FOR TEACHERS

Answer Key

Answers are shown in **red**. Moon pictures are drawn for Northern Hemisphere viewers. Live data answers vary with the date and time students observe; the 6–8 key includes a sample data set and the pattern students should find.

Moon Phase Detective, Part 2 (Detective Log): what to look for

- **Graph:** bars rising day to day = waxing; falling = waning. Over 5 school days the % usually changes by about 15–45 points, depending on where in the cycle you start.
- **Prediction (7 days later):** about a quarter of the cycle passes in 7 days, so the Moon moves about two phases forward in the order. Examples: Waxing Crescent → Waxing Gibbous; First Quarter → Full Moon; Full Moon → Last Quarter; Last Quarter → New Moon.
- **Good clues:** waxing/waning direction from the table; about 7½ days between main phases; about 29½ days for the whole cycle.

Main phases, November 2026 – January 2027 (Eastern Time)

New Moon	First Quarter	Full Moon	Last Quarter
Mon Nov 9, 2:02 AM	Tue Nov 17, 6:47 AM	Tue Nov 24, 9:53 AM	Tue Dec 1, 1:08 AM
Tue Dec 8, 7:51 PM	Thu Dec 17, 12:42 AM	Wed Dec 23, 8:28 PM	Wed Dec 30, 1:59 PM
Thu Jan 7, 3:24 PM	Fri Jan 15, 3:34 PM	Fri Jan 22, 7:17 AM	Fri Jan 29, 5:55 AM

Computed with the NASA JPL DE421 ephemeris (Skyfield). Times are Eastern Standard Time.

NGSS connections (nextgenscience.org)

- **1-ESS1-1** Use observations of the sun, moon, and stars to describe patterns that can be predicted. (My Moon Journal)
- **5-ESS1-2** Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (Moon Phase Detective builds this practice of graphing sky data; moon phases themselves are not part of this PE.)
- **MS-ESS1-1** 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. (Why the Moon Has Phases)

GRADES 3–5 · ANSWER KEY

Moon Phase Detective

Name: _____

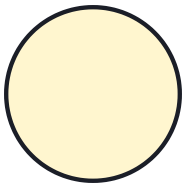
The Moon doesn't change shape. Half of it is always lit by the Sun. As the Moon travels around Earth, we see different amounts of that sunlit half. These shapes are called **phases**.

1 Name the phases

Write the correct name under each Moon. Use the word bank.

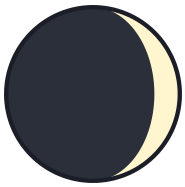
Waning Gibbous · First Quarter · New Moon · Waxing Crescent · Full Moon · Last Quarter · Waxing Gibbous · Waning Crescent

A



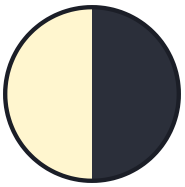
Full Moon

B



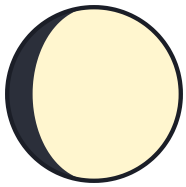
Waxing Crescent

C



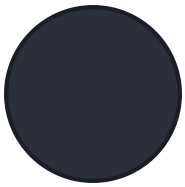
Last Quarter

D



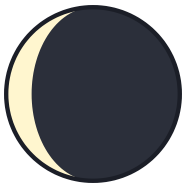
Waxing Gibbous

E



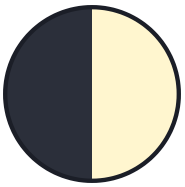
New Moon

F



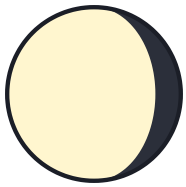
Waning Crescent

G



First Quarter

H



Waning Gibbous

Pictures show the Moon as seen from the Northern Hemisphere (U.S., Canada, Europe). In the Southern Hemisphere the lit side is flipped.

2 Put them in order

Start with the New Moon (E). Write the letters in the order the phases happen. Then it starts again!

E → B → G → D → A → H → C → F → E …

3 Detective clues

1. **Waxing** means the lit part is getting _bigger_. **Waning** means it is getting _smaller_.
2. From one New Moon to the next takes about _29½_ days (about one month).
3. Which two phases look like half a circle? _First Quarter and Last Quarter_

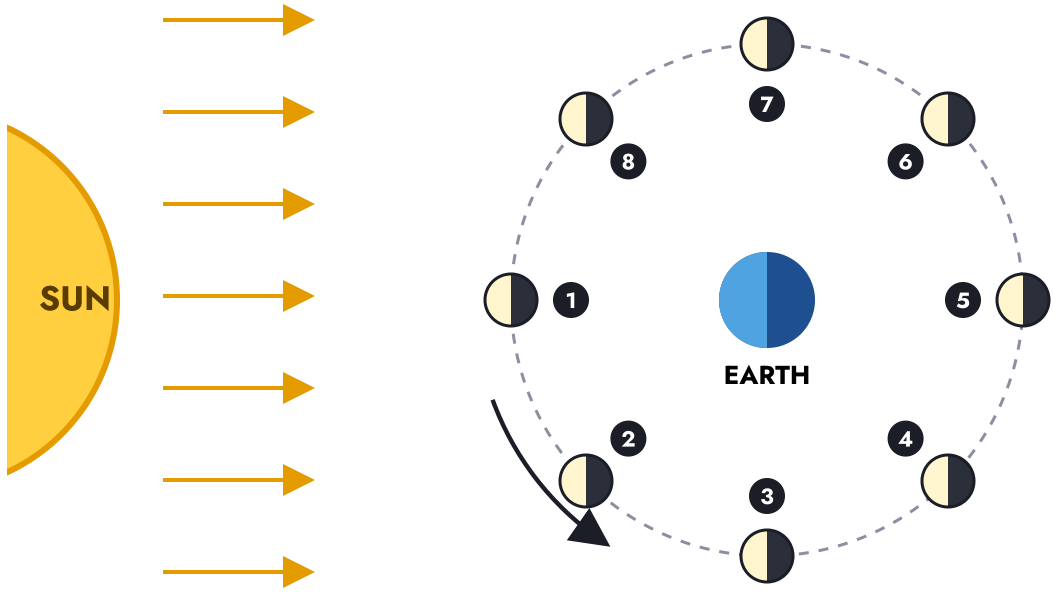
GRADES 6–8 · ANSWER KEY

Why the Moon Has Phases

Name: _____

Model: the Sun always lights half of the Moon. As the Moon orbits Earth (about 29.5 days from new Moon to new Moon), we see different fractions of that lit half. Earth's shadow does **not** cause phases.

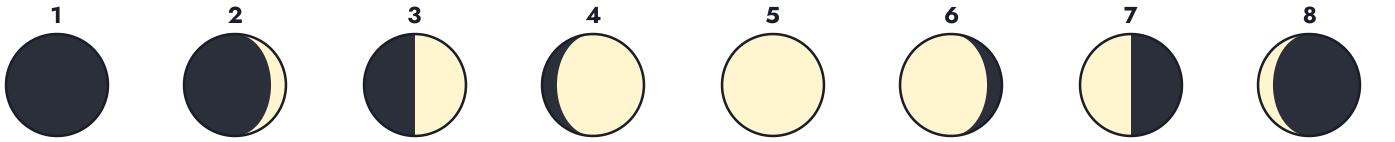
1 The Sun–Earth–Moon model



sunlight

View from above Earth's North Pole · not to scale

For each numbered position, shade the circle to show how the Moon **looks from Earth** (Northern Hemisphere), then name the phase.



1	2	3	4	5	6	7	8
New	Waxing crescent	First quarter	Waxing gibbous	Full	Waning gibbous	Last quarter	Waning crescent

2 Use the model

1. At which position is the Moon between Earth and the Sun? 1, New Moon Why can't we see it then?

   Its lit half faces away from Earth (toward the Sun), and it is up in the daytime sky near the Sun's glare.

2. At position 5 the Moon is on the far side of Earth from the Sun, yet it is usually fully lit. Why doesn't Earth's shadow block it every month?

   The Moon's orbit is tilted about 5° to Earth's orbit, so the Moon usually passes above or below Earth's shadow.

   Only when it lines up exactly (near an orbit node) do we get a lunar eclipse.

GRADES 6–8 · PART 2 · ANSWER KEY

Moon Data Lab

Name: _____

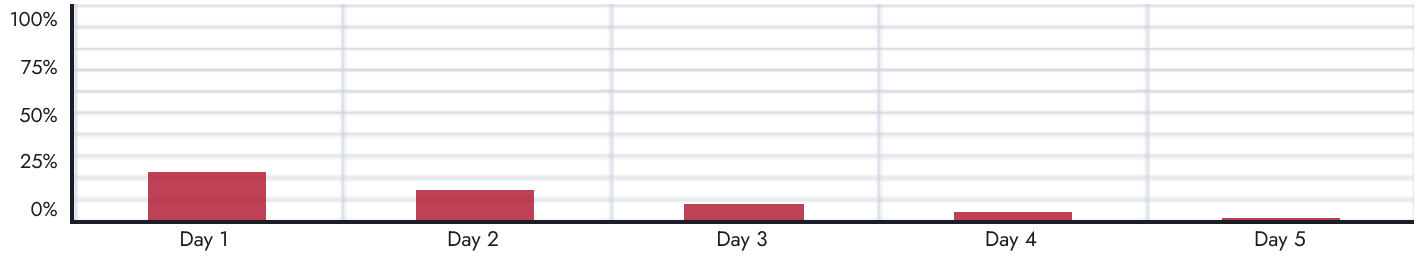
On the Skyline™ MOON UPDATE live stream, the **top-right corner** shows % illuminated and the phase name all the time. The Moon segment adds the exact illumination, the Moon's age (days since new Moon) and its distance. Record data at about the **same time each day**.

3 Data table (5 days)

Date	Time	Phase name	% illuminated	Moon age (days)	Change from previous day (%)
Wed Nov 4, 2026	9:00 AM ET	Waning Crescent	21.9%	25.0	—
Thu Nov 5	9:00 AM ET	Waning Crescent	13.8%	26.0	-8.1
Fri Nov 6	9:00 AM ET	Waning Crescent	7.5%	27.0	-6.3
Sat Nov 7	9:00 AM ET	Waning Crescent	3.1%	28.0	-4.4
Sun Nov 8	9:00 AM ET	Waning Crescent	0.7%	29.0	-2.4

Sample data (Nov 4–8, 2026, computed from NASA JPL DE421, the same ephemeris the stream uses). Student data will differ by date and time; check that it follows the same pattern.

4 Graph and analyze



3. Is the Moon waxing or waning? Use your data as evidence.

   Sample: waning. Illumination fell every day (21.9% to 0.7%) and the phase name is waning crescent.

4. Did the % change by the same amount each day? Where in the cycle does it change fastest?

   No. It changes fastest near First and Last Quarter (about 10% per day) and slowest near New and Full Moon, because near a quarter phase the shadow line crosses the middle of the disk, where each day uncovers the most area.

5. Use the 29.5-day cycle and your data to predict the date of the next full Moon. Show your reasoning.

   Sample: age 25 days on Nov 4, so new Moon in about 4.5 days (Nov 9); full about 14.8 days later: about Nov 24.

   Actual: new Moon Nov 9, 2026, 2:02 AM ET; full Moon Nov 24, 2026, 9:53 AM ET.

6. The stream also shows the Moon's distance. Does distance cause phases? Explain using the model.

   No. Distance changes the Moon's apparent size a little, but the phase depends only on the Sun–Earth–Moon angle, which sets how much of the sunlit half faces Earth.