Name: _____ Date: _____

How Many Planets Are There?

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Two posters hung side by side in the school hallway, and Hector stopped in front of them. The old one showed nine round planets in a row, with Pluto at the end. The new one showed only eight. Hector looked from one to the other and counted twice. "Which one is right?" he asked his teacher. "The new one," said Ms. Sorensen. "But the old poster was right once too, and the way it changed is a good story."

The eight planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. The first four are rocky worlds with solid ground. The last four are giants with no hard ground to stand on. Jupiter and Saturn are called gas giants. Uranus and Neptune are called ice giants, because they hold a lot of icy stuff, like water. That makes the giants very different from our own world. Each one circles the Sun, but none of them looks much like the others.

Hector walked along the new poster and stopped at Jupiter, the largest planet. "If it were a hollow shell, 1,000 Earths could fit inside it," said Ms. Sorensen. Hector tried to picture a ball so big that a thousand Earths could rattle around inside it. Ms. Sorensen tapped Mercury, the closest planet to the Sun and the smallest. "Planets are not all alike," she said. "That is one reason the question of what counts as a planet is harder than it looks."

Telescopes changed the count. Until then, people had known only the planets they could see with their own eyes. In 1781 an astronomer named William Herschel spotted something new through his telescope. He thought it was a comet or a star. Two years later, astronomers agreed it was a planet, the first one ever found with a telescope. It was named Uranus, for the Greek god of the sky. Hector found it on the new poster, the seventh planet from the Sun.

Neptune was found a different way. Astronomers noticed that Uranus did not travel exactly as they expected. A French mathematician named Urbain Le Verrier worked out where a hidden planet would have to be to tug on Uranus like that. In 1846, telescopes found Neptune in the sky. It was the first planet found by math instead of by looking. Hector put his finger on Neptune. Somebody had found it with a pencil first.

Pluto came next. An astronomer named Clyde Tombaugh discovered it in 1930, and for the next seventy-six years it was counted as the ninth planet. It is small and icy, far out in the cold, and its path around the Sun is a stretched oval, not a neat circle. Hector looked at the old poster, where Pluto sat at the end of the row. "It looked like it belonged," he said. "It did, for a long time," said Ms. Sorensen.

Pluto also has an unusually large moon. Its name is Charon, and it is about half the size of Pluto itself. That makes it the largest moon compared to its planet anywhere in the solar system. Our own Moon is much smaller next to Earth. "Pluto and Charon are almost like a

pair," said Ms. Sorensen. Hector liked that idea, two small worlds out in the dark, keeping each other company, a long way past Neptune.

Then trouble started. Astronomers found more icy worlds far out past Neptune, in a doughnut-shaped region called the Kuiper Belt. In 2005, Mike Brown and two other astronomers announced one called Eris. It is about the same size as Pluto, nearly 1,500 miles across. Now there was a problem. If Pluto counted as a planet, then Eris had to count too. And there might be many more worlds like them waiting to be found.

So astronomers decided to say clearly what a planet is. In 2006, more than two thousand five hundred of them gathered in Prague for the General Assembly of the International Astronomical Union, or IAU. The IAU is a group of astronomers that names things in space. They voted on three rules. A planet must go around the Sun. It must be heavy enough that its own gravity pulls it into a nearly round shape. And it must have cleared the neighborhood around its orbit.

That third rule means a planet has the biggest pull in its lane, so no other worlds of its size share the path. The eight planets did it. Pluto did not, because it shares its space with many other icy worlds. So the IAU made a second group, called dwarf planets. They go around the Sun and are nearly round, but they have not cleared their paths. The first members were Ceres, Pluto, and a far-off world that did not have its real name yet. Now Hector knew why Pluto was missing from the new poster.

Not everyone was happy. Pluto had been a planet for as long as many people had been alive. Many people were upset, and textbooks had to be updated. In 2015, NASA's New Horizons flew by and became the first spacecraft to explore Pluto up close. Hector looked at the little dot at the end of the old poster on his wall. It was still a place, and now people had seen it.

Today the IAU recognizes five dwarf planets: Ceres, Pluto, Haumea, Makemake, and Eris. Ceres is the only one close in, in the asteroid belt between Mars and Jupiter. The rest are far out in the cold. Astronomers think there may be many more, perhaps more than a hundred, still waiting to be discovered. The number of dwarf planets is not settled yet. The number of planets has been eight since 2006.

Some questions are still open, and the answers are not in any book yet. Some astronomers wonder whether one more planet is hiding far out past Neptune, in the dark. It might explain a few odd things astronomers see out there, but nobody has found direct evidence of it yet. Hector looked at the two posters again. Which one would you hang? And what would you ask the next astronomer who finds something new?

Questions

1. How many planets does the solar system have today?

A. Seven
B. Nine
C. Eight

2. How was Neptune found?

A. Herschel mistook it for a comet
B. Mathematicians worked out where a hidden planet had to be
C. A spacecraft flew past it

3. Why did the discovery of Eris make astronomers rethink what a planet is?

A. It was about as big as Pluto, so Pluto could not be special
B. It was bigger than Jupiter
C. It had rings

4. Which rule did Pluto fail to meet?

A. Going around the Sun
B. Clearing the neighborhood around its orbit
C. Being nearly round

5. A world that has "cleared the neighborhood" around its orbit has done what?

A. Painted its sky
B. Moved to a new star
C. Cleared away other objects of similar size near its path

Words to know

planet: star-circling world
dwarf: very small kind
Kuiper: icy belt's name
astronomer: sky scientist
orbit: path around
gravity: pulling force

Answer key: How Many Planets Are There?

1. C. Eight
2. B. Mathematicians worked out where a hidden planet had to be
3. A. It was about as big as Pluto, so Pluto could not be special
4. B. Clearing the neighborhood around its orbit
5. C. Cleared away other objects of similar size near its path