How Many Birthdays: Your Age on Other Worlds

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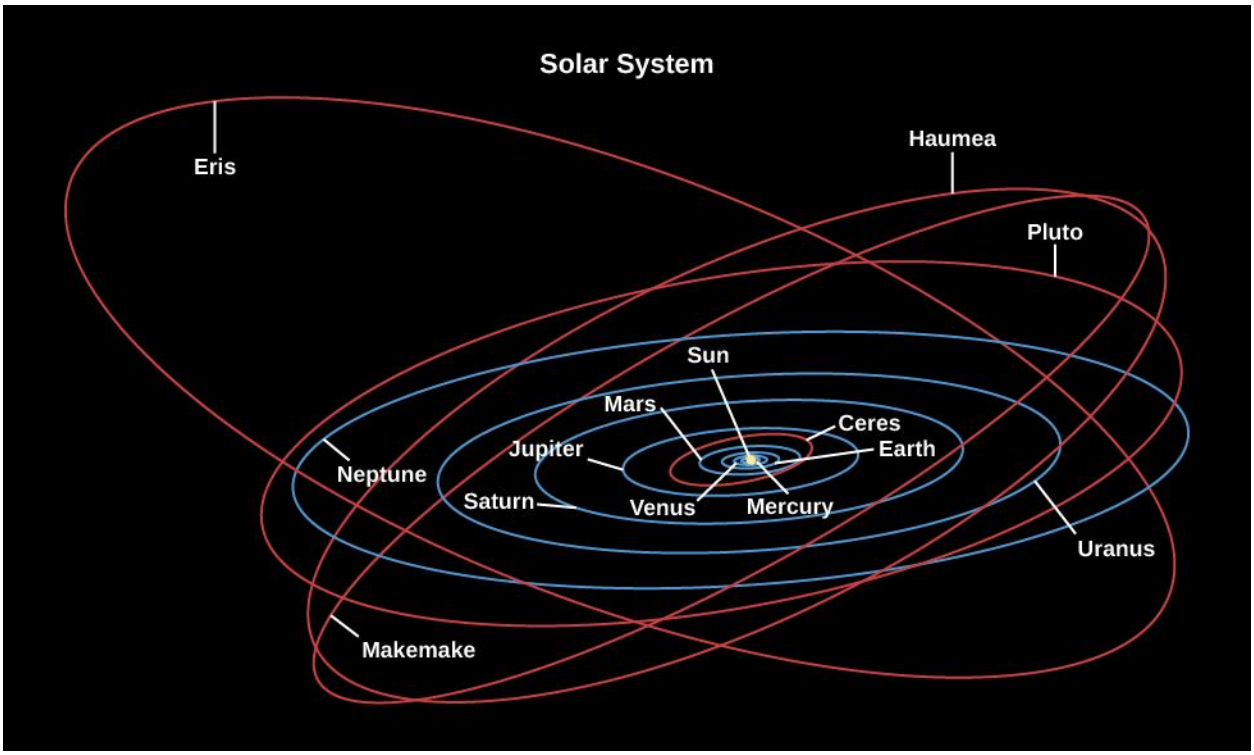

Few things in life are more fun than celebrating a birthday. We usually take the yearly cycle of seasons and birthdays for granted on Earth, but this activity may help students think differently about them. Most students, from upper elementary school on, also know that the year that passes between their birthdays is the time it takes the Earth to make one more orbit around the Sun.

But as the next generation of students considers the possibility of people landing on Mars, it is interesting to ask how your birthday cycle, and thus your age, would change on other worlds.

In this activity, students use arithmetic to consider how long other worlds take to orbit the Sun or another star, and how old (in units of local years) they would be if they had been born on these other worlds. It can be fun for students to discover that on some of the planets in our solar system, they wouldn't even be one year old yet!

Procedure:

After students have studied the planets and dwarf planets in our solar system, elicit from them what one year means in astronomical terms – the time it takes for a planet to go once around the Sun. Ask them how long the Earth takes to do this in different units – 365 ¼ days, 52 weeks, 1 year. Next ask them to gather in small discussion groups and list all the planets that take a shorter time to go around the Sun and those that take a longer time. After enough time has passed, groups can compare notes and someone can make a master list on the board.

Then remind students that we have a tradition of celebrating when each person has made one more trip around the Sun with a birthday party. And, once each year, we add one more number to the value of our age. But if we lived on a planet with a shorter year, we would have had more parties and be considered older in local years. And if we lived on a planet with longer years, we would have had fewer parties and would be younger in local years.

So, the purpose of this activity is to figure out how old each student would be on the other planets with which we share the neighborhood of the Sun. And, for fun, we can consider not only the big planets, but also the smaller ones that are called now dwarf planets, some of which are literally "far out" – so far from the Sun that they take centuries to make one orbit.

Provide students with the attached worksheet, giving the orbital period of each planet and acknowledged dwarf planet in units of Earth years. Students should write in their own age, and then divide each period by their Earth age to find out how old they would be on the new world under consideration. Depending on their math skills, you might also ask students to look at the worlds where their age is only a fraction of a year and give that age in days or weeks.

Students will likely be amused to discover that a 12-year old on Earth would be age 50 on Mercury, and that she would be 0.042 years old on Haumea, which translates as 15.4 days old (if you count in Earth days.) Birthday parties would get old fast (pardon the expression) on Mercury, and they'd never come during a human life time on Haumea.

Bonus Activity:

Our system of planets is not the only one. Astronomers have now discovered about 6,000 planets orbiting other stars, and, from all indications, that's just the tip of the iceberg. Astronomers at the University of Puerto Rico have set up a Planetary Habitability Lab to figure out which of these planets might be most likely to harbor life as we know it. They keep a *Habitable Worlds Catalog,* which lists the characteristics of each likely planet at: https://phl.upr.edu/hwc Students could pick one or more worlds and use the blank lines on the worksheet to figure out how old they are on those planets. (Note that the table gives the period the planet takes to orbit its star in days. Students might be surprised that so many of the periods are so short, when planets orbiting close to our Sun are too hot for life. That's because many of those planets orbit stars that are less bright and hot than the Sun, so you have to be closer to them to be warm enough.)

World	One Orbit Takes	Your Earth Age	Your New Age
Mercury	88 Earth days = 0.24 Earth years		
Venus	225 Earth days = 0.62 Earth years		
Mars	687 Earth days = 1.88 Earth years		
Ceres	4.6 Earth years		
Jupiter	12 Earth years		
Saturn	29 Earth years		
Uranus	84 Earth years		
Neptune	165 Earth years		
Pluto	248 Earth Years		
Haumea	285 Earth Years		
Makemake	307 Earth Years		
Eris	558 Earth Years		