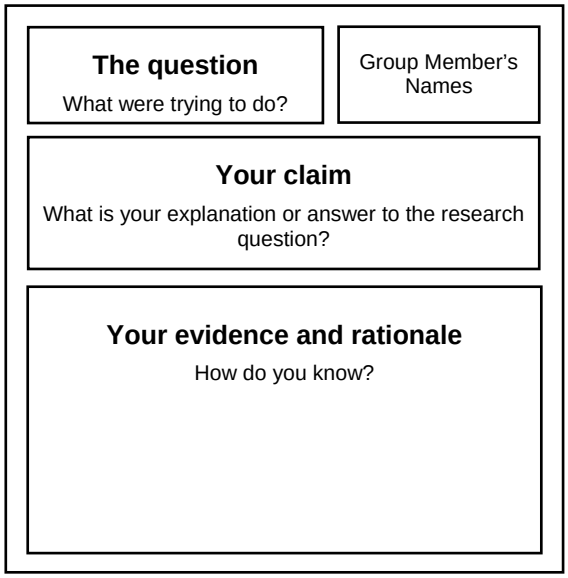
Ida Jupiter Mercury

All of these objects are big enough to be seen from Earth, but should we classify all three of these objects as a planet? This question has made many people wonder:

How many planets are there in the solar system?

With your group, develop an explanation that can be used to answer this simple, but important, question. Make sure you have good evidence and reasoning to support your explanation. You can record any observations or notes you make as you work in the space below.

Interactive poster session
Once your group has developed an explanation that answers this question, prepare a whiteboard that you can use to share and justify your ideas. Your whiteboard should include all the information shown in the diagram.



To share your work with others, we will be using a round-robin format. This means that one member of the group stays at your work station to share your groups' ideas while the other group members go to the other groups, one at a time, to listen to and critique the explanations developed by your classmates.

Remember, as you critique the work of others, you have to decide whether their conclusions are valid or acceptable based quality of their explanation and how well they are able to support their ideas. In other words, you need to determine if their argument is *persuasive and convincing*. To do this, ask yourself the following questions:

- Is their explanation *sufficient* (i.e., it explains everything it needs to) and *coherent* (i.e., it is free from contradictions)?
- Did they use *genuine evidence* (i.e., They organized their data in a way that shows a trend over time, a relationship between variables, or a difference between groups)?
- Did they use *enough evidence* to support their ideas (i.e., They used more than one piece of evidence and all their ideas are supported by evidence)?
- Is there any *counterevidence* that does not support their explanation?
- How well does their explanation *fit with other theories and laws* that are used in science to explain or describe how the world works?
- Is their rationale *adequate* (i.e., They explain why the evidence was used *and* why it supports the explanation)?
- Is their reasoning *appropriate* (rational and sound)?

Relevant information about this problem

It is not known with certainty how planets are formed. The prevailing theory is that they are formed during the collapse of a nebula into a thin disk of gas and dust. A proto-star (proto = early) forms at the core, surrounded by a rotating proto-planetary disk.

Through a process called *accretion* (i.e., sticky collision) dust particles in the disk steadily accumulate mass to form ever-larger bodies. Local concentrations of mass known as *planetesimals* begin to form, and these accelerate the accretion process by drawing in additional material by their gravitational attraction. These concentrations become ever denser until they collapse inward under gravity to form proto-planets.

When the proto-star has grown massive enough to ignite and form a star, the rest of the disk is removed from the inside outward by photoevaporation, the solar wind, and other similar effects. Thereafter there still may be many proto-planets orbiting the star or each other, but over time many will collide—either to form a single larger planet or release material for other larger proto-planets or planets to absorb.

Some objects in space are a spherical shape because of the nature of gravity. The shapes of small objects (e.g., people, houses, mountains, and asteroids) are determined by their physical properties. You can take a rock and cut it into a particular shape, and it will pretty much stay that way because it is small. However, if something is really big, the force of gravity is great enough to actually change the shape of an object. You can think of gravity as a force that points inward toward the center of a large object so that every part of the surface is pulled evenly toward the center, resulting in a spherical shape.

The basic reason why the planets revolve around or orbit the Sun is that the gravity of the Sun keeps them in their orbits. (**Note:** "Rotate" is used to describe the spin of planet; for example, Earth completes one rotation about its axis every 24 hours, but it completes one revolution around the Sun every 365 days.) Just as the Moon orbits Earth because of the pull of Earth's gravity, Earth orbits the Sun because of the pull of the Sun's gravity.