Family edition

Moon and Tides Lab: Why Isn't There an Eclipse Every Month?

Ages 11-14 · about 45 minutes, in one sitting

Your child finds out why there is not an eclipse every month, in Moon and Tides Lab. The point is that the Moon's path is tipped a little, so most full Moons pass above or below Earth's shadow.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month&ref=fam-moontideslab-2. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month&ref=fam-moontideslab-2. The Eclipses chapter: the picture from far above, with a side view under it where heights are to scale and distances are squeezed.

1. **Predict.** Pick every month, some months or never.
2. **Three full Moons.** Press `Next full Moon` three times. The side view shows the Moon about 4 to 5 degrees below the shadow each time: no eclipse.
3. **Flat.** Press `Lay the orbit flat`. Now every full Moon goes through the shadow.
4. **Back.** Turn the orbit back and press `Next eclipse`. The app jumps months ahead to the next one.
5. **Things to try.** After the second answer: a total eclipse of the Moon seen from here, an eclipse of the Sun seen from here, and a ring of fire.

> Every eclipse of the Sun in the app comes with the safety lines: eclipse glasses made to ISO 12312-2, never sunglasses, and bare eyes only during totality. Read them aloud even though the lesson is on a screen.

The ideas, in plain words

An eclipse of the Moon needs a full Moon in Earth's shadow; an eclipse of the Sun needs a new Moon whose shadow falls on Earth. The Moon's path is tipped 5.1 degrees, so at most full and new Moons it passes above or below. Only when the Sun is lined up with the two crossing points, about every 173 days, can there be eclipses.

Every eclipse season has at least one eclipse of the Sun, so there are at least two a year somewhere on Earth. Each one is seen only from the narrow path of the Moon's shadow, while an eclipse of the Moon is seen by everyone on the night side.

Children often confuse phases and eclipses. Phases happen every month and have nothing to do with the shadow; eclipses are the rare months the shadows line up.

Do it together

1. Open mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month&ref=fam-moontideslab-2 together. Ask: is there an eclipse of the Moon every month? Pick your answer in the guide.

   > **You'll know it worked when:** Any answer is fine: it is asked again later.

2. Press `Next full Moon` three times and watch the side view under the picture.

   > **You'll know it worked when:** The Moon passes above or below the shadow each time.

3. Lay the orbit flat, then turn it back and press `Next eclipse`.

   > **If you get stuck:** The switch is under the picture, with the jump buttons.
   >
   > **You'll know it worked when:** With a flat path every full Moon is an eclipse; with the real tipped path you have to wait for one.

4. Try A total eclipse of the Moon seen from here, and read the safety lines together.

   > **You'll know it worked when:** Your child can say why an eclipse of the Moon is seen by everyone on the night side.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- In the side view, where did the Moon pass this time?
- What changed when you laid the orbit flat?
- Why can an eclipse of the Moon only happen at full Moon?
- Who on Earth can see an eclipse of the Moon? An eclipse of the Sun?
- How far apart were the eclipses in your log?

> The second question is the real test: a child who can say why flat means monthly eclipses has the model.

For younger and older kids

Younger: For a younger child, use a flashlight, a ball and a smaller ball: line them up for an eclipse, then lift the small ball a little.

Older: For a teenager, log twelve full Moons and find the two eclipse seasons.

Keep going

- Find a ring of fire eclipse and explain why the Moon looks too small to cover the Sun.
- Solve the Eclipse or not? and Who sees it? puzzles.
- Use Real dates to find the next eclipse of the Moon seen from your town.

Bring it into other subjects

- Math: eclipse seasons come about every 173 days. How many in three years? Why do they come a little earlier each year?
- History: read how Aristotle used the round edge of Earth's shadow on the Moon as evidence that the Earth is round.
- Health: make a poster on safe ways to watch an eclipse of the Sun.
- English: write a news report on a total eclipse of the Moon for a town on the night side.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Moon and Tides Lab: Why Isn't There an Eclipse Every Month?
SUBJECTS	Earth and space science
TIME	45 minutes
WHAT WE DID	Used a model of the Earth, Sun and Moon to explain why eclipses happen only some months: the Moon's orbit is tilted about 5 degrees.
SKILLS PRACTICED	Eclipses; Using a model; Recording data

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month

Essential question: There is a full Moon every month. Why isn't there an eclipse of the Moon every month?

Warm-up: Is there an eclipse of the Moon every month, some months, or never? Why?

_____

1. **Vocabulary.** Lunar eclipse, solar eclipse, tilt, eclipse season, umbra: write each in your own words.

2. **The full Moon log.** Press Next full Moon twelve times. For each: above, below, or an eclipse? Circle the eclipses.

3. **Flat.** With the orbit laid flat, how many full Moons were eclipses? _____

1. Why do most full Moons miss Earth's shadow? Draw the side view.

2. Who can see an eclipse of the Moon, and who can see an eclipse of the Sun?

Quick check

Name: _____

1. An eclipse of the Moon can only happen at (A) new Moon (B) first quarter (C) full Moon

2. Most months there is no eclipse because (A) the Moon's path is tipped (B) clouds block it (C) the Moon is too far away

3. A friend says the phases and eclipses are the same thing. What would you tell them?

Answers

QUESTION	ANSWER	WHY
1	C	Only at full Moon is the Moon on the far side of the Earth, where the shadow points.
2	A	Tipped about 5 degrees, the Moon passes above or below the shadow most months.
3	They are different	Phases happen every month because we see different amounts of the lit half; an eclipse is a shadow and happens only some months.

If your state or umbrella school asks, this lesson covers NGSS MS-ESS1-1.

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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