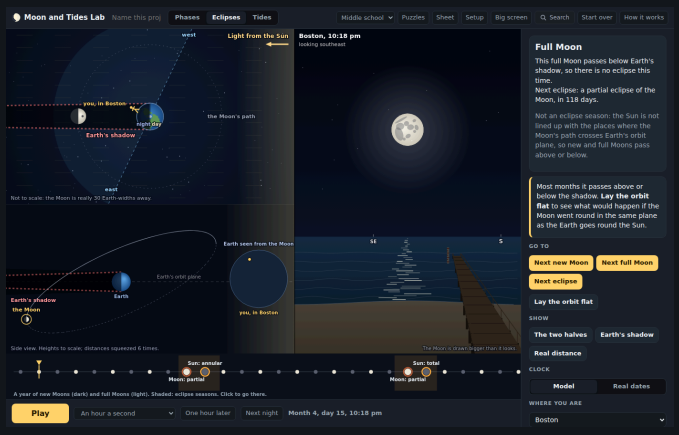
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Moon and Tides Lab: Why Isn't There an Eclipse Every Month?

Grades 6-8 · 45 minutes

Earth and space science · Astronomy



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a full Moon log
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school Earth and space science
- Standards: NGSS

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

Grades 6-8 · 45 minutes · Earth and space science, Astronomy

There is a full Moon every month, so why not an eclipse every month? Students predict, then jump from full Moon to full Moon and watch a side view where the Moon passes above or below Earth's shadow. Laying the orbit flat makes every full Moon an eclipse. The real path is tipped about 5 degrees, so eclipses come only when a full or new Moon falls near a crossing point, in two seasons a year.

At a glance

ESSENTIAL QUESTION

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

OBJECTIVES

Students will be able to:

- describe where the Sun, Earth and Moon are during an eclipse of the Moon and an eclipse of the Sun
- explain that the Moon's path is tipped about 5 degrees, so most full and new Moons miss the shadows
- predict whether a full Moon will be an eclipse from where it passes in the side view
- explain why a solar eclipse is seen from a narrow path but a lunar eclipse from half the Earth

VOCABULARY

Eclipse of the Moon (lunar eclipse), Eclipse of the Sun (solar eclipse), Tilt, Eclipse season, Umbra

STANDARDS

MS-ESS1-1

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work
- Optional: a hula hoop held a little tipped round a ball, for the tilt

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month&ref=tpt-moontideslab-2 once on a student computer: it opens on the Eclipses chapter, with a side view under the picture from above. Pick an answer, press `Next full Moon` three times, lay the orbit flat, turn it back and press `Next eclipse`, about five minutes.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up vote: every month, some months, or never? Record the numbers.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app. Point at the side view: the Sun far to the left, Earth's shadow reaching to the right, the Moon above or below the line. Show Seen from the side, then A total eclipse of the Moon. **It's working when:** Hold a hoop tipped round a ball while you explain: the Moon crosses the flat line in two places only.	Fill in the vocabulary.
12 to 22	**Guided practice (We do)** Three full Moons together	Students open the link or scan the QR code. The guide asks them to pick an answer, press Next full Moon three times, lay the orbit flat, turn it back and find the next eclipse, then answer again. **Watch for:** Students who look only at the picture from above, where every full Moon seems to touch the shadow. Send them to the side view.	Follow the guide and record the first three full Moons in the log.
22 to 38	**Independent practice (You do)** The full Moon log	Students press Next full Moon twelve times and log each one: above, below, or an eclipse. Then they find an eclipse of the Sun under Things to try. Walk the room with the What to look for questions. **If they ask:** "Your eclipses came about six months apart. Where is the Sun then, compared with the places the Moon's path crosses?" The eclipse months	Fill in the log and circle the months with eclipses.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Go back to the warm-up vote and compare it with the logs. Read the eclipse safety lines aloud. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/moontideslab?lesson=why-isnt-there-an-eclipse-every-month&ref=tpt-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.

Background for the teacher

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.

Students 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.

What to look for

Ask these while students work. A student who has understood the lesson 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 student who can say why flat means monthly eclipses has the model.

Cross-curricular extensions

- 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.

Vocabulary

Eclipse of the Moon (lunar eclipse)	The Moon passes through Earth's shadow. It can only happen at full Moon.
Eclipse of the Sun (solar eclipse)	The Moon's shadow falls on Earth. It can only happen at new Moon.
Tilt	The Moon's path is tipped about 5 degrees from the flat path the Earth takes round the Sun.
Eclipse season	A stretch of about a month, twice a year, when the Sun lines up with the places the Moon's path crosses Earth's.
Umbra	The dark middle of a shadow, where the Sun is completely blocked.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the shadow and the Moon in the side view as you say "above" and "below".
- Pair each learner with a partner; the log is three words, above, below or eclipse.
- Accept the explanation as a side-view drawing with the shadow and the Moon.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one pressing and one logging.
- Zoom the browser to 150%.
- Allow six full Moons instead of twelve where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "Most full Moons miss the shadow because the Moon's path is ___."
- Fill in the first three rows of the log together.
- Show the hoop and ball again before the independent work.

STUDENTS READY FOR MORE

- 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.

Adapting for other grades

Younger students: In grades 4 and 5, stop after the guide and log six full Moons; drop the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school, switch the level to High school, read the Moon's height above the plane in degrees at each full Moon, and work out how close to a crossing point the Sun must be for an eclipse.

Student worksheet

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?

Exit ticket

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?

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Exit ticket

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

Answer key: exit ticket

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.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Data	Twelve full Moons logged, with the eclipse months found and a solar eclipse found too.	Twelve full Moons logged with the eclipses marked.	Fewer than twelve, or eclipses not marked.	No log.
Model	Draws the side view with the Sun, Earth, shadow and a Moon passing above or below, and an eclipse with all three in a line.	Draws a side view with the Moon missing the shadow.	Draws only the view from above.	No drawing.
Explanation	Explains the 5 degree tilt, the two crossing points and why eclipse seasons come about twice a year.	Explains that the tipped path makes most full Moons miss the shadow.	Says eclipses are rare with no reason.	No explanation, or says every full Moon is an eclipse.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-ESS1-1, the eclipses part.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-ESS1-1**	6-8	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Students use a model with the Moon's tilted orbit to describe the cycle of eclipses of the Sun and Moon and predict whether one will occur.

Checked November 2026 against: NGSS MS-ESS1-1, Earth's Place in the Universe, NGSS MS-ESS1-1 evidence statement (June 2015), NASA eclipse web site, the Moon's orbit and eclipse seasons.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/moon-and-tides-lab/lessons/why-isnt-there-an-eclipse-every-month/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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