

Planet Party

Grades 3-5

The Big Idea

This week you'll use glowsticks to map the Earth's path as it zooms through space. You'll see why the Moon changes shape and how fast it has to hustle to orbit around us!

Supplies You Provide

- ★ Glowsticks: 52 sticks (13 of each color: green, red, blue and yellow)
Glowsticks are highly recommended, but you could use painter's tape, yarn, or ribbon in green, red, blue and yellow. You'll need approximately 8 feet of each color.
- ★ Flashlight
- ★ Writing surface, like whiteboard, blackboard or large sheet of paper

Room Set-up

- ★ Choose a space where the lights can be dimmed so the kids can see the glowsticks glow!
- ★ Clear the middle of the room to create **at least 10 square feet** of open space.

Other Key Prep

- ★ **Sort out 13 sticks** in each color: red, green, blue, yellow. Keep the connectors handy, too. **Crack and shake the sticks right before the club starts.**
- ★ It's important that you **watch the Coach Overview Video** for this week to see the activity in action.

What's the Math?

- ★ Geometry: diameter, circumference
- ★ Ratios and scale
- ★ Factors and multiplication

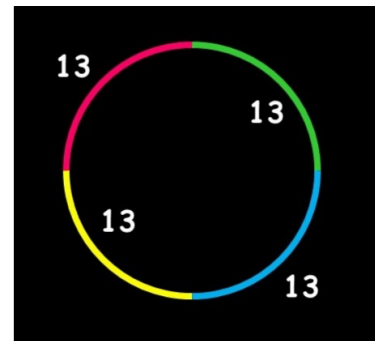
Kickoff

Intro to the kids: “Today we’re going to explore how far the Earth and Moon travel through space.”

Make Some Space (10 minutes)

Intro to the kids: “Just like the Moon orbits the Earth, the Earth orbits the Sun. Let’s make a model of Earth’s orbit around the Sun!”

1. Split the kids into **4 groups**.
2. Hand each group 13 sticks of **the same color** plus connectors.
3. Each group uses connectors to connect their own sticks in a line.
4. Then ask the green team to connect 1 end to the blue group. Then the blue group connects its open end to the yellow group. The yellow group connects its open end to the red group, which connects its open end to green to make one large, 52-stick circle!
5. **Dim the lights** to see it all glow! You can note that in real life Earth’s orbit is an **ellipse** (oval), not an exact circle.



Ask the kids:

- ★ “This is Earth’s orbit. Why do we have 1/4 of it in each color?” (Discuss. It’s the **4 seasons!** Show the kids the glow sticks going **counterclockwise**: green spring, red summer, yellow autumn and blue winter.)
- ★ “What do you call that distance across a circle?” (Discuss. It’s the **diameter**.)
- ★ “What do you call the whole distance around the orbit?” (Discuss. It’s the **circumference** of the circle.)
- ★ “If Earth is 93 million miles from the Sun (the center of this circle), **how far across** is its whole orbit?” (Answer: twice as far, or 186 million miles.)

Bonus (optional): Ask the kids:

- ★ “Do you know how to get the circumference from the diameter?” Explain that it’s always a little more than 3 times the diameter, or **pi**, which is rounded to 3.14 (some kids may not have learned pi yet).
- ★ “So about how far do we and Earth travel around the Sun every year?” Answer: We all travel about **584 million miles** a year!
- ★ “How many millions of miles have you traveled in your life?” Let the kids round to 500 or 600 million to estimate!

Get the Rhythm (5-10 minutes)***Intro to the kids:***

- ★ “We’re going to count out loud as a group: 1, 2, 3…”
- ★ “Then on 4 you also **clap** - and you’re going to clap on every 4th number. What’s the next number you’ll clap for? And the one after that?” **Write their responses** on the board (Clap: 4, 8, 12, 16…). Keep going all the way up to 52.
- ★ “Then, on every 13th number, you also **stomp your feet**. When will you **stomp** next after 13?” Take their **next 3 guesses** and write them down. This should give you (Stomp: 13, 26, 39 and 52).
- ★ “We’re now going to do our rhythm counting from 1 to **52**. Is everyone ready?” You can first practice just clapping on the 4s, then try again with them adding the stomps on the 13s.

Ask the kids:

- ★ “Can anyone guess why on earth we did this?” (Discuss. You can give the kids a **hint if needed**: “What comes in a set of 52?” They may guess playing cards, but that’s not the answer we’re looking for! See if kids guess that it’s the number of **weeks in a year**.)
- ★ “So, what happens every 4 weeks?” (Discuss. **Wait** to see if the kids guess that that’s the time our **Moon** takes to travel in a circular path, or “orbit,” once around the Earth).

- ★ “And what happens every 13 weeks?” (Discuss. Take guesses and see if the kids get that it’s the start of a new **season!**)

Bonus (optional): Ask the kids: “Knowing that there are 365 *days* in a year, are there exactly 52 *weeks* in a year?” (Discuss. Let them play with the numbers and see if they can figure out that 52 weeks times 7 days per week is only 364 days. What’s the discrepancy? The Moon’s orbit is closer to 29 days, which is a bit longer than 4 weeks.)

Feel the Earth Move (20 minutes)

Intro to the kids: “Now let’s see the Earth, Moon, and Sun in action!”

1. Ask for **3 volunteers** to be the Earth, Moon, and Sun.
2. Hand the **Sun** a **flashlight**. S/he stands at the center of your glowstick orbit.
3. The **Earth** stands on the orbit at the division between blue and green, facing the direction that green is running.

Ask the kids: “What time of year is this?” (Discuss until kids guess it’s the start of spring!)

4. Divide the remaining kids into **4 groups**. Have each group stand at the start of a season.
5. The **Moon** stands on the far side of Earth **away from the Sun**. The Sun shines the flashlight on both of them.
6. First, to practice the Moon’s orbit, the whole group counts 1, 2, 3... and **claps** on all the multiples of 4. **Earth stands still**, while the **Moon walks around** the Earth counterclockwise like in real life - and has to get all the way around the Earth on **every 4th beat!**
7. Once they master that, the Earth **starts walking around** its glowstick orbit counterclockwise, while the Moon **keeps walking around** the Earth. **Remind** the group that:
 - ★ They now have to stomp on the 13s to mark each season (13, 26, 39, and 52).

- ★ The Earth has to move 1 glowstick per beat and **make it to the next season** by each stomp!
 - ★ The Moon still has to make it around the Earth in 4 beats.
 - ★ Point out that Earth should also be **spinning**, but it would have to turn 7 times each week (1 glowstick) and 90 per season!
8. When Earth and Moon reach the end of spring, swap in 2 new kids to be Earth and Moon. **Swap again** at the end of each season so more kids get to play.
 9. Once you finish a year, **repeat** with a new Earth, Moon, **and** Sun, but going faster!
 10. When the kids get comfortable with their orbits, you can **turn off the lights** to boost the flashlight effect.

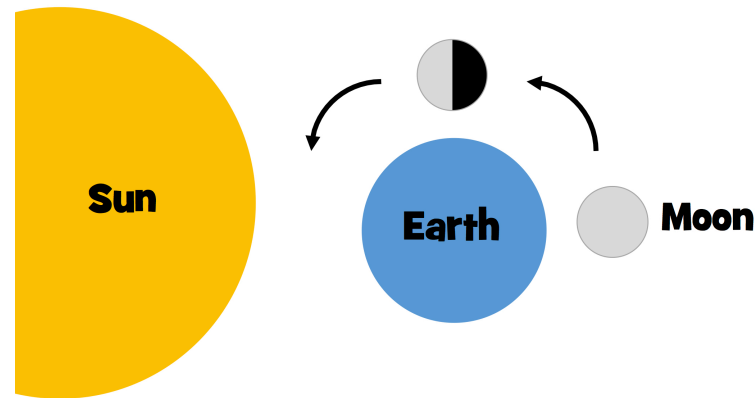
Put a Spin on It (15-20 minutes)

Intro to the kids: ““In real life, how far away from us is our Moon?” (Answer: it’s about 240,000 miles, or nearly a quarter-million miles!) When you look up into the sky at night, you’ll notice that the Moon changes shapes from day to day and is in a different location depending on the time of night. Let’s take a closer look at the Moon’s orbit!”

1. Ask for new **3 new volunteers** to be the Earth, Moon, and Sun.
2. The **Moon** stands on the far side of the Earth **away from the Sun**. The **Sun** shines the flashlight on both of them.

Ask the kids:

- ★ “Our Moon is standing on the dark (night) side of Earth. What would this Moon look like?” (Answer: you’d see a **full moon**, the lit side.)
3. Now let the Moon walk **counterclockwise** 1/4 of the way around the Earth, as shown here:



Ask the kids:

- ★ “What shape does the Moon look like now to people on Earth?”
(Discuss. It’s a half moon, with the left side lit to make a C.)
 - ★ “And what time of day is it for people looking straight up at it?”
(Discuss. It’s sunrise: if they look left, they can *just* start to see the Sun. Let Earth turn **counterclockwise in place** to show sunrise.)
 - ★ “What time of day is it for people who are *just* starting to see the Moon?” (Discuss. See they figure out that it’s midnight – the Moon is **rising in the east**, to their left.)
 - ★ **Explain:** “As we see, a **1/2 moon** is up **1/2 the night!** And a **full moon** is up for the **full night** – easy to remember! That’s a **Party Fun Fact** you can share with your friends and family!”
4. Have the Moon move between the Earth and the Sun, to show the **new moon**. It’s up all day: “zero” moon is up for 0 hours of the night!

A Touch of Class: “I bet you didn’t know you could use math to figure out the different seasons and when we will see a full moon! We see circles every day, but the ones we can’t see are the biggest and the best, like the Earth’s orbit. And we measure those using the same math from school.”